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Document Name: ITU-R M-493-11: Digital Selective-calling System for Use in the Maritime Mobile Service, with Annexes 1 and 2

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RECOMMENDATION ITU-R M.493-11*

**Digital selective-calling system for use
in the maritime mobile service**

(1974-1978-1982-1986-1990-1992-1994-1995-1997-1997-2000-2004)

The ITU Radiocommunication Assembly,

considering

- a) that selective-calling in the shore-to-ship, ship-to-ship and ship-to-shore directions would expedite the handling of traffic in the maritime mobile service;
- b) that the International Maritime Organization (IMO) has listed a number of operational requirements that should be taken into account when designing a general purpose selective-calling system;
- c) that Chapter IV of the International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended, requires the use of digital selective calling (DSC) for distress alerting and safety calling in the Global Maritime Distress and Safety System (GMDSS);
- d) that neither the selective-calling system described in Recommendation ITU-R M.257, nor that forming part of the systems described in Recommendations ITU-R M.476 and ITU-R M.625, can fully meet the IMO performance standards for shipborne equipment;
- e) that the DSC system should be applicable to the maritime mobile service, both for international and national needs;
- f) that it is desirable that the DSC system fulfils the requirements of all types of vessels desiring to use it;
- g) that the Radio Regulations (RR) adopted by the World Radiocommunication Conference (Geneva, 1997) (WRC-97) provided for the use of maritime mobile service identities by all administrations;
- h) that after experience gained, a need exists to reduce unnecessary alarms and simplify operation of shipborne equipment;
- j) that in certain applications there may be a need to disable DSC automatic channel switching when there is a requirement for vessels to maintain continuous radio watch on a specific radio telephony channel (e.g. port traffic control, bridge-to-bridge communications),

* This Recommendation should be brought to the attention of the International Maritime Organization (IMO).

recommends

- 1 that where there is a need for a general purpose DSC system, the system should be designed in accordance with the characteristics given in Annex 1;
- 2 that where there is a need for simplified versions of DSC equipment, they should be designed in accordance with Annex 2;
- 3 that in a GMDSS coast radio station installation, sufficient separation should be provided between the DSC distress channel receiver antennas and any transmitting antennas within the installation. This is to avoid any de-sensitization of the DSC distress channel receivers if any transmitter is used at full power on any designated transmit frequency other than the DSC distress frequencies;
- 4 that DSC equipment should also be designed in accordance with the requirements specified within Recommendation ITU-R M.541.

Annex 1

General purpose equipment characteristics

1 General

1.1 The system is a synchronous system using characters composed from a ten-bit error-detecting code as listed in Table 1.

1.1.1 The first seven bits of the ten-bit code of Table 1 are information bits. Bits 8, 9 and 10 indicate, in the form of a binary number, the number of B elements that occur in the seven information bits, a Y element being a binary number 1 and a B element a binary number 0. For example, a BYY sequence for bits 8, 9 and 10 indicates 3 ($0 \times 4 + 1 \times 2 + 1 \times 1$) B elements in the associated seven information bit sequence; and a YYB sequence indicates 6 ($1 \times 4 + 1 \times 2 + 0 \times 1$) B elements in the associated seven information bit sequence. The order of transmission for the information bits is least significant bit first but for the check bits it is most significant bit first.

1.2 Time diversity is provided in the call sequence as follows:

1.2.1 Apart from the phasing characters, each character is transmitted twice in a time-spread mode; the first transmission (DX) of a specific character is followed by the transmission of four other characters before the re-transmission (RX) of that specific character takes place, allowing for a time-diversity reception interval of:

1.2.1.1 400 ms for HF and MF channels, and

1.2.1.2 $33\frac{1}{3}$ ms for VHF radio-telephone channels.

1.3 The classes of emission, frequency shifts and modulation rates are as follows:

1.3.1 F1B or J2B 170 Hz and 100 Bd for use on HF and MF DSC calling channels. When frequency-shift keying is effected by applying audio signals to the input of single-sideband transmitters (J2B), the centre of the audio-frequency spectrum offered to the transmitter is 1 700 Hz. When a DSC call is transmitted on HF and MF working channels for public correspondence, the class of emission is J2B. In this case, audio tones with frequencies $1\,700\text{ Hz} \pm 85\text{ Hz}$ and modulation rate 100 Bd are used in order for the DSC call to be transmitted.

1.3.2 Frequency modulation with a pre-emphasis of 6 dB/octave (phase modulation) with frequency-shift of the modulating sub-carrier for use on VHF channels:

- frequency-shift between 1 300 and 2 100 Hz; the sub-carrier being at 1 700 Hz;
- the frequency tolerance of the 1 300 and 2 100 Hz tones is $\pm 10\text{ Hz}$;
- the modulation rate is 1 200 Bd;
- the index of modulation is $2.0 \pm 10\%$.

1.3.3 The radio-frequency tolerances of new designs of both transmitters and receivers in the MF and HF bands should be:

- coast station: $\pm 10\text{ Hz}$,
- ship station: $\pm 10\text{ Hz}$,
- receiver bandwidth: should not exceed 300 Hz.

1.4 The higher frequency corresponds to the B-state and the lower frequency corresponds to the Y-state of the signal elements.

1.5 The information in the call is presented as a sequence of seven-bit combinations constituting a primary code.

1.5.1 The seven information bits of the primary code express a symbol number from 00 to 127, as shown in Table 1, and where:

1.5.1.1 the symbols from 00 to 99 are used to code two decimal figures according to Table 2;

1.5.1.2 the symbols from 100 to 127 are used to code service commands (see Table 3).

1.6 Where the distress alert repetitions described in § 11 apply, the following conditions are considered necessary:

1.6.1 the transmitter encoder must provide repetitive transmission of the call sequence in accordance with § 11; and

1.6.2 the receiver decoder should provide maximum utilization of the received signal, including use of the error-check character and by using an iterative decoding process with adequate memory provision.

1.7 When the transmission of a DSC distress alert is automatically repeated, ships' DSC equipments must be capable of automatically receiving a subsequent distress acknowledgement (see Recommendation ITU-R M.541, Annex 1, § 3.1.3.1, 3.1.3.2 and 3.3.5).

TABLE 1
Ten-bit error-detecting code

Symbol No.	Emitted signal and bit position 1 2 3 4 5 6 7 8 9 10	Symbol No.	Emitted signal and bit position 1 2 3 4 5 6 7 8 9 10	Symbol No.	Emitted signal and bit position 1 2 3 4 5 6 7 8 9 10
00	BBBBBBYYY	43	YBYBYBBY	86	BYYBYBYBY
01	YBBBBBYB	44	BBYYBYBB	87	YYYBYBYBY
02	BYBBBBYB	45	YBYBYBBY	88	BBYYBYBYB
03	YYBBBBYB	46	BYYBYBBY	89	YBBYBYBYB
04	BBYBBBBY	47	YYYYBYBY	90	BYYYBYBYB
05	YBYBBBBY	48	BBBBYBYB	91	YYBYBYBYB
06	BYYBBBBY	49	YBBYYBYB	92	BBYYBYBYB
07	YYYBBBBY	50	BYBBYYBB	93	YBYYYBYBY
08	BBYBBBBY	51	YBBYYBBY	94	BYYYYBYBY
09	YBBYBBYB	52	BBYBYBYB	95	YYYYYBYBY
10	BYBYBBYB	53	YBYYYBBY	96	BBBBYYBYB
11	YYBYBBYB	54	BYYBYBBY	97	YBBBBYYBY
12	BBYBBYBY	55	YYBYBYBY	98	BYBBYYBYB
13	YBYBBYBY	56	BBYYBYBY	99	YBBBYBYBY
14	BYYYBBYB	57	YBBYYBBY	100	BBYBBYYBY
15	YYYYBBYB	58	BYBYBBYB	101	YBYBBYYBY
16	BBBYBBYB	59	YYBYBBYB	102	BYYBBYYBY
17	YBBYBBYB	60	BYYYYBBY	103	YYBBYYBYB
18	BYBBYBYB	61	YBYYYBBY	104	BBBYBYBYB
19	YBBYBYBY	62	BYYYYBYB	105	YBBYBYBYB
20	BBYBYBYB	63	YYYYYBBY	106	BYBYBYBYB
21	YBYBYBYB	64	BBBBBYBYB	107	YBYBYBYBY
22	BYYBYBYB	65	YBBBYBYB	108	BBYYBYBYB
23	YYYBYBYB	66	BYBBBYBY	109	YBYBYBYBY
24	BBYBYBYB	67	YBBBYBYB	110	BYYYBYBYB
25	YBBYBYBY	68	BBYBBYYBY	111	YYYYBYBYB
26	BYBYBYBY	69	YBYBBYYB	112	BBBBYYBYB
27	YYBYBYBY	70	BYBBYYBB	113	YBBYYBYBY
28	BBYYBYBY	71	YYYBBYBY	114	BYBBYYBYB
29	YBYYYBBY	72	BBYBBYBY	115	YYBBYYBYB
30	BYYYYBBY	73	YBBYBBYB	116	BBYBYBYBY
31	YYYYYBBY	74	BYBYBYBY	117	YBYYYBYBY
32	BBBBBYBY	75	YBYBYBYB	118	BYYBYBYBY
33	YBBBBYBY	76	BBYYBYBY	119	YYYBYBYBY
34	BYBBYBYB	77	YBYBYBYB	120	BBYYBYBYB
35	YBBBYBYB	78	BYYBYBYB	121	YBBYYBYBY
36	BBYBYBYB	79	YYYYBYBY	122	BYBYYYBYB
37	YBYBYBYB	80	BBBYBYBY	123	YYBYYYBYB
38	BYYBYBYB	81	YBBYBYBY	124	BBYYYYBYB
39	YYYBYBYB	82	BYBBYBYB	125	YBYYYBYBY
40	BBBYBYBY	83	YYBYBYBY	126	BYYYYBYBY
41	YBBYBYBY	84	BBYBYBYB	127	YYYYYYBYB
42	BYBYBYBY	85	YBYBYBYB		

B = 0
Y = 1
Order of bit transmission: bit 1 first.

TABLE 2
Packing table for decimal numbers into ten-bit characters

The digits for the									
Thousands of millions D2	Hundreds of millions D1	Tens of millions D2	Millions D1	Hundreds of thousands D2	Tens of thousands D1	Thousands D2	Hundreds D1	Tens D2	Units D1
Character 5		Character 4		Character 3		Character 2		Character 1	

NOTE 1 – Character 1 is the last character transmitted,

The digit sequence D2-D1 varies from 00 to 99 inclusive in each character (character 1 to 5 inclusive). The character that represents a particular two-decimal figure is transmitted as the symbol number (see Table 1) that is identical to that particular two-decimal figure.

When the number consists of an odd number of decimal digits, a zero shall be added in front of the most significant position to provide an integral number of ten-bit characters.

TABLE 3
Use of symbol Nos. 100 to 127

Symbol No.	Phasing and unique functions	Format specifier ⁽¹⁾	Category ⁽¹⁾	Nature of distress ⁽¹⁾	First telecommand ⁽¹⁾	Second telecommand ⁽¹⁾
100			Routine	Fire, explosion	F3E/G3E All modes TP	No reason given ⁽²⁾
101				Flooding	F3E/G3E duplex TP	Congestion at maritime switching centre
102		Geographical area		Collision		Busy ⁽²⁾
103		⁽³⁾	⁽³⁾	Grounding	Polling	Queue indication ⁽²⁾
104	Phasing RX-0 position			Listing, in danger of capsizing	Unable to comply	Station barred ⁽²⁾
105	Phasing RX-1 position			Sinking	End of call ⁽⁴⁾	No operator available ⁽²⁾
106	Phasing RX-2 position		⁽⁶⁾	Disabled and adrift	Data	Operator temporarily unavailable ⁽²⁾
107	Phasing RX-3 position			Undesignated distress		Equipment disabled ⁽²⁾
108	Phasing RX-4 position		Safety	Abandoning ship		Unable to use proposed channel ⁽²⁾
109	Phasing RX-5 position			Piracy/armed robbery attack	J3E TP	Unable to use proposed mode ⁽²⁾
110	Phasing RX-6 position	⁽⁵⁾	Urgency	Man overboard	Distress acknowledgement	Ships and aircraft according to Resolution 18 (Mob-83)
111	Phasing RX-7 position				⁽⁶⁾	Medical transports (as defined in 1949 Geneva Conventions and additional Protocols)
112		Distress	Distress	EPIRB emission	Distress relay	Pay-phone/public call office
113					F1B/J2B TTY-FEC	Facsimile/data according to Recommendation ITU-R M.1081
114		Ships having common interest				
115					F1B/J2B TTY-ARQ	⁽⁶⁾
116		All ships ⁽⁷⁾			⁽⁶⁾	⁽⁶⁾
117	Ack. RQ (EOS)				⁽⁶⁾	⁽⁶⁾
118					Test	⁽⁶⁾
119					⁽⁶⁾	⁽⁶⁾
120		Individual stations			⁽⁶⁾	⁽⁶⁾

TABLE 3 (end)

Symbol No.	Phasing and unique functions	Format specifier ⁽¹⁾	Category ⁽¹⁾	Nature of distress ⁽¹⁾	First telecommand ⁽¹⁾	Second telecommand ⁽¹⁾
121		Reserved for national non-calling purposes e.g. Report ITU-R M.1159			Ship position or location registration updating	⁽⁶⁾
122	Ack. BQ (EOS)				⁽⁶⁾	⁽⁶⁾
123		Individual station semi-automatic/automatic service			⁽⁶⁾	⁽⁶⁾
124		⁽⁵⁾			⁽⁶⁾	⁽⁶⁾
125	Phasing DX position				⁽⁶⁾	⁽⁶⁾
126	*				No information	No information
127	EOS				⁽⁶⁾	⁽⁶⁾

TP: telephony

TTY: direct printing

ARQ: Rec. ITU-R M.476 or Rec. ITU-R M.625 equipment

⁽¹⁾ Unassigned symbols should be rejected. The DSC equipment should take no action.

⁽²⁾ Currently unassigned when used with first telecommands other than symbol No. 104 – for future use.

⁽³⁾ Used for selective call to a group of ships in a specified VTS area (Rec. ITU-R M.825). Reception of calls having format specifier 103, for (or) category shall not activate any alarms on shipborne DSC controller. Should not be used in any future expansion.

⁽⁴⁾ Only used for semi-automatic/automatic service.

⁽⁵⁾ Used in the automatic VHF/UHF service (Rec. ITU-R M.586). Should not be used in any future expansion.

⁽⁶⁾ Should not be used in any future expansion.

⁽⁷⁾ MF/HF used only for distress alert acknowledgment and coast station receive (see Table 4).

2 Technical format of a call sequence

2.1 The technical format of the call sequence is:

Dot pattern See § 3	Phasing sequence See § 3	Call content See Tables 4.1 to 4.10.2	Closing sequence See § 9, § 10 and Fig. 1
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Dot pattern	Phasing sequence	Format specifier	Address	Category	Self-identification
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* Distress calls only.

2.2 Examples of typical call sequences and the construction of the transmission format are given in Figs. 1 to 3.

2.3 The flow charts illustrating the operation of the DSC system are shown in Figs. 4 and 5.

3 Dot pattern and phasing

3.1 The phasing sequence provides information to the receiver to permit correct bit phasing and unambiguous determination of the positions of the characters within a call sequence (see Note 1).

NOTE 1 – Acquisition of character synchronization should be achieved by means of character recognition rather than, for example, by recognizing a change in the dot pattern, in order to reduce false synchronization caused by a bit error in the dot pattern.

3.2 The phasing sequence consists of specific characters in the DX and RX positions transmitted alternatively. Six DX characters are transmitted.

3.2.1 The phasing character in the DX position is symbol No. 125 of Table 1.

3.2.2 The phasing characters in the RX position specify the start of the information sequence (i.e. the format specifier) and consist of the symbol Nos. 111, 110, 109, 108, 107, 106, 105 and 104 of Table 1, consecutively.

3.3 Phasing is considered to be achieved when two DXs and one RX, or two RXs and one DX, or three RXs in the appropriate DX or RX positions, respectively, are successfully received. These three phasing characters may be detected in either consecutive or non-consecutive positions but in both cases all bits of the phasing sequence should be examined for a correct 3-character pattern. A call should be rejected only if a correct pattern is not found anywhere within the phasing sequence.

3.4 To provide appropriate conditions for earlier bit synchronization and to allow for scanning methods to monitor several HF and MF frequencies by ship stations, the phasing sequence should be preceded by a dot pattern (i.e. alternating B-Y or Y-B sequence bit synchronization signals) with duration of:

3.4.1 200 bits

At HF and MF for:

- distress alerts;
- distress acknowledgements;
- distress relays addressed to a geographic area;
- distress relay acknowledgements addressed to all ships;
- all calls addressed to a ship station other than those specified in § 3.4.2.

3.4.2 20 bits

At HF and MF, for all acknowledgements to individual calls having format specifiers 120 and 123 and for all calling to coast stations. At VHF for all calls.

4 Format specifier

4.1 The format specifier characters which are transmitted twice in both the DX and RX positions (see Fig. 1) are:

4.1.1 symbol No. 112 for a “distress” alert (RR Appendix 13, Part A3, § 1); or

4.1.2 symbol No. 116 for an “all ships” call; or

4.1.3 symbol No. 114 for a selective call to a group of ships having a common interest (e.g. belonging to one particular country, or to a single ship owner, etc.); or

4.1.4 symbol No. 120 for a selective call to a particular individual station; or

4.1.5 symbol No. 102 for a selective call to a group of ships in a particular geographic area; or

4.1.6 symbol No. 123 for a selective call to a particular individual station using the semi-automatic/automatic service.

4.2 It is considered that receiver decoders must detect the format specifier character twice for “distress” alerts and “all ships” calls to effectively eliminate false alerting. For other calls, the address characters provide additional protection against false alerting and, therefore, single detection of the format specifier character is considered satisfactory (see Table 3).

5 Address

5.1 “Distress” alerts and “all ships” calls do not have addresses since these calls are implicitly addressed to all stations (ship stations and coast stations).

5.2 For a selective call directed to an individual ship, to a coast station or to a group of stations having a common interest, the address consists of the characters corresponding to the station’s maritime mobile service identity, the sequence consisting of characters coded in accordance with Table 2 (see Note 1).

NOTE 1 – According to RR Article 19, maritime mobile service identities are formed of a series of nine digits, consisting of three digits of the Maritime Identification Digits (MID) and six more digits.

These identities are included in the address and self-identification parts of the call sequence and are transmitted as five characters $C_5C_4C_3C_2C_1$, comprising the ten digits of:

$$(X_1, X_2) (X_3, X_4) (X_5, X_6) (X_7, X_8) \text{ and } (X_9, X_{10})$$

respectively, whereas digit X_{10} is always the figure 0 unless the equipment is also designed in accordance with Recommendation ITU-R M.1080.

Example:

MID $X_4 X_5 X_6 X_7 X_8 X_9$ being the ship station identity is transmitted by the DSC equipment as:

$$(M, I) (D, X_4) (X_5, X_6) (X_7, X_8) (X_9, 0)$$

5.3 For a selective call directed to a group of ships in a particular geographic area a numerical geographic coordinates address consisting of ten digits (i.e. 5 characters), is constructed as follows (see Fig. 6 and Note 1):

NOTE 1 – In order to comply with commonly accepted practice, the order of entry and read-out should be: first latitude and then longitude.

- 5.3.1 the designated geographic area will be a rectangle in Mercator projection;
- 5.3.2 the upper left-hand (i.e. North-West) corner of the rectangle is the reference point for the area;
- 5.3.3 the first digit indicates the azimuth sector in which the reference point is located, as follows:
 - 5.3.3.1 quadrant NE is indicated by the digit “0”,
 - 5.3.3.2 quadrant NW is indicated by the digit “1”,
 - 5.3.3.3 quadrant SE is indicated by the digit “2”,
 - 5.3.3.4 quadrant SW is indicated by the digit “3”;
- 5.3.4 the second and third digits indicate the latitude of the reference point in tens and units of degrees;
- 5.3.5 the fourth, fifth and sixth digits indicate the longitude of the reference point in hundreds, tens and units of degrees;
- 5.3.6 the seventh and eighth digits indicate the vertical (i.e. North-to-South) side of the rectangle, $\Delta\phi$, in tens and units of degrees;
- 5.3.7 the ninth and tenth digits indicate the horizontal (i.e. West-to-East) side of the rectangle, $\Delta\lambda$, in tens and units of degrees.

6 Category

- 6.1 The “category” information is coded as shown in Table 3 and defines the degree of priority of the call sequence.
- 6.2 For a “distress” alert the priority is defined by the format specifier and no category information is included in the call sequence.
 - 6.2.1 For distress relays, distress relay acknowledgements and distress acknowledgements the category is distress (RR Appendix 13, Part A3, § 25.1).
- 6.3 For safety related calls, the “category” information specifies:
 - 6.3.1 urgency; or
 - 6.3.2 safety.
- 6.4 For other calls, the “category” information specifies:
 - 6.4.1 routine.

7 Self-identification

- 7.1 The maritime mobile service identity (MMSI) assigned to the calling station, coded as indicated in § 5.2 and its Note 1, is used for self-identification.

8 Messages

The messages that are included in a call sequence contain the following message elements, which are listed in the order in which they would appear in each message. All message formats are explicitly defined in Tables 4.1 through 4.10.2:

8.1 For a “distress” alert (see Table 4.1)) the distress information is contained in four messages in the following order:

8.1.1 Message 1 is the “nature of distress” message, coded as shown in Table 3, i.e.:

8.1.1.1 fire, explosion;

8.1.1.2 flooding;

8.1.1.3 collision;

8.1.1.4 grounding;

8.1.1.5 listing, in danger of capsizing;

8.1.1.6 sinking;

8.1.1.7 disabled and adrift;

8.1.1.8 undesignated distress;

8.1.1.9 abandoning ship;

8.1.1.10 piracy/armed robbery attack;

8.1.1.11 man overboard;

8.1.1.12 emergency position-indicating radiobeacon (EPIRB) emission.

8.1.2 Message 2 is the “distress coordinates” message, consisting of ten digits indicating the location of the vessel in distress, coded on the principles described in Table 2, in pairs starting from the first and second digits (see Note 1 to § 5.3):

8.1.2.1 The first digit indicates the quadrant in which the incident has occurred, as follows:

8.1.2.1.1 quadrant NE is indicated by the digit “0”,

8.1.2.1.2 quadrant NW is indicated by the digit “1”,

8.1.2.1.3 quadrant SE is indicated by the digit “2”,

8.1.2.1.4 quadrant SW is indicated by the digit “3”.

8.1.2.2 The next four figures indicate the latitude in degrees and minutes.

8.1.2.3 The next five figures indicate the longitude in degrees and minutes.

8.1.2.4 If “distress coordinates” cannot be included, or if the position information has not been updated for 23½ h, the 10 digits following the “nature of distress” should be automatically transmitted as the digit 9 repeated 10 times.

8.1.3 Message 3 is the time indication (UTC) when the coordinates were valid consisting of four digits coded on the principles described in Table 2, in pairs starting from the first and second digits.

8.1.3.1 The first two digits indicate the time in hours.

8.1.3.2 The third and fourth digits indicate the part of the hours in minutes.

8.1.3.3 If the time cannot be included the four time indicating digits should be transmitted automatically as “8 8 8 8”.

8.1.4 Message 4 is a single character to indicate the type of communication (telephone or FEC teleprinter) which is preferred by the station in distress for subsequent exchange of distress traffic (RR Appendix 13, Part A3, § 25, 1). This character is coded as shown in Table 3 first telecommand.

8.2 For a distress relay, distress relay acknowledgement, distress acknowledgement (see Tables 4.2, 4.3 and 4.4) the distress information is contained in five messages in the following order:

8.2.1 Message 0 is the “MMSI” of the vessel in distress.

8.2.2 Message 1 is the “nature of distress” message, coded as shown in Table 3, i.e.:

8.2.2.1 fire, explosion;

8.2.2.2 flooding;

8.2.2.3 collision;

8.2.2.4 grounding;

8.2.2.5 listing, in danger of capsizing;

8.2.2.6 sinking;

8.2.2.7 disabled and adrift;

8.2.2.8 undesignated distress;

8.2.2.9 abandoning ship;

8.2.2.10 piracy/armed robbery attack;

8.2.2.11 man overboard;

8.2.2.12 emergency position-indicating radiobeacon (EPIRB) emission.

8.2.3 Message 2 is the “distress coordinates” message, consisting of ten digits indicating the location of the vessel in distress, coded on the principles described in Table 2, in pairs starting from the first and second digits (see Note 1 to § 5.3):

8.2.3.1 The first digit indicates the quadrant in which the incident has occurred, as follows:

8.2.3.1.1 quadrant NE is indicated by the digit “0”,

8.2.3.1.2 quadrant NW is indicated by the digit “1”,

8.2.3.1.3 quadrant SE is indicated by the digit “2”,

8.2.3.1.4 quadrant SW is indicated by the digit “3”.

8.2.3.2 The next four figures indicate the latitude in degrees and minutes.

8.2.3.3 The next five figures indicate the longitude in degrees and minutes.

8.2.3.4 If “distress coordinates” cannot be included, or if the position information has not been updated for 23½ h, the 10 digits following the “nature of distress” should be automatically transmitted as the digit 9 repeated 10 times.

8.2.4 Message 3 is the time indication (UTC) when the coordinates were valid consisting of four digits coded on the principles described in Table 2, in pairs starting from the first and second digits.

8.2.4.1 The first two digits indicate the time in hours.

8.2.4.2 The third and fourth digits indicate the part of the hours in minutes.

8.2.4.3 If the time cannot be included the four time indicating digits should be transmitted automatically as “8 8 8 8”.

8.2.5 Message 4 is a single character to indicate the type of communication (telephone or FEC teleprinter) which is preferred by the station in distress for subsequent exchange of distress traffic (RR Appendix 13, Part A3, § 25.1). This character is coded as shown in Table 3 first telecommand.

8.3 For other types of calls (see Table 4.5 through 4.10.2 and Figs. 2 and 3) messages are included in the following order:

8.3.1 Message 1 is the “telecommand” information and consists of 2 characters (first and second telecommand) coded as shown in Table 3;

8.3.1.1 if no information additional to that conveyed by the first telecommand character is required, then the second telecommand signal should be symbol No. 126 (no information) (see Table 3);

8.3.1.2 if no telecommand information is used, symbol No. 126 is transmitted twice.

8.3.1.3 If the telecommand 1 is “F3E/G3E duplex TP” (symbol 101) in a request, which can be complied with, the telecommand 1 “F3E/G3E all modes TP” (symbol 100) should be used in the acknowledgement.

8.3.2 Message 2 may contain two “channel or frequency message” elements, each of which always consists of three characters, “character 1”, “character 2” and “character 3”, indicating the proposed working frequency (in the F1B/J2B mode the assigned frequency should be used) in multiples of 100 Hz or the channel number (coded in accordance with Table 5) or the ship’s position. The first frequency element (the RX field) in the call indicates the called station receive frequency and the second frequency element (the TX field) indicates the called station transmit frequency. In acknowledgements the RX and TX fields indicate the receive and transmit frequency of the acknowledging station respectively (see also Fig. 2 and Note 1).

NOTE 1 – If only one channel or frequency message element is used, this indicates the called station receive channel or frequency or a two-frequency (paired) channel. A second channel or frequency message element may be used to designate the called station transmit channel or frequency. If the calling station indicates only the called station receive frequency (for broadcast mode transmissions) then the symbol No. 126 repeated three times should be transmitted instead of the called station transmit channel or frequency message element. If no “channel or frequency message” elements are used, the symbol No. 126 is transmitted six times. For calls using the semi-automatic/automatic VHF service (see Table 4.10.1) then only one “channel or frequency message” element is transmitted which indicates the paired channel number. In the absence of this element the symbol No. 126 should be transmitted three times.

8.3.2.1 Frequency information

The frequency (in the F1B/J2B mode the assigned frequency should be used) in multiples of 100 Hz may only be indicated as such when the frequency is below 30 MHz. The three characters provide for the required six decimal digits. Character 1 represents the units (U) and tens (T) of 100 Hz, character 2 the hundreds (H) and thousands (M) and character 3 the tens of thousands (TM) and hundreds of thousands (HM) of 100 Hz. For MF/HF DSC, use frequency selection mode, vice channel selection mode, to ensure international interoperability.

8.3.2.2 Channel information

8.3.2.2.1 HF and MF channels

If the HM digit is 3, this indicates that the number represented by the digits TM, M, H, T and U is the HF/MF working channel number (either single frequency or two frequency channels). This mode should only be used for decoding received calls, to ensure interoperability with older equipment.

8.3.2.2.2 VHF channels

If the HM digit is 9, this indicates that the number represented by the values of the digits M, H, T and U is the VHF working channel number. If the M digit is 1, this indicates that the ship stations transmitting frequency is being used as a simplex channel frequency for both ship and coast stations. If the M digit is 2, this indicates that the coast stations transmitting frequency is being used as a simplex channel frequency for both ship and coast stations.

8.3.2.3 Ship's position information

8.3.2.3.1 For MF/HF calls, Message 2 may contain the ship's position, consisting of the digit 5 repeated two times and ten digits (five characters) indicating this position, coded in accordance with § 8.1.2 to § 8.1.2.3 (see Table 6).

8.3.2.3.2 For position requests message 2 consists of 6 no information symbols (symbol No. 126).

8.3.2.3.3 In acknowledgements to a call requesting ship's position (see Fig. 3d)) message 2 consists of twelve digits (six symbols), the first of which should be coded in accordance with § 8.1.2 to § 8.1.2.3 followed by one symbol No. 126.

Message 3 follows message 2 in this case and contains the time (UTC) when the coordinates were valid, coded as indicated in § 8.1.3 to § 8.1.3.3.

8.3.3 Message 3 follows message 2 when using the DSC system for calls initiated by ship stations requiring a semi-automatic or automatic connection (see Table 4.10.1 and 4.10.2) and contains the public switched network number (e.g. telephone number). In this case the format specifier used is symbol No. 123.

8.3.3.1 This number is coded by up to nine symbols in a manner similar to that shown in Table 2, except that the first character transmitted should be either symbol No. 105 or No. 106 to indicate whether the network number contains an odd or even number of significant digits. As an example, the number 0012345 would be coded as symbol numbers 105 00 01 23 45 whereas the number 00123456 should be coded as symbol numbers 106 00 12 34 56.

8.4 For “distress relay” including shore-to-ship alerts, “distress relay acknowledgement” and “distress acknowledgement” calls, the message formats are indicated in Tables 4.3, 4.4 and 4.2 respectively.

8.4.1 When sending a distress alert on behalf of another ship which is unable to send its own alert, and where the identity of the station in distress is unknown, the distress relay call should contain the symbol No. 126 transmitted five times for the “identification of the station in distress”.

8.5 Test calls

Test calls on the distress and safety frequencies for MF and HF and VHF channel 70 may be conducted using the test call sequence in Table 4.7.

9 End of sequence

The “end of sequence” (EOS) character is transmitted three times in the DX position and once in the RX position (see Fig. 1b)). It is one of the three unique characters corresponding to symbol Nos. 117, 122 and 127 as follows:

9.1 symbol No. 117 if the call requires acknowledgement (Acknowledge RQ), used for individual and automatic/semiautomatic calls only;

9.2 symbol No. 122 if the sequence is an answer to a call that requires acknowledgement (Acknowledge BQ), used for individual and automatic/semiautomatic calls and all distress relay acknowledgements;

9.3 symbol No. 127 for all other calls.

10 Error-check character

10.1 The error-check character (ECC) is the final character transmitted and it serves to check the entire sequence for the presence of errors which are undetected by the ten-unit error-detecting code and the time diversity employed.

10.2 The seven information bits of the ECC shall be equal to the least significant bit of the modulo-2 sums of the corresponding bits of all information characters (i.e. even vertical parity). The format specifier and the EOS characters are considered to be information characters. The phasing characters and the retransmission (RX) characters shall not be considered to be information characters. Only one format specifier character and one EOS character should be used in constructing the ECC. The ECC shall also be sent in the DX and RX positions.

10.3 Automatic acknowledgement transmissions should not start unless the ECC is received and decoded correctly. A received ECC which does not match that calculated from the received information characters may be ignored if this was due to an error detected in the ten-unit error-detecting code of the information characters which was correctable by use of the time diversity code.

10.4 The receiver decoder should provide maximum utilization of the received signal, including use of the error-check character.

11 Distress alert attempt

11.1 Distress alerts may be transmitted as a single frequency or a multi-frequency call attempt preceded by a dot pattern. MF/HF equipment should be capable of using both single and multi-frequency call attempts. Where a distress alert attempt contains more than one consecutive distress alert on the same frequency (see Recommendation ITU-R M.541, Annex 1, § 3.1.3), these consecutive alerts should be transmitted with no gap between the end of one call and the start of the dot pattern of the following call to enable bit synchronization to be maintained (see Fig. 1c)). Multi-frequency call attempts should always include at least the MF and HF 8 MHz band DSC distress and safety frequencies.

11.2 A distress alert should be activated only by means of a dedicated distress button which should be clearly identified and be protected against inadvertent operation with a spring loaded lid or cover. The initiation of a distress alert should at least require two independent actions.

11.3 Calls with format specifier “distress” or category “distress”, “urgency” and “safety” should be initiated manually only. This applies also for ships equipped for automatic DSC operation. For automatic repetition of distress alerts see Recommendation ITU-R M.541, Annex 1, § 3.1.3 and 3.3.5.

11.4 Immediately following a distress alert a DSC expansion message giving enhanced position resolution according to Recommendation ITU-R M.821 should be transmitted in the following manner.

11.4.1 For a single frequency distress alert attempt the expansion message should be transmitted immediately after the last of five consecutive distress alerts.

11.4.2 For a multi-frequency distress alert attempt the expansion message should be transmitted immediately after each distress alert.

12 Shipborne human machine interface (HMI)

12.1 Shipborne aural alarm

Shipborne alarms should start softly and increase in volume if not silenced by the operator. This will give the operator the opportunity to acknowledge the alarm without interrupting the ship's current communications.

Distress and urgency calls should have a distinctive two tone alarm. The alarm should consist of two substantially sinusoidal audio-frequency tones, transmitted alternately. One tone should have a frequency of 2 200 Hz and the other a frequency of 1 300 Hz. The duration of each tone should be 250 ms.

Distress calls and urgency calls should activate an alarm. For HF and MF distress calls, the alarm should activate only when a distress alert, distress acknowledgement, or a distress relay is received and the distress position is within 500 nm (926 km) of the receiving vessel's position, or if the distress position is in the polar areas (latitude greater than 70° N or 70° S). The alarm should also activate when the call is received and the distance between the vessel in distress and the receiving vessel cannot be determined. (NOTE – Disabling of aural alarm does not affect handling of call.)

For geographic area calls, the alarm appropriate to the category should activate when the receiving station's position is within the area specified by the call or the receiving station's position is not known. The alarm should not be activated where duplicate distress relay calls are received within one hour. A duplicate distress relay call is one having format specifier all ships or geographic area that contains identical message information, as defined in § 8.1 and an identical distress MMSI.

12.2 Inactivity timer

During normal operation, the equipment should include an inactivity timer to return the DSC system display to default or standby mode if the operator is in a menu where DSC call reception is disabled and does not make any selections or changes for 10 min.

12.3 Display

The information on the display should be visible in all shipboard lighting conditions. It should have the means to display, in plain language with a minimum of 160 characters in two or more lines, the information contained in the received call.

12.4 MMSI

DSC equipment should not transmit any DSC call until own ship's MMSI allocated to the ship by the relevant administration has been configured and stored in the DSC equipment. Once stored, it should not be possible for the user to change the MMSI number without advise from the manufacturer.

The DSC equipment should display own ship's MMSI on start-up unless the MMSI has not been configured. If the MMSI has not been configured, the equipment will display a warning that the unit will not transmit any DSC calls until own ship's MMSI is entered. The equipment should stay in this state until the operator confirms he has read the display.

The MMSI should be readily displayed on the HMI when the DSC equipment is on.

12.5 Disabling of DSC automatic channel switching function on VHF

Automatic switching to a subsequent communications channel on receipt of a DSC call might in some cases disrupt important ongoing communications. Where such capability exists, a means for disabling that function should therefore be provided for all calls other than individual station calls of category distress or urgency. The DSC equipment should provide visual indication that the automatic switching function is disabled.

12.6 Data interface

DSC equipment should be provided with facilities for exchange of data from shipborne navigational equipment or systems, or other shipborne equipment as necessary in accordance with IEC 61162 for purposes including automatic position updating.

12.7 Position updating

DSC equipment should accept valid IEC 61162 position information including the time at which the position was determined, from an external source utilizing the data interface described in § 12.6, for automatic update of own ship's DSC position.

The DSC equipment may also be provided with an internal electronic position fixing device. In which case, the DSC equipment should automatically switch to the internal source if the external IEC 61162 position information is not valid or not available.

If the automatic position update is not available, a displayed and audible reminder to manually update the position should occur before the position information is 4 h old. The displayed reminder should remain until position updating has been carried out. Any position information not updated for more than 23½ h should automatically be erased.

Own ship's DSC position information and the source of that information (external, internal, or manually entered) should be displayed on the DSC equipment.

12.8 Geographic area entry

DSC equipment should be provided with means for transforming a geographical area specified by the user as a centre point and a range to the corresponding Mercator area call format specified in § 5.3. The centre point should default to the ship's position information and the range should default to 500 nm (926 km). The transformation of the entered range and centre-point should result in the minimum rectangular area that encompasses the entered data.

12.9 Medical transport and neutral ships and aircraft

The capability of using second telecommands "Ships and Aircraft according to Resolution 18" and "Medical Transports" should not be available by default but only after changing relevant parameters in the setup menu.

FIGURE 2
Examples of a calling sequence and reply sequences for typical individual calls

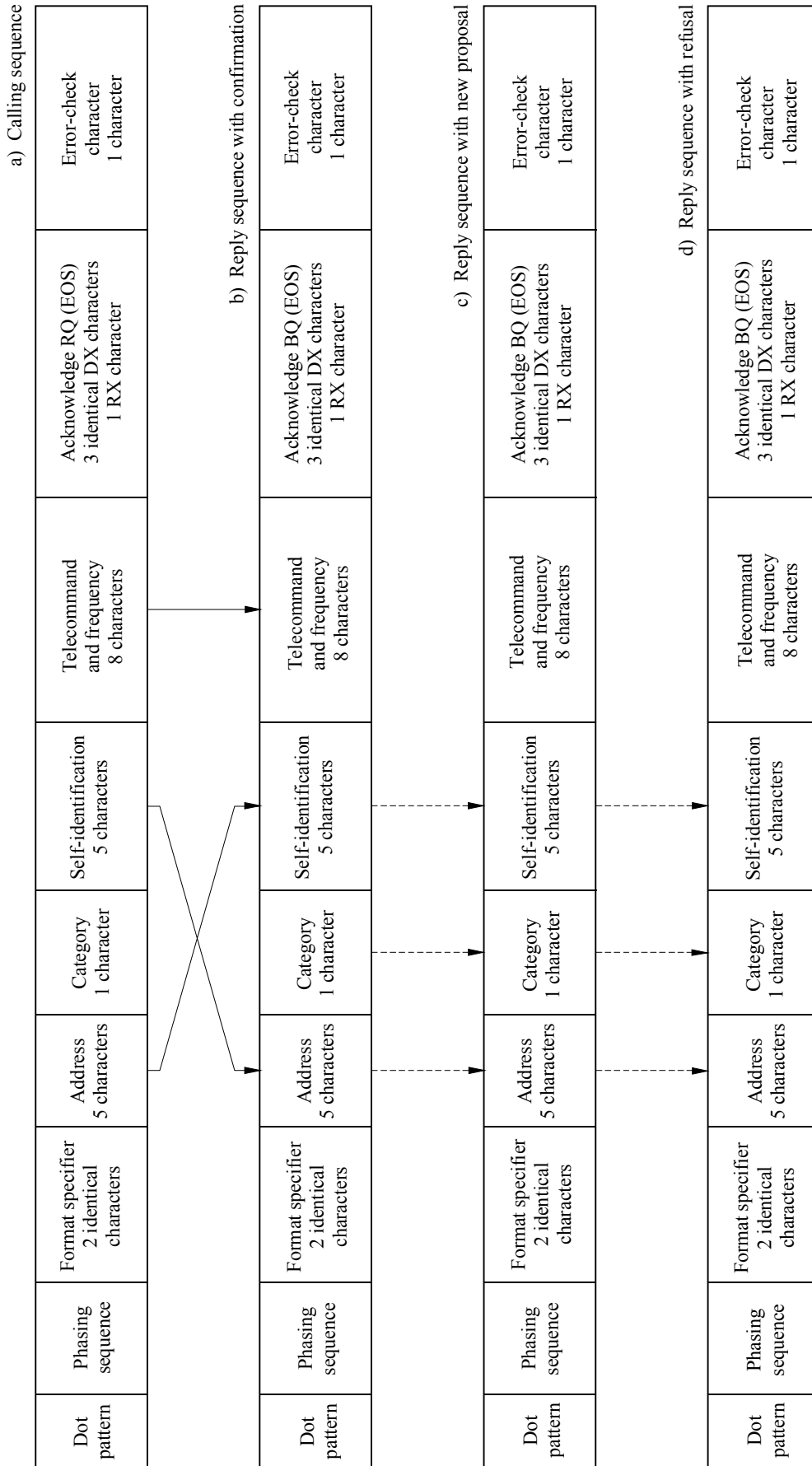
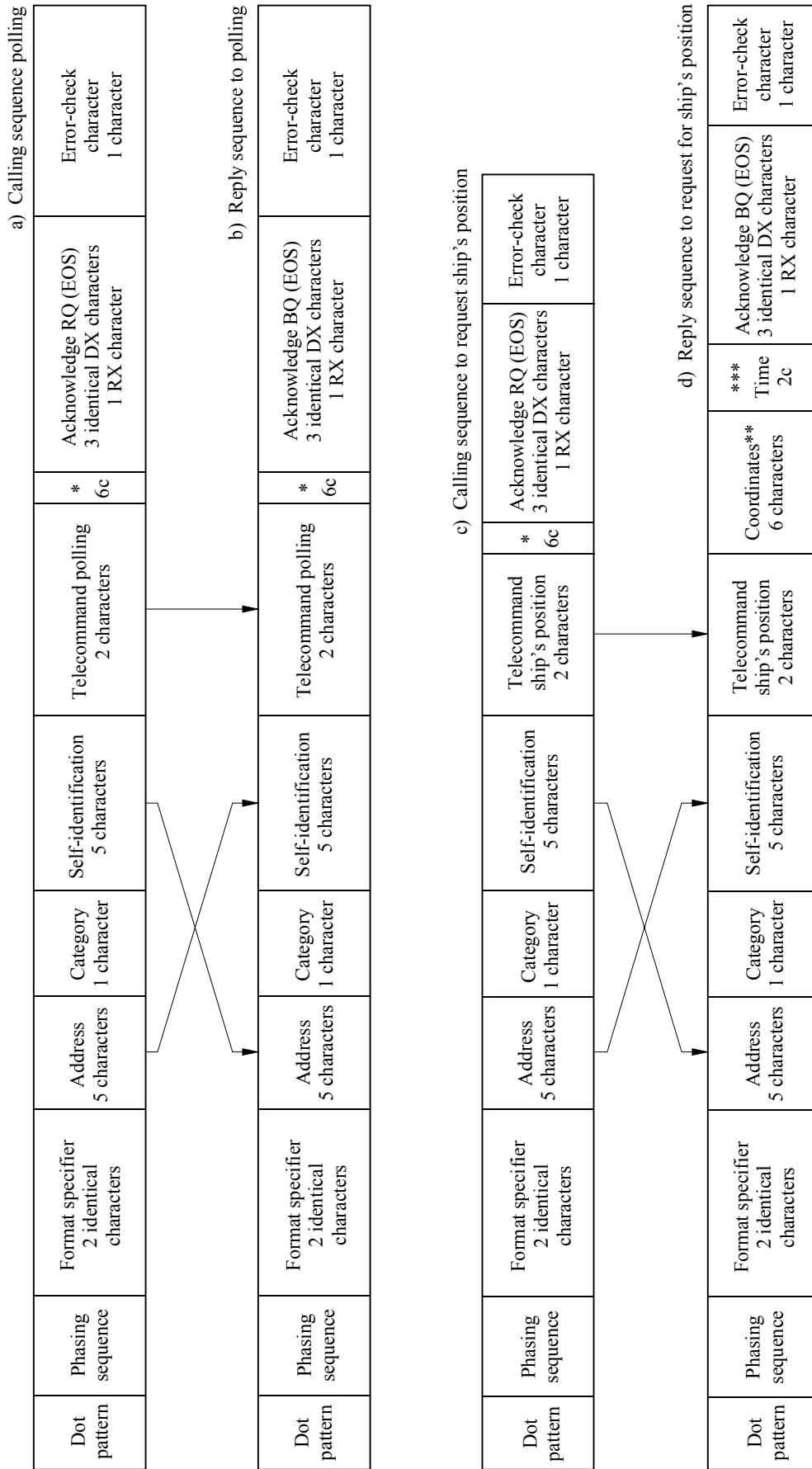


FIGURE 3
Calling sequences and reply sequences for polling and ship's position

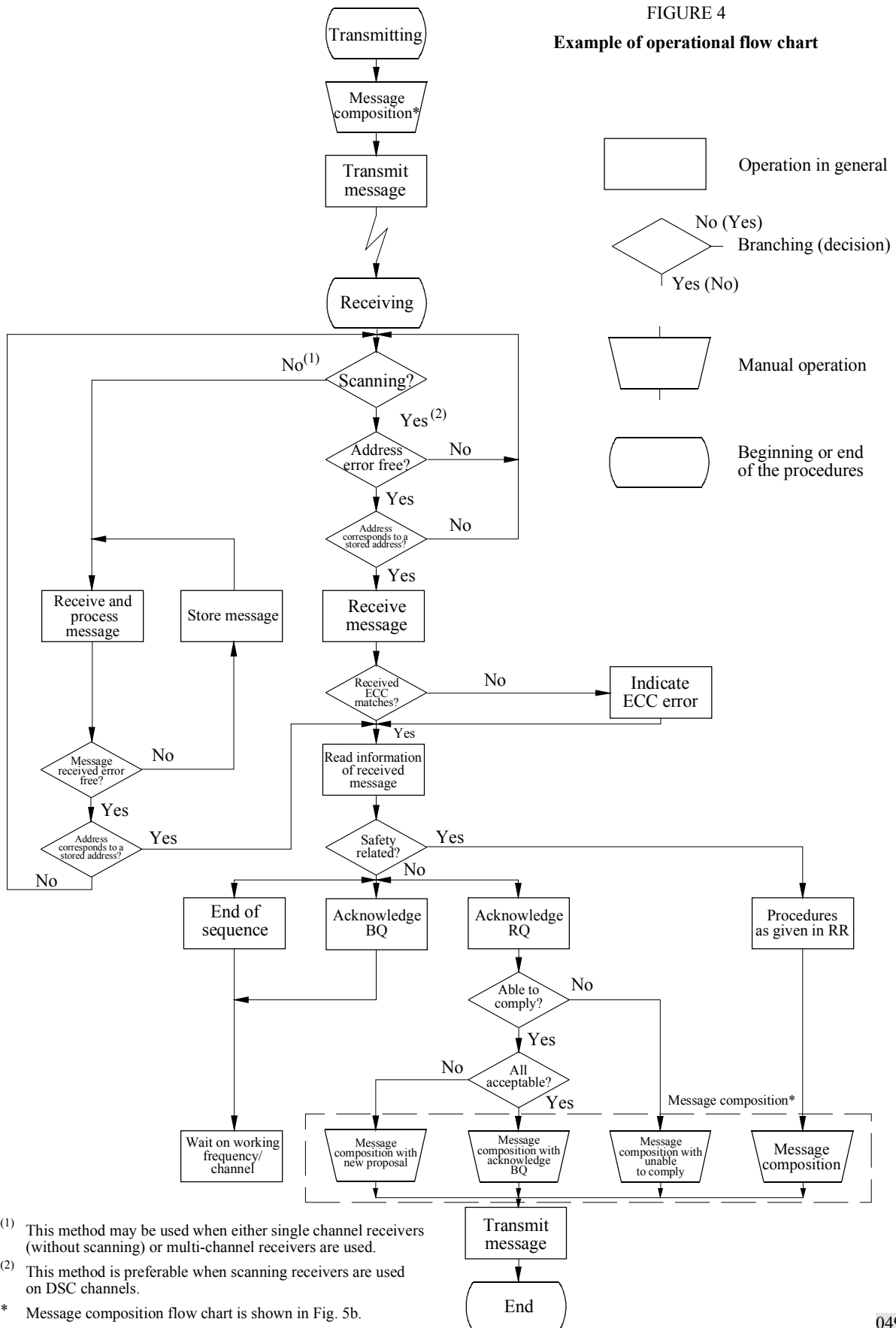


* The symbol No. 126 repeated six times should be included (see § 8.3.2, Note 1).

** See § 8.3.2.3.3 (6 characters).

*** See § 8.3.2.3.2 (2 characters).

FIGURE 4
Example of operational flow chart



(1) This method may be used when either single channel receivers (without scanning) or multi-channel receivers are used.

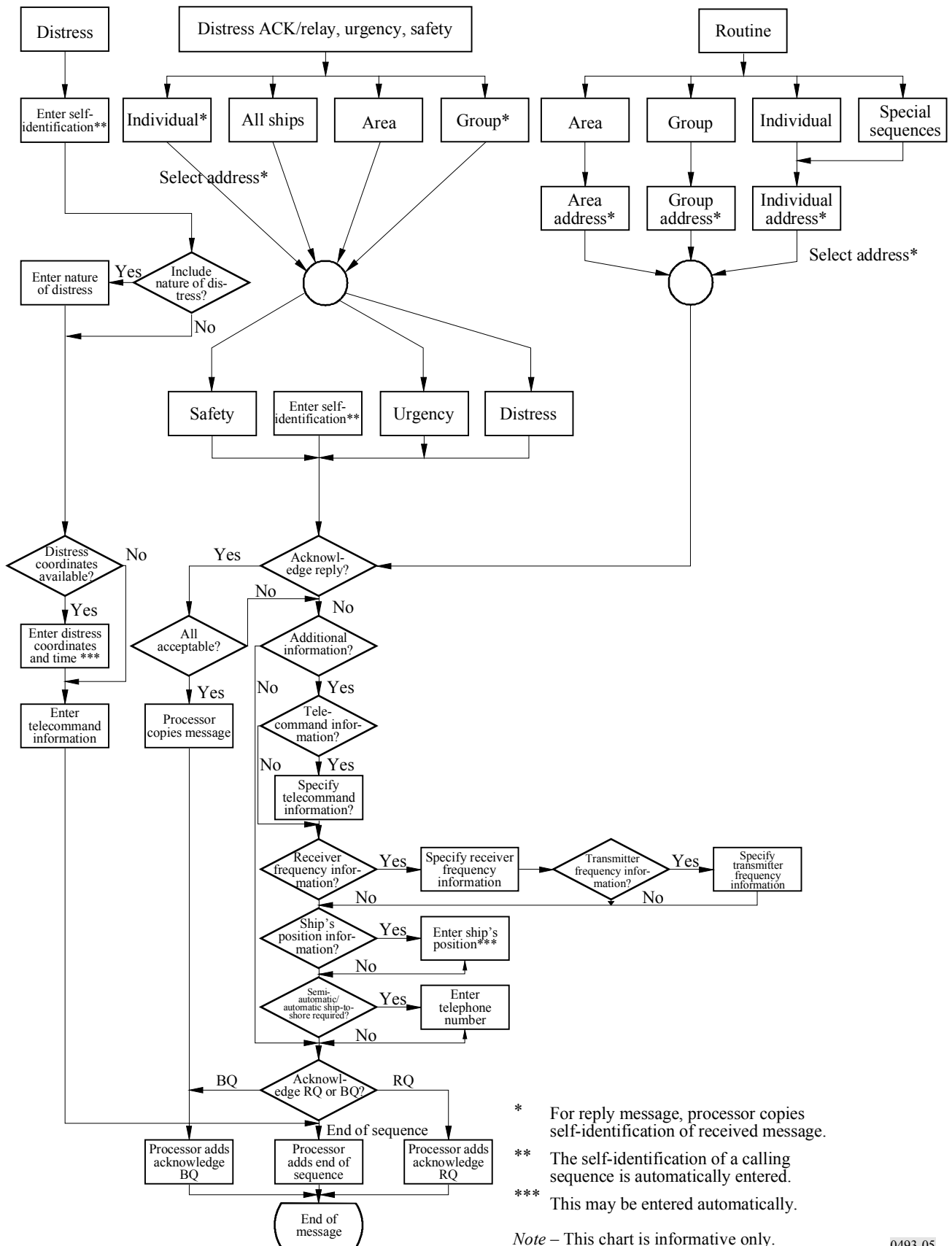
(2) This method is preferable when scanning receivers are used on DSC channels.

* Message composition flow chart is shown in Fig. 5b.

Note - This chart is informative only.

FIGURE 5

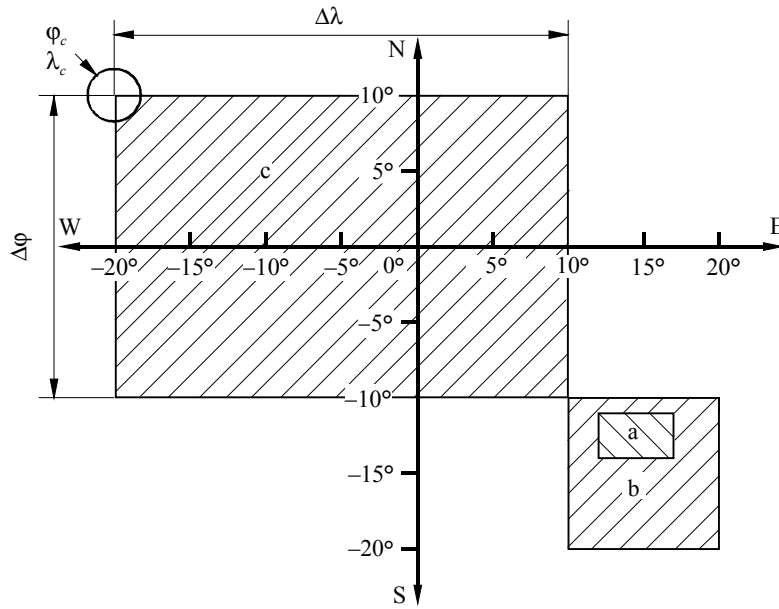
Example of message composition flow chart



* For reply message, processor copies self-identification of received message.
 ** The self-identification of a calling sequence is automatically entered.
 *** This may be entered automatically.

Note – This chart is informative only.

FIGURE 6
Geographic coordinates



a) $\phi_a = -11^\circ$ (South) $\lambda_a = 12^\circ$ (East) $\Delta\phi = 3^\circ$ $\Delta\lambda = 5^\circ$

Format specifier	2	1	1	0	1	2	0	3	0	5	Category
------------------	---	---	---	---	---	---	---	---	---	---	----------

Sector ϕ_a λ_a $\Delta\phi$ $\Delta\lambda$

b) $\phi_b = -10^\circ$ (South) $\lambda_b = 10^\circ$ (East) $\Delta\phi = 10^\circ$ $\Delta\lambda = 10^\circ$

Format specifier	2	1	0	0	1	0	1	0	1	0	Category
------------------	---	---	---	---	---	---	---	---	---	---	----------

c) $\phi_c = 10^\circ$ (North) $\lambda_c = -20^\circ$ (West) $\Delta\phi = 20^\circ$ $\Delta\lambda = 30^\circ$

Format specifier	1	1	0	0	2	0	2	0	3	0	Category
------------------	---	---	---	---	---	---	---	---	---	---	----------

Legend for Tables 4.1 to 4.10.2

Symbol/expression	Meaning
•	Required
■	Required for backward compatibility
Symbols 100-127	Symbols in accordance with Table 3
Area	Coded in accordance with Annex 1, § 5.3
Frequency	Coded in accordance with Annex 1, § 8.2.2
MMSI	Coded in accordance with Annex 1, § 5.2
Pos1	Coded in accordance with Annex 1, § 8.1.2
Pos2	Coded in accordance with Annex 1, § 8.3.2.3.1
Pos3	Coded in accordance with Annex 1, § 8.3.2.3.2
Pos4	Coded in accordance with Annex 1, § 8.3.2.3.3
Pos5	Coded in accordance with Recommendation ITU-R M.821
UTC	Coded in accordance with Annex 1, § 8.1.3
n/a	This field is not included in this call
ECC	Coded in accordance with Annex 1, § 10.2
expan1	Expansion sequence 1
expan2	Expansion sequence 2
expan3	Expansion sequence 3
	Does not apply

NOTE – For Class A and B all functions are identical for VHF and MF. HF does not apply to class B.

TABLE 4.1
Distress alerts

Frequency band	Type	Applicable to								Technical format of call sequence								
		Ship station Class A/B		Ship station Class D		Ship station Class E		Coast station		Format specifier (2 identical)	Self-ID (5)	Message				EOS (1)	ECC (1)	EOS (2 identical)
		Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx			1	2	3	4			
												Nature of distress (1)	Distress coordinates (5)	Time (2)	Subsequent communications (1)			
VHF	Détresse (RT)	•	•	•	•				•	112	MMSI	100 to 111	Pos1	UTC	100	127	ECC	127
	Détresse (RLS)		•		•				•	112	MMSI	112	Pos1	UTC	126	127	ECC	127
MF/HF	Détresse (RT)	•	•			•	•		•	112	MMSI	100 to 111	Pos1	UTC	109	127	ECC	127
	Détresse (CED)	•	•				•		•	112	MMSI	100 to 111	Pos1	UTC	113	127	ECC	127

Rec. ITU-R M.821 expansion sequence (9)
expan1
expan1
expan1
expan1

Rec. ITU-R M.493-11

Rec. ITU-R M.821 expansion sequence					
Type	Expansion data specifier (1)	Enhanced position resolution (4)	EOS (1)	ECC (1)	EOS (2 identical)
expan1	100	Pos5	127	ECC	127

TABLE 4.2
Distress acknowledgements

Frequency band	Type	Applicable to								Technical format of call sequence											
		Ship station Class A/B		Ship station Class D		Ship station Class E		Coast station		Format specifier (2 identical)	Category (1)	Self-ID (5)	Tele-command (1)	Message					EOS (1)	ECC (1)	EOS (2 identical)
		Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx					0	1	2	3	4			
														Distress MMSI (5)	Nature of distress (1)	Distress coordinates (5)	Time (2)	Subsequent communications (1)			
VHF	Distress acknowledgement (RT)	●	●	·	●	·	·	●	●	116	112	MMSI	110	MMSI	100 to 111	Pos1	UTC	100	127	ECC	127
	Distress acknowledgement (EPIRB)	●	●	·	●	·	·	●	●	116	112	MMSI	110	MMSI	112	Pos1	UTC	126	127	ECC	127
MF	Distress acknowledgement (RT)	●	●	·	·	·	●	●	●	116	112	MMSI	110	MMSI	100 to 111	Pos1	UTC	109	127	ECC	127
	Distress acknowledgement (FEC)	●	●	·	·	·	●	●	●	116	112	MMSI	110	MMSI	100 to 111	Pos1	UTC	113	127	ECC	127
HF	Distress acknowledgement (RT)	·	●	·	·	·	●	●	●	116	112	MMSI	110	MMSI	100 to 111	Pos1	UTC	109	127	ECC	127
	Distress acknowledgement (FEC)	·	●	·	·	·	●	●	●	116	112	MMSI	110	MMSI	100 to 111	Pos1	UTC	113	127	ECC	127

The message should match the received distress alert information, except for manually generated distress acknowledgements by coast stations.

Rec. ITU-R M.821 expansion sequence (9)
expan1
expan1
expan1
expan1
expan1

Rec. ITU-R M.821 expansion sequence					
Type	Expansion data specifier (1)	Enhanced position resolution (4)	EOS (1)	ECC (1)	EOS (2 identical)
expan1	100	Pos5	127	ECC	127

TABLE 4.3
Distress relays

Frequency band	Type	Applicable to								Technical format of call sequence												
		Ship station Class A/B		Ship station Class D		Ship station Class E		Coast station		Format specifier (2 identical)	Address (5)	Category (1)	Self-ID (5)	Tele-command (1)	Message					EOS (1)	ECC (1)	EOS (2 identical)
		Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx						0	1	2	3	4			
															Distress MMSI (5)	Nature of distress (1)	Distress coordinates (5)	Time (2)	Subsequent communications (1)			
VHF	Individual (RT)	●	●	●	●	·	·	●	●	120	MMSI	112	MMSI	112	MMSI	100 to 111	Pos1	UTC	100	117	ECC	117
	Individual (EPIRB)	●	●	·	●	·	·	●	●	120	MMSI	112	MMSI	112	MMSI	112	Pos1	UTC	126	117	ECC	117
	Geographic area (RT)	·	■	·	■	·	·	·	■	102	Zone	112	MMSI	112	MMSI	100 à 111	Pos1	UTC	100	127	ECC	127
	Geographic area (EPIRB)	·	■	·	■	·	·	·	■	102	Zone	112	MMSI	112	MMSI	112	Pos1	UTC	126	127	ECC	127
	All ships (RT)	●	●	·	●	·	·	●	●	116	n/a	112	MMSI	112	MMSI	100 to 111	Pos1	UTC	100	127	ECC	127
	All ships (EPIRB)	●	●	·	●	·	·	●	●	116	n/a	112	MMSI	112	MMSI	112	Pos1	UTC	126	127	ECC	127
MF/HF	Individual (RT)	●	●	·	·	●	●	●	●	120	MMSI	112	MMSI	112	MMSI	100 to 111	Pos1	UTC	109	117	ECC	117
	Individual (FEC)	●	●	·	·	·	●	●	●	120	MMSI	112	MMSI	112	MMSI	100 to 111	Pos1	UTC	113	117	ECC	117
	Geographic area (RT)	●	●	·	·	·	●	●	●	102	Zone	112	MMSI	112	MMSI	100 to 111	Pos1	UTC	109	127	ECC	127
	Geographic area (FEC)	●	●	·	·	·	●	●	●	102	Zone	112	MMSI	112	MMSI	100 to 111	Pos1	UTC	113	127	ECC	127

Rec. ITU-R M.821 expansion sequence (9)
expa2
expa2
expa1
expa1
expa1
expa1
expa2
expa2
expa1
expa1

Rec. ITU-R M.493-11

TABLE 4.3 (end)

Frequency band	Type	Applicable to								Technical format of call sequence												
		Ship station Class A/B		Ship station Class D		Ship station Class E		Coast station		Format specifier (2 identical)	Address (5)	Category (1)	Self-ID (5)	Tele-command (1)	Message					EOS (1)	ECC (1)	EOS (2 identical)
		Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx						0	1	2	3	4			
															Distress MMSI (5)	Nature of distress (1)	Distress coordinates (5)	Time (2)	Subsequent communications (1)			
MF/HF (end)	All ships (RT)	•	■	•	•	•	■	•	■	116	n/a	112	MMSI	112	MMSI	100 to 111	Pos1	UTC	109	127	ECC	127
	All ships (FEC)	•	■	•	•	•	■	•	■	116	n/a	112	MMSI	112	MMSI	100 to 111	Pos1	UTC	113	127	ECC	127

The message should match the received distress alert information, except for manually generated relays observed or notified by non-DSC means.

Rec. ITU-R M.821 expansion sequence					
Type	Expansion data specifier (1)	Enhanced position resolution (4)	EOS (1)	ECC (1)	EOS (2 identical)
expan1	100	Pos5	127	ECC	127
expan2	100	Pos5	117	ECC	117

Rec. ITU-R M.821 expansion sequence (9)
expan1
expan1

TABLE 4.4
Distress relay acknowledgements

Frequency band	Type	Applicable to								Technical format of call sequence												
		Ship station Class A/B		Ship station Class D		Ship station Class E		Coast station		Format specifier (2 identical)	Address (5)	Category (1)	Self-ID (5)	Tele-command (1)	Message					EOS (1)	ECC (1)	EOS (2 identical)
		Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx						0	1	2	3	4			
															Distress MMSI (5)	Nature of distress (1)	Distress coordinates (5)	Time (2)	Subsequent communications (1)			
VHF	Individual (RT)	●	●	●	●	·	·	●	●	120	MMSI	112	MMSI	112	MMSI	100 to 111	Pos1	UTC	100	122	ECC	122
	Individual (EPIRB)	●	●	·	●	·	·	●	●	120	MMSI	112	MMSI	112	MMSI	112	Pos1	UTC	126	122	ECC	122
	All ships (RT)	·	●	·	●	·	·	●	●	116	n/a	112	MMSI	112	MMSI	100 to 111	Pos1	UTC	100	122	ECC	122
	All ships (EPIRB)	·	●	·	●	·	·	●	●	116	n/a	112	MMSI	112	MMSI	112	Pos1	UTC	126	122	ECC	122
MH/HF	Individual (RT)	●	●	·	·	●	●	●	●	120	MMSI	112	MMSI	112	MMSI	100 to 111	Pos1	UTC	109	122	ECC	122
	Individual (FEC)	●	●	·	·	·	●	●	●	120	MMSI	112	MMSI	112	MMSI	100 to 111	Pos1	UTC	113	122	ECC	122
	All ships (RT)	·	■	·	·	·	■	●	●	116	n/a	112	MMSI	112	MMSI	100 to 111	Pos1	UTC	109	122	ECC	122
	All ships (FEC)	·	■	·	·	·	■	●	●	116	n/a	112	MMSI	112	MMSI	100 to 111	Pos1	UTC	113	122	ECC	122

The message should match the received distress relay call information.

Rec. ITU-R M.821 expansion sequence (9)
expan3
expan3
expan3
expan3
expan3
expan3
expan3
expan3

Rec. ITU-R M.493-11

Rec. ITU-R M.821 expansion sequence					
Type	Expansion data specifier (1)	Enhanced position resolution (4)	EOS (1)	ECC (1)	EOS (2 identical)
expan3	100	Pos5	122	ECC	122

TABLE 4.5
Urgency and safety calls – All ships

Frequency band	Type	Applicable to								Technical format of call sequence								
		Ship station Class A/B		Ship station Class D		Ship station Class E		Coast station		Format specifier (2 identical)	Category (1)	Self-ID (5)	Message			EOS (1)	ECC (1)	EOS (2 identical)
		Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx				1		2			
													1st tele-command (1)	2nd tele-command (1)	Frequency (6)			
VHF	All modes RT	●	●	●	●	·	·	●	●	116	108 or 110	MMSI	100	126	Frequency	127	ECC	127
	Duplex RT ¹	·	■	·	■	·	·	·	■	116	108 or 110	MMSI	101	126	Frequency	127	ECC	127
	Medical transports	●	●	·	·	·	·	·	●	116	110	MMSI	100	111	Frequency	127	ECC	127
	Ships and aircraft (Res. 18)	●	●	·	·	·	·	·	●	116	110	MMSI	100	110	Frequency	127	ECC	127
MF/HF	J3E RT	·	·	·	·	·	·	·	■	116	108 or 110	MMSI	109	126	Frequency	127	ECC	127
	F1B FEC	·	·	·	·	·	·	·	■	116	108 or 110	MMSI	113	126	Frequency	127	ECC	127

¹ See § 8.3.1.3.

TABLE 4.6

Urgency and safety – Geographic area calls

Frequency band	Type	Applicable to								Technical format of call sequence									
		Ship station Class A/B		Ship station Class D		Ship station Class E		Coast station		Format specifier (2 identical)	Address (5)	Category (1)	Self-ID (5)	Message			EOS (1)	ECC (1)	EOS (2 identical)
		Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx					1		2			
														1st tele-command (1)	2nd tele-command (1)				
MF/HF	J3E (RT)	●	●	·	·	●	●	●	●	102	Area	108 or 110	MMSI	109	126	Frequency	127	ECC	127
	F1B (FEC)	●	●	·	·	·	·	●	●	102	Area	108 or 110	MMSI	113	126	Frequency	127	ECC	127
	Medical transports	●	●	·	·	·	·	·	●	102	Area	110	MMSI	109 or 113	111	Frequency	127	ECC	127
	Ships and aircraft (Res. 18)	●	●	·	·	·	·	·	●	102	Area	110	MMSI	109 or 113	110	Frequency	127	ECC	127

TABLE 4.7
Urgency and safety – Individual calls and their acknowledgements

Frequency band	Type	Applicable to								Technical format of call sequence										
		Ship station Class A/B		Ship station Class D		Ship station Class E		Coast station		Format specifier (2 identical)	Address (5)	Category (1)	Self-ID (5)	Message			EOS (1)	ECC (1)	EOS (2 identical)	
		Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx					1		2				3
														1st tele-command (1)	2nd tele-command (1)					
VHF	All modes RT	●	●	·	●	·	·	●	●	120	MMSI	108 or 110	MMSI	100	126	Frequency	n/a	117	ECC	117
	Duplex RT ¹	·	■		·	·	·	·	■	120	MMSI	108 or 110	MMSI	101	126	Frequency	n/a	117	ECC	117
	RT acknowledgement	●	●	●	·	·	·	●	●	120	MMSI	108 or 110	MMSI	100	126	Frequency	n/a	122	ECC	122
	Unable to comply acknowledgement	●	●	●	·	·	·	●	●	120	MMSI	108 or 110	MMSI	104	100 to 109	Frequency	n/a	122	ECC	122
	Position request	●	●	·	·	·	·	●	·	120	MMSI	108	MMSI	121	126	Pos3	n/a	117	ECC	117
	Position acknowledgement	●	●	·	·	·	·	·	●	120	MMSI	108	MMSI	121	126	Pos4	UTC	122	ECC	122
	Test	●	●	●	●	·	·	●	●	120	MMSI	108	MMSI	118	126	126	n/a	117	ECC	117
	Test acknowledgement	●	●	●	●	·	·	●	●	120	MMSI	108	MMSI	118	126	126	n/a	122	ECC	122

¹ See § 8.3.1.3.

TABLE 4.7 (end)

Frequency band	Type	Applicable to								Technical format of call sequence										
		Ship station Class A/B		Ship station Class D		Ship station Class E		Coast station		Format specifier (2 identical)	Address (5)	Category (1)	Self-ID (5)	Message				EOS (1)	ECC (1)	EOS (2 identical)
		Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx					1		2	3			
														1st tele-command (1)	2nd tele-command (1)	Frequency or pos number (6)	Time (2)			
MF/HF	J3E RT	●	●	·	·	·	●	●	●	120	MMSI	108 or 110	MMSI	109	126	Frequency	n/a	117	ECC	117
	J3E RT with pos number	●	·	·	·	·	·	·	●	120	MMSI	108 or 110	MMSI	109	126	Pos2	n/a	117	ECC	117
	J3E RT acknowledgement	●	●	·	·	·	·	●	●	120	MMSI	108 or 110	MMSI	109	126	Frequency	n/a	122	ECC	122
	F1B FEC or ARQ	●	●	·	·	·	·	●	●	120	MMSI	108 or 110	MMSI	113 or 115	126	Frequency	n/a	117	ECC	117
	F1B FEC or ARQ with pos number	●	·	·	·	·	·	·	●	120	MMSI	108 or 110	MMSI	113 or 115	126	Pos2	n/a	117	ECC	117
	F1B FEC or ARQ acknowledgement	●	●	·	·	·	·	●	●	120	MMSI	108 or 110	MMSI	113 or 115	126	Frequency	n/a	122	ECC	122
	Unable to comply acknowledgement	●	●	·	·	·	·	●	●	120	MMSI	108 or 110	MMSI	104	100 to 109	Frequency	n/a	122	ECC	122
	Position request	●	●	·	·	·	·	●	·	120	MMSI	108	MMSI	121	126	Pos3	n/a	117	ECC	117
	Position acknowledgement	●	●	·	·	·	·	·	●	120	MMSI	108	MMSI	121	126	Pos4	UTC	122	ECC	122
	Test	●	●	·	·	·	·	●	●	120	MMSI	108	MMSI	118	126	126	n/a	117	ECC	117
Test acknowledgement	●	●	·	·	·	·	●	●	120	MMSI	108	MMSI	118	126	126	n/a	122	ECC	122	

TABLE 4.8
Routine group calls

Frequency band	Type	Applicable to								Technical format of call sequence									
		Ship station Class A/B		Ship station Class D		Ship station Class E		Coast station		Format specifier (2 identical)	Address (5)	Category (1)	Self-ID (5)	Message		EOS (1)	ECC (1)	EOS (2 identical)	
		1		2															
		Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx					1st tele-command (1)	2nd tele-command (1)				Frequency (6)
VHF	All mode RT	●	●	●	●	·	·	●	●	114	MMSI	100	MMSI	100	126	Frequency	127	ECC	127
	Duplex RT ¹		■	·	·	·	·		■	114	MMSI	100	MMSI	101	126	Frequency	127	ECC	127
MF/HF	J3E RT	●	●			●	●	●	●	114	MMSI	100	MMSI	109	126	Frequency	127	ECC	127
	F1B FEC	●	●	·	·	·	·	●	●	114	MMSI	100	MMSI	113	126	Frequency	127	ECC	127

¹ See § 8.3.1.3.

TABLE 4.9

Routine individual calls and their acknowledgements

Frequency band	Type	Applicable to								Technical format of call sequence									
		Ship station Class A/B		Ship station Class D		Ship station Class E		Coast station		Format specifier (2 identical)	Address (5)	Category (1)	Self-ID (5)	Message			EOS (1)	ECC (1)	EOS (2 identical)
		Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx					1		Frequency or pos number (6)			
														1st tele-command (1)	2nd tele-command (1)				
VHF	All mode RT	●	●	●	●	·	·	●	●	120	MMSI	100	MMSI	100	126	Frequency	117	ECC	117
	Duplex RT ¹		■			·	·		■	120	MMSI	100	MMSI	101	126	Frequency	117	ECC	117
	RT acknowledgement	●	●	●	●	·	·	●	●	120	MMSI	100	MMSI	100	126	Frequency	122	ECC	122
	Data	●	●	·	·	·	·	●	●	120	MMSI	100	MMSI	106	126	Frequency	117	ECC	117
	Data acknowledgement	●	●	·	·	·	·	●	●	120	MMSI	100	MMSI	106	126	Frequency	122	ECC	122
	Unable to comply acknowledgement	●	●			·	·	●	●	120	MMSI	100	MMSI	104	100 to 109	Frequency	122	ECC	122
	Polling	·	●	·	·	·	·	●	■	120	MMSI	100	MMSI	103	126	126	117	ECC	117
	Polling acknowledgement	●	·	·	·	·	·	■	●	120	MMSI	100	MMSI	103	126	126	122	ECC	122

¹ See § 8.3.1.3.

TABLE 4.9 (end)

Frequency band	Type	Applicable to								Technical format of call sequence									
		Ship station Class A/B		Ship station Class D		Ship station Class E		Coast station		Format specifier (2 identical)	Address (5)	Category (1)	Self-ID (5)	Message			EOS (1)	ECC (1)	EOS (2 identical)
		Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx					1		2			
														1st tele-command (1)	2nd tele-command (1)	Frequency or pos number (6)			
MF/HF	J3E RT	●	●	·	·	●	●	●	●	120	MMSI	100	MMSI	109	126	Frequency	117	ECC	117
	J3E RT with pos number	●	·	·	·	●	·	·	●	120	MMSI	100	MMSI	109	126	Pos2	117	ECC	117
	J3E RT acknowledgement	●	●	·	·	●	●	●	●	120	MMSI	100	MMSI	109	126	Frequency	122	ECC	122
	F1B FEC, ARQ or data	●	●	·	·	·	·	●	●	120	MMSI	100	MMSI	113, 115, 106	126	Frequency	117	ECC	117
	FEC, ARQ or data with pos number	●	·	·	·	·	·	·	●	120	MMSI	100	MMSI	113, 115, 106	126	Pos2	117	ECC	117
	F1B FEC, ARQ or data acknowledgement	●	●	·	·	·	·	●	●	120	MMSI	100	MMSI	113, 115, 106	126	Frequency	122	ECC	122
	Unable to comply acknowledgement	●	●			·	·	●	●	120	MMSI	100	MMSI	104	100 à 109	Frequency	122	ECC	122
	Polling	·	●	·	·	·	·	●	■	120	MMSI	100	MMSI	103	126	126	117	ECC	117
	Polling acknowledgement	●	·	·	·	·	·	■	●	120	MMSI	100	MMSI	103	126	126	122	ECC	122

TABLE 4.10.1
Semi/auto VHF (optional)

Type	Applicable to								Technical format of call sequence										
	Ship station Class A/B		Ship station Class D		Ship station Class E		Coast station		Format specifier (2 identical)	Address (5)	Category (1)	Self-ID (5)	Message				EOS (1)	ECC (1)	EOS (2 identical)
	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx					1		2	3			
													1st tele-command (1)	2nd tele-command (1)	Frequency (3)	Number (2-9)			
Request	●	●	●	●	·	·	●	●	123	MMSI	100	MMSI	100, 101, 106	126	Frequency	Number	117	ECC	117
Able to comply acknowledgement	●	●	●	●	·	·	●	●	123	MMSI	100	MMSI	100, 101, 106	126	Frequency	Number	122	ECC	122
Start of call (on working channel)	●	·	●	·	·	·	·	●	123	MMSI	100	MMSI	100, 101, 106	126	Frequency	Number	127	ECC	127
Unable to comply acknowledgement	●	●	●	●	·	·	●	●	123	MMSI	100	MMSI	104	100-109	Frequency	Number	122	ECC	122
End of call request (on working channel)	●	·	●	·	·	·	·	●	123	MMSI	100	MMSI	105	126	Frequency	Number	117	ECC	117
End of call acknowledgement (on working channel)	·	●	·	●	·	·	●	·	123	MMSI	100	MMSI	105	126	Duration	Number	122	ECC	122

NOTE 1 – See Recommendation ITU-R M.689.

NOTE 2 – For Class D symbol 123 does not need to be displayed.

TABLE 4.10.2
Semi/auto MF/HF (optional)

Type	Applicable to								Technical format of call sequence										
	Ship station Class A/B		Ship station Class D		Ship station Class E		Coast station		Format specifier (2 identical)	Address (5)	Category (1)	Self-ID (5)	Message				EOS (1)	ECC (1)	EOS (2 identical)
	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx					1		2	3			
													1st telecommand (1)	2nd telecommand (1)	Frequency or pos number (6)	Number (2-9)			
J3E RT/F1B FEC/ARQ											
Request coast station	.	●	.	.	.	●	●	.	123	MMSI	100	MMSI	109, 113, 115	126	Frequency	Number	117	ECC	117
Request ship station	●	.	.	.	●	.	.	●	123	MMSI	100	MMSI	109, 113, 115	126	126 or Pos2	Number	117	ECC	117
Able to comply acknowledgement	●	●	.	.	●	●	●	●	123	MMSI	100	MMSI	109, 113, 115	126	Frequency	Number	122	ECC	122
Signal strength test by ship (on working channel) ⁽¹⁾	●	.	.	.	●	.	.	●	123	MMSI	100	MMSI	109, 113, 115	126	Frequency	Number	117	ECC	117
Coast station acknowledgement with new working frequency ⁽¹⁾	.	●	.	.	.	●	●	.	123	MMSI	100	MMSI	109, 113, 115	126	New frequency	Number	122	ECC	122
Call start: Coast station acknowledgement with same working frequency ⁽¹⁾	.	●	.	.	.	●	●	.	123	MMSI	100	MMSI	109, 113, 115	126	Same frequency	Number	122	ECC	122
Unable to comply	●	●	.	.	●	●	●	●	123	MMSI	100	MMSI	104	100 a 109	Frequency	Number	122	ECC	122
End of call request (on working channel)	●	.	.	.	●	.	.	●	123	MMSI	100	MMSI	105	126	Frequency	Number	117	ECC	117
End of call acknowledgement (on working channel) ⁽²⁾	.	●	.	.	.	●	●	.	123	MMSI	100	MMSI	105	126	Duration	Number	122	ECC	122

NOTE 1 – See Recommendation ITU-R M.1082.

NOTE 2 – For Class E symbol 123 does not need to be displayed.

⁽¹⁾ This call involves signal strength testing. The ship requests call by sending the coast station its position. Once the ship or coast station is able to comply the ship station sends test DSCs on the working frequency. If the coast station acknowledges with a new working frequency, the ship station sends a test DSC on the new frequency. When the coast station acknowledges with an unchanged frequency, the subsequent communication may begin.

⁽²⁾ Upon call completion the coast station may send the end of call acknowledgement without a request from the ship station.

TABLE 5
Frequency or channel information

Frequency	0 1 2	X X X	X X X	X X X	X X X	X X X	The frequency in multiples of 100 Hz as indicated by the figures for the digits HM, TM, M, H, T, U. This should be used for MF, HF equipment.
Channels	3	X	X	X	X	X	The HF/MF working channel number indicated by the values of the digits TM, M, H, T and U. This should be used for backward compatibility in receive only mode.
	8	X	X	X	X	X	Only used for Recommendation ITU-R M.586 equipment.
	9	0	X ⁽¹⁾	X	X	X	The VHF working channel number indicated by the values of the digits M, H, T and U.
	HM	TM	M	H	T	U	
	Character 3	Character 2		Character 1 ⁽²⁾			

- (1) If the M digit is 1 this indicates that the ship stations transmitting frequency is being used as a simplex channel frequency for both ship and coast stations. If the M digit is 2 this indicates that the coast stations transmitting frequency is being used as a simplex channel frequency for both ship and coast stations. If the M digit is 0, this indicates the frequency being used is in accordance with RR Appendix 18.
- (2) Character 1 is the last character transmitted.

TABLE 6
Position information (Annex 1, § 8.3.2.3)

	Quadrant digit NE = 0 NO = 1 SE = 2 SO = 3	Latitude				Longitude				
		Tens of degrees	Units of degrees	Tens of minutes	Units of minutes	Hundreds of degrees	Tens of degrees	Units of degrees	Tens of minutes	Units of minutes
55	X	X	X	X	X	X	X	X	X	X
Character 6	Character 5	Character 4		Character 3		Character 2	Character 1 ⁽¹⁾			

- (1) Character 1 is the last character transmitted.

Annex 2

Equipment classes

1 Equipment classes only apply to shipborne equipment

Class A equipment, which includes all the facilities defined in Annex 1, will comply with the IMO GMDSS carriage requirements for MF/HF installations and/or VHF installations.

Class B equipment providing minimum facilities for equipment on ships not required to use Class A equipment and complying with the minimum IMO GMDSS carriage requirements for MF and/or VHF installations.

Class D equipment is intended to provide minimum facilities for VHF DSC distress, urgency and safety as well as routing calling and reception, not necessarily in full accordance with IMO GMDSS carriage requirements for VHF installations.

Class E equipment is intended to provide minimum facilities for MF and/or HF DSC distress, urgency and safety as well as routine calling and reception, not necessarily in full accordance with IMO GMDSS carriage requirements for MF/HF installations.

Class A and Class B equipment may support the optional semi-automatic/automatic service in accordance with Recommendations ITU-R M.689, ITU-R M.1082 and Tables 4.10.1 and 4.10.2 and are encouraged to do so.

Class D and Class E equipment may also support the optional semi-automatic/automatic service.

NOTE 1 – Class C, F and G equipment as defined in earlier versions of this Recommendation (e.g., Recommendations ITU-R M.493-5 (Geneva, 1992) and ITU-R M.493-7 (Geneva, 1995)) did not provide vital minimum DSC functions (transmitting and receiving distress alerts) and have therefore been withdrawn.

2 Class requirements for B, D and E are given in § 3, 4 and 5 (See Tables 4.1 to 4.10.2 for technical requirements)

3 Class B (MF and/or VHF only)

3.1 Transmit capabilities

3.1.1 Format specifier:

- Distress
- All ships
- Geographic area
- Individual station
- Semi-automatic/automatic service
- Ships having common interest (group).

3.1.2 The numerical identification of the called station (address).

3.1.3 Category: Distress
Urgency
Safety
Routine.

3.1.4 Self-identification (automatically inserted).

3.1.5 Messages

3.1.5.1 For distress alerts:

Message 1: Nature of distress, defaulting to undesignated distress

Message 2: Distress coordinates

Message 3: Time for last position update

Message 4: Type of subsequent communication:

MF: J3E

VHF: F3E/G3E simplex.

3.1.5.2 For distress relay calls:

First telecommand: Distress relay

Identification of the ship: As defined in Annex 1

Messages 1 to 4: As § 3.1.5.1.

3.1.5.3 For distress acknowledgement calls:

First telecommand: Distress acknowledgement

Identification of the ship: As defined in Annex 1

Messages 1 to 4: As § 3.1.5.1.

3.1.5.4 For all other calls:

First telecommand: Unable to comply.

MF: For individual station calls, J3E or “test” (see Annex 1 § 8.4); for calls using the semi-automatic/automatic MF-services, J3E or “end of call”.

VHF: For individual station calls, F3E/G3E or “polling” (see Annex 1 § 8.4); for calls using the semi-automatic/automatic VHF-services F3E/G3E or “end of call”.

Second telecommand: No information.

Frequency/channel or ship’s position: As defined in Annex 1.

Selection information (semi-automatic/automatic service): Telephone number of public telephone subscriber.

3.1.6 End of sequence character: As defined in Annex 1.

3.2 Receive capabilities

3.2.1 Receive and be capable of displaying all the information in calls listed in § 3.1 plus all distress relay calls having the format specifier “geographical area calls”, all distress acknowledgement calls and all “unable to comply” calls.

3.2.2 Audible alarm upon reception of any DSC call.

4 Class D (VHF only)

4.1 Transmit capabilities

4.1.1 Format specifier: Distress
 All ships
 Individual station
 Ships having common interest (group).

4.1.2 The numerical identification of the called station (address).

4.1.3 Category: Distress
 Urgency
 Safety
 Routine.

4.1.4 Self-identification (automatically inserted).

4.1.5 Messages

4.1.5.1 For distress calls:

Message 1: Nature of distress, defaulting to undesignated distress

Message 2: Distress coordinates

Message 3: Time for last position update

Message 4: Type of subsequent communication: F3E/G3E simplex.

4.1.5.2 For all other calls:

First telecommand: F3E/G3E simplex
 Unable to comply
 Polling.

Second telecommand: No information.

Frequency/channel information: VHF working channel, defaulting to channel 16 for urgency and safety calls and a recognized intership channel (RR Appendix 18) for all other calls.

4.1.6 End of sequence character: As defined in Annex 1.

4.2 Receive capabilities

Receive and be capable of displaying all the information in calls listed in § 4.1 plus all distress relay calls except those having the format specifier “geographical area calls”, all distress acknowledgement calls and all “unable to comply” calls.

5 Class E (MF and/or HF only)

5.1 Transmit capabilities

5.1.1 Format specifier: Distress
Geographic area
Individual station
Ships having common interest (group).

5.1.2 The numerical identification of the called station (address).

5.1.3 Category: Distress
Urgency
Safety
Routine.

5.1.4 Self-identification (automatically inserted).

5.1.5 Messages

5.1.5.1 For distress calls:

Message 1: Nature of distress, defaulting to undesignated distress

Message 2: Distress coordinates

Message 3: Time for last position update

Message 4: Type of subsequent communication J3E.

5.1.5.2 For all other calls:

First telecommand: J3E telephony
Unable to comply
Test.

Second telecommand: No information.

Frequency/channel information: MF/HF working channel, on MF defaulting to 2 182 kHz for urgency and safety calls.

5.1.6 End of sequence character: As defined in Annex 1.

5.2 Receive capabilities

Receive and be capable of displaying all the information in calls listed in § 5.1 plus all distress relay calls having the format specifier “geographical area calls”, all distress acknowledgement calls and all “unable to comply” calls.
