

RECOMMENDATION ITU-R M.821-1*

**OPTIONAL EXPANSION OF THE DIGITAL SELECTIVE-CALLING SYSTEM
FOR USE IN THE MARITIME MOBILE SERVICE**

(Question ITU-R 9/8)

(1992-1997)

Summary

The Recommendation provides in Annex 1 optional expansion sequences to calls in the digital selective-calling (DSC) system described in Recommendations ITU-R M.493 and ITU-R M.541. These expansion sequences enable DSC equipment to transmit optional messages of more precise geographic coordinates, the navigation equipment used to derive the position, the datum used for its calculation and the resolution of the fix, ship's speed, course or alternative ship identification.

The ITU Radiocommunication Assembly,

considering

- a) that the digital selective-calling (DSC) system described in Recommendation ITU-R M.493 currently provides an efficient method of geographic calling and transmitting a ship's position in geographic coordinates in degrees and minutes, and that Recommendation ITU-R M.825 also uses DSC sequences;
- b) that the addition of a brief optional message to a DSC sequence providing more precise information for geographic calling and concerning a ship's position, the type of navigation equipment used to derive the position, the resolution of the fix and the datum used, speed, course or identification would serve useful safety and operational purposes;
- c) that new navigation systems can routinely provide position resolution to an accuracy significantly better than 1 min of the geographic coordinates of a ship's location as well as accurate data concerning the ship's current speed and course;
- d) that providing additional ship's identification (ship's name or registration/documentation information, for example) could speed the process of retrieving pertinent vessel parameters and eliminate unnecessary audio traffic in some basic calling situations;
- e) that an automated maritime VHF vessel position reporting system of sufficient precision would increase the efficient surveillance and management of ship movement and operations;
- f) that the optional capability in § b) may be implemented only in those DSC equipments where it is desired;
- g) that the optional capability in § b) can be implemented in a manner that will not derogate the normal functioning of other DSC operations where this capability is not employed,

recommends

- 1 that where there is a need for DSC equipment capable of transmitting optional messages of more precise geographic coordinates, the navigation equipment used to derive the position, the datum used for its calculation and the resolution of the fix, ship's speed, course or alternative ship identification, it should be designed in accordance with characteristics given in Annex 1;
- 2 that when VHF channel 70 and other DSC distress, safety and calling frequencies are used for this purpose care should be taken not to load these channels above 0.1 E on MF or HF or 0.15 E on VHF.

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

ANNEX 1

**Technical characteristics of an expansion of the digital selective-calling system
for use in the maritime mobile service**

1 General

1.1 All expansion sequences must utilize all the technical characteristics outlined in Recommendation ITU-R M.493 except as otherwise noted in this Annex.

1.2 The expansion sequence directly follows the end of the call sequence and error-check character of the transmission sequences defined in Recommendations ITU-R M.493 and ITU-R M.541. The expansion sequence consists of one or more message fields as defined in the technical characteristics section of this Annex followed by a second end of call sequence with error-check character. The sequence is implicitly addressed to the same station with the same category as the transmission sequence to which it is appended.

1.3 Implementation of the expansion sequences is optional. The content of the message fields varies with the content of the standard transmission sequence. Some expansion data may be automatically included with DSC calls of certain types, however, the expansion sequence should normally only be transmitted upon request from another station so as to minimize the effect that the additional data has on DSC channel loading.

1.4 When processing a received sequence, a character should be searched for following the error-check character of the standard transmission. If a symbol pertaining to a data specifier character is detected, additional characters should be received until the second error-check character is received.

2 Technical format of added data

2.1 Expansion message fields

The expansion message fields allow more explicit data pertaining to the transmitting station to be passed to receiving stations than is defined in Recommendation ITU-R M.493. The data passed allows for increased resolution in positioning; information on navigation equipment, fix resolution and datum used; reporting of station current speed and course; and a means of tendering a secondary method of station identification. Each message field is preceded by an expansion data specifier character followed by one or more data characters representing the value of the message field.

2.1.1 The expansion data specifiers for the message fields are found in Table 1. Each specifier must have a value in the range 100-127. This distinguishes the specifiers from messages which cannot fall within this range with the exception of the command characters of Table 3.

TABLE 1
Symbols used for expansion data specifiers

Symbol No.	Expansion data specifier
100	Enhanced position resolution
101	Source and datum of position
102	Current speed of the vessel
103	Current course of the vessel
104	Additional station identification
105	Enhanced geographic area
106	Number of persons on board

2.1.2 The data content and length for each message field varies with the type of message.

2.1.2.1 The data for the enhanced position resolution message field consist of either a command character taken from Table 3 or four characters (eight digits). These digits represent the tenths, hundredths, thousandths and ten thousandths of minutes for both latitude and longitude. The first two characters are the extra resolution for latitude and the second two for longitude. Unused digits are filled with zeros.

2.1.2.2 The data for the navigation equipment, fix resolution and datum used message field consist of either a single command character taken from Table 3 or three characters (six digits). The first and second digits indicate the type of navigation receiver the position data was derived from and the status of that fix. This character is obtained from Table 4.

The third and fourth digits indicate the current fix resolution (GDOP for LORAN-C, HDOP for GPS fixes). The third digit indicates units and the fourth digit indicates tenths. Any GDOP or HDOP equal to or exceeding 9.9 should be indicated by 99.

The fifth and sixth digits indicate the datum used in calculating the position fix. This character is obtained from Table 5.

2.1.2.3 The data for the vessel speed message field consist of either a single command character taken from Table 3 or two characters (four digits). These digits represent the hundreds, tens, units and tenths of units of the speed of the ship in knots. Unused positions are filled with zeros.

2.1.2.4 The data for the vessel course message field consist of either a single command character taken from Table 3 or two data characters (four digits). These digits represent true course in hundreds, tens, units and tenths of degrees. Unused positions are filled with zeros.

2.1.2.5 The data for the additional station identification message field consist of either a single command character taken from Table 3 or up to ten characters taken from Table 2 representing the name or other identification of the transmitting station.

2.1.2.6 The data for the enhanced geographic area message field consists of twelve data characters (twenty-four digits). The first sixteen digits represent tens, units, tenths and hundredths of minutes for the latitude, longitude, vertical and horizontal extension of the rectangle. Unused digits are filled with zeros. The first two characters (four digits) are the extra resolution for latitude and the second two characters (four digits) are the extra resolution for longitude. The fifth and sixth characters (four digits) are the extra resolution in the vertical extension of the rectangle and the seventh and eighth characters (four digits) are the extra resolution in the horizontal extension of the rectangle. The last eight digits represent hundreds, tens, units and tenths of units for the speed and course of the vessel. Unused digits are filled with zeros. The ninth and tenth characters (four digits) are the estimated speed of the vessel, or two symbols No. 126 if no speed estimation is available. The eleventh and twelfth characters (four digits) are the estimated course of the vessel, or two symbols No. 126 if no course estimation is available.

2.1.2.7 The data for the number of persons on board message field consists of either a command character taken from Table 3 or two data characters (four digits). These digits represent thousands, hundreds, tens and units of persons on board. Unused positions are filled with zeros.

2.2 Start and end of transmission of expansion sequence

2.2.1 The symbols used in the first two RX positions should be 126.

2.2.2 The end of transmission sequence is formulated in a manner identical to that defined in Recommendation ITU-R M.493. The sequence consists of end of sequence characters and error-check characters.

2.2.2.1 The end of sequence character is transmitted three times in the DX position and once in the RX position. The character used is the same as that used to terminate the standard portion of the entire DSC formatted call.

2.2.2.2 The error-check character is generated by taking the modulo-2 sums of all the characters in the message fields including the data specifiers and one end of sequence character. This character is transmitted once in the RX and once in the DX position.

2.2.3 Figure 1 illustrates the technical format and transmission sequence of the expansion.

TABLE 2
Symbols used to denote alphanumeric characters

Symbol No.	Character	Symbol No.	Character	Symbol No.	Character
00	0	16	F	32	V
01	1	17	G	33	W
02	2	18	H	34	X
03	3	19	I	35	Y
04	4	20	J	36	Z
05	5	21	K	37	“.”
06	6	22	L	38	“,”
07	7	23	M	39	“_”
08	8	24	N	40	“/”
09	9	25	O	41	Space
10	Not used	26	P		
11	A	27	Q		
12	B	28	R		
13	C	29	S		
14	D	30	T		
15	E	31	U		

TABLE 3
Symbols used for command characters

Symbol No.	Command characters
110	Data request
126	No data available

TABLE 4
Symbols used in describing the type of positioning device used for VTS positioning

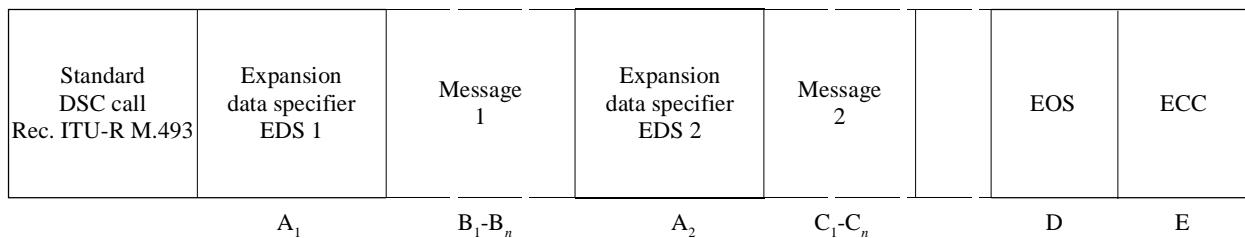
Symbol No.	Position information source
00	Current position data invalid
01	Position data from differential GPS
02	Position data from uncorrected GPS
03	Position data from differential LORAN-C
04	Position data from uncorrected LORAN-C
05	Position data from GLONASS
06	Position data from radar fix
07	Position data from Decca
08	Position data from other source

TABLE 5

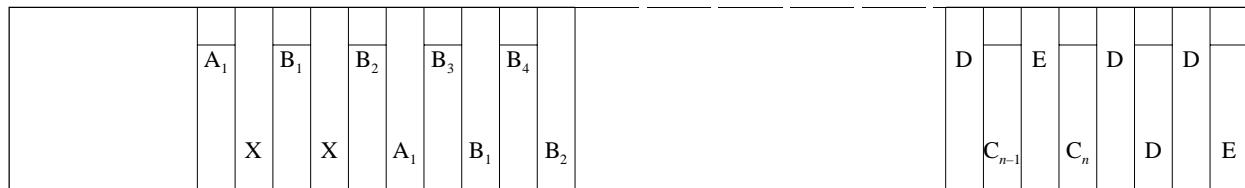
Symbols used in describing the datum for calculating position with the VTS area

Symbol No.	Datum indicated for coordinate calculations
00	WGS-84
01	WGS-72
02	Other

**FIGURE 1
Technical format and transmission sequence of expansion**



a) Technical format



b) Transmission sequence

- A₁: first expansion data specifier
- A₂: second expansion data specifier
- B₁-B_n: characters of message 1
- C₁-C_n: characters of message 2
- D: EOS end of sequence
- E: ECC error-check character
- X: symbol No. 126 no information

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3 Operational characteristics of expanded transmission

3.1 Enhanced position resolution

The expansion message field with enhanced position resolution may be appended to any standard DSC transmission sequences which include position information, provided the data is available. Transmission with other types of sequences is meaningless.

As an example of an enhanced position resolution message field, if the position $27^{\circ} 54.0572' \text{N}$ and $82^{\circ} 42.5933' \text{W}$ was to be transmitted, the extra position message field (consisting of the tenths, hundredths, thousandths and ten thousandths of minutes) would consist of five characters total, as follows: 10005 725933. To request this information from a vessel, the expansion data specifier 100 would be followed by the command character 110.

3.2 The type of navigation equipment, the fix resolution and the datum used for calculating the position should generally be transmitted together and upon request from another station.

As an example, for a vessel using differential GPS to report the position without specified HDOP using WGS-84 datum, the message field would consist of four characters total, as follows: 101 01 00 00. To request this information from a vessel, the expansion data specifier 101 would be followed by the command character 110.

3.3 Ship speed and course

Ship speed and course data should generally be transmitted together. This expansion sequence can be appended to any standard DSC call, however, normally the speed and position data should only be transmitted upon request from another station.

A ship's speed or course may be requested by another station utilizing the data request command from Table 3.

As an example of a transmitted speed and course field, if a vessel's speed is 12.4 knots and the true course is 298° the speed data field would consist of three characters 102 01 24 and the course data field would consist of three characters 103 02 98. To request the speed of another vessel, the speed expansion data specifier character 102 would be followed by the command character 110. To request the course of another vessel, the course data specifier character 103 would be followed by the command character 110.

3.4 Additional station identification

The additional station identification message field may be added to any standard DSC transmission sequence.

This expansion sequence may be requested by another station utilizing the data request command from Table 3. This request is generally appended to request type calls (RQ) (communication requests or polling calls, for example) but may be transmitted with replies to a received call prompting an additional transmission from the original caller. For example, if a station receives a DSC call, the generated response could include a request for additional information from the calling station. The calling station should then respond with a transmission which includes the requested additional information.

As an example of an additional station identification message field, the station name "PICES 3" would be transmitted using eight characters as follows: 104 26 19 13 15 29 41 03. To request additional information from another station, the expansion data specifier 104 would be followed by the command character 110.

3.5 Enhanced geographic area

The enhanced geographic area message field may only be appended to a DSC call directed to a group of ships in a particular geographic area.

This expansion sentence is only appended to request type calls (RQ) directed to a group of ships in a particular geographic area. Ships within the addressed area, after checking compliance with speed and course, where possible, should reply as to a request for ship's position.

3.6 Number of persons on board

The number of persons on board message field may be appended to any DSC sentence.

This expansion sentence may be requested by another station utilizing the data request command from Table 3. This request is generally appended to request type calls (RQ) but may be transmitted with replies to a received call prompting an additional transmission from the original caller. For example, if the station receives a DSC call, the generated response could include a request for additional information from the calling station. The calling station should then respond with a transmission which includes the requested additional information.

3.7 Maximum sequence length

In order to minimize the channel loading effects of expansion sequences, the maximum number of characters which may be transmitted in an expansion sequence is 38, including the end of call sequence, error-check character and time diversity retransmissions.
