

RECOMMENDATION ITU-R M.825-3*

**CHARACTERISTICS OF A TRANSPONDER SYSTEM USING DIGITAL
SELECTIVE CALLING TECHNIQUES FOR USE WITH VESSEL
TRAFFIC SERVICES AND SHIP-TO-SHIP IDENTIFICATION**

(Question ITU-R 28/8)

(1992-1995-1997-1998)

Summary

Several administrations have requirements for a radio transponder system for the purpose of obtaining information on ships entering and sailing within vessel traffic service (VTS) areas. In addition, there is a need for a system to provide ship-to-ship identification.

This Recommendation contains the characteristics of a system which uses digital selective-calling (DSC) techniques, suitable for both applications. The Recommendation is based upon Recommendation ITU-R M.493 and introduces a new message "category" for messages related to VTSs and ship-to-ship identification. It also describes the format, composition and contents of such messages.

This Recommendation for a transponder system is not intended to meet the requirements for a universal automatic identification system (AIS) which is under consideration in IMO.

The ITU Radiocommunication Assembly,

considering

- a) that the use of a transponder system would expedite the passing of data between a VTS centre and ships in its service area;
- b) that several administrations have been developing different systems;
- c) that a transponder system should, as far as practicable, make use of existing equipment on board ships;
- d) that it is desirable that one transponder system for VTS purposes should fulfil the requirements of all administrations desiring to use it;
- e) that the digital selective-calling system having the technical and operational characteristics in accordance with Recommendations ITU-R M.493 and ITU-R M.541 has been recommended for use in the maritime mobile service;
- f) that some administrations are planning to make extensive use of transponders for tracking ships in high-traffic waterways and where radar may be unavailable, and for ship-to-ship identification, also outside VTS operating areas;
- g) that some administrations are requiring more types of data messages and more data capacity than can be afforded by DSC transmissions on VHF channel 70, but that they wish to use DSC as a common gateway to facilitate the use and implementation of automatic identification systems;
- h) that administrations planning to use transponders for tracking ships in high-traffic waterways with VTS systems utilizing DSC require up to four ship's position reports per second,

recommends

- 1 that, where there is a need for a transponder system using digital selective calling techniques to be used in conjunction with a VTS, the system should be designed in accordance with the characteristics given in Annex 1;
- 2 that, in areas where VHF channel 70 is used for public correspondence calling, channel 70 should not be used for vessel traffic services and ship-to-ship identification unless experience indicates that sufficient spare capacity is available, in accordance with Recommendation ITU-R M.822;

* This Recommendation should be brought to the attention of the International Maritime Organization (IMO) and the International Association of Lighthouse Authorities (IALA).

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- 3 that Annex 1 may be used as a gateway to identify the transponder system and to assign its operating channel frequencies;
- 4 that the transponder should be interfaced with the ship's systems as required to perform the intended operation;
- 5 that VHF transponders should be capable of operating on frequency channels in accordance with Annex 4 of Recommendation ITU-R M.1084;
- 6 that, where there is a need when using DSC techniques for a higher update rate than can be achieved by using the characteristics given Annex 1, then the system should be designed to include the additional characteristics given in Annex 2.

ANNEX 1

**Technical characteristics of a transponder system for use
on maritime VHF channels for vessel traffic service
purposes and ship-to-ship identification**

1 General

1.1 The transponder system is a synchronous system using the transmission techniques detailed in the sections of Recommendation ITU-R M.493 describing the implementation of DSC in the maritime VHF environment.

1.2 In addition to the definitions for the symbols No. 00 to No. 127 as defined in Recommendation ITU-R M.493, the symbols No. 00 to No. 99 can also be used to represent alphanumeric data, as specified in Table 1.

TABLE 1

Symbols used to denote alphanumeric data

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		

1.3 The equipment should automatically code and transmit a response to all calls received which contain the symbol No. 117 (acknowledge RQ) as the "end of sequence" character. The automatic response to calls addressed to a "VTS area" should be transmitted after a random delay distributed over the range of 0 to 20 s providing the signalling channel is clear of other traffic.

2 Technical format of a transmission sequence

2.1 The technical format of a transmission sequence is identical to that described in Recommendation ITU-R M.493. The construction of the transmission format is given in Table 2.

TABLE 2

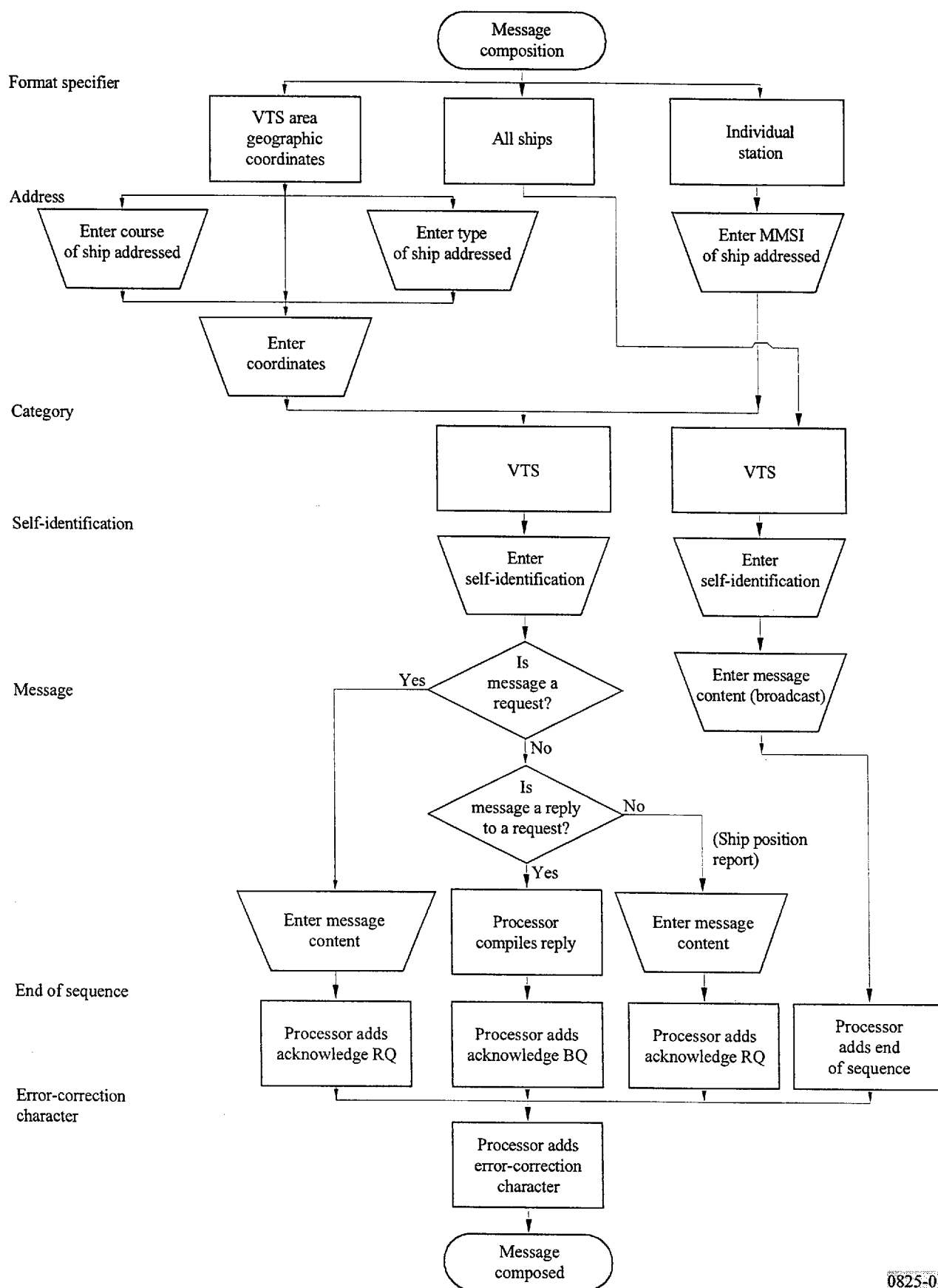
Format of a transmission sequence

Dot pattern	
DX	RX7
DX	RX6
DX	RX5
DX	RX4
DX	RX3
DX	RX2
A	RX1
A	RX0
B ₁	A
B _n	A
C	B ₁
D ₁	B _n
D _n	C
E ₁	D ₁
E _n	D _n
F	E ₁
G	E _n
F	F
F	G

RX/DX: phasing sequence
 A: format specifier
 B₁-B_n: address
 C: category
 D₁-D_n: self-identification
 E₁-E_n: message
 F: end of sequence
 G: error-check character

2.2 A flow-chart illustrating the message composition is shown in Fig. 1.

FIGURE 1
Message composition flow chart



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3 Dot pattern and phasing sequence

3.1 The dot pattern and phasing sequence used are formatted as described in Recommendation ITU-R M.493 for operation in the maritime VHF service.

4 Format specifier

4.1 The format specifier signals are transmitted per definition in Recommendation ITU-R M.493. The new format specifier (symbol No. 103) is utilized for all VTS DSC operations. The format specifiers relevant to VTS DSC operations are:

4.1.1 symbol No. 103 for a selective call to a group of ships in a specified VTS area;

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

4.1.3 symbol No. 116 for an "all ships" call to be used only for broadcast messages.

5 Addresses

5.1 For a selective call directed to an individual station, the maritime mobile service identity (MMSI) of the station is inserted in the address field following the methodology as described in Recommendation ITU-R M.493.

5.2 For a selective call directed to ships in a specified VTS area, a numerical geographic coordinated address consisting of 22 digits (i.e., 11 characters) is constructed. When all ships in the area are addressed, the coordinates shall follow immediately after the symbol No. 103. However, two characters indicating the course of the ships addressed or one character indicating that ships of a certain type are being addressed may optionally be inserted between the format symbol and the coordinates.

5.2.1 Ships on a certain course

When it is required to address a ship in the defined area which is steering a particular course, the two characters (four digits) to be inserted between the format symbol and the coordinates shall be constructed as follows:

- the first digit shall be the digit "4" to indicate that a course follows;
- the second, third and fourth digits shall indicate the designated true course in degrees (from 000 to 359). All leading zeros must be used to "fill" the field;
- for example, when addressing ships on a course of 040° true, the two characters inserted between the format specifier and the geographical address would be "40" and "40". If the course was 205° true, the two characters would be "42" and "05";
- shipborne equipment should be considered "addressed" when the ship's heading differs by 2° or less from the course given in the DSC call.

5.2.2 Ships of a certain type

When it is required to address all ships of a certain type in the defined area, the single character (two digits) to be inserted between the format symbol and the geographic coordinates shall be the appropriate symbol derived from Table 3. The first digit shall be either "5", "6", "7", "8" or "9" as defined in the table.

TABLE 3

**Symbols to indicate the type of ship and for the address
of calls to groups of ships in VTS areas**

Symbols to be used by ships to report their type and in the address of calls directed to a group of ships in a VTS area	
Symbol No.	Special craft
50	Pilot boats
51	Search and rescue vessels
52	Tugs
53	Port tenders
54	Vessels with anti-pollution facilities or equipment
55	Law enforcement vessels
56	<i>spare – for assignment to local vessels</i>
57	<i>spare – for assignment to local vessels</i>
58	Medical transports (as defined in 1949 Geneva Conventions and additional Protocols)
59	Ships according to Resolution 18 (Mob-83)
Other ships	
First digit	Second digit
6 – Passenger ship(s)	0 – All ships of this type
7 – Cargo ship(s)	1 – Carrying DG, HS or MP IMO hazard or pollutant category A
8 – Tanker(s)	2 – Carrying DG, HS or MP IMO hazard or pollutant category B
9 – Other types of ships	3 – Carrying DG, HS or MP IMO hazard or pollutant category C
	4 – Carrying DG, HS or MP IMO hazard or pollutant category D
	5 – Not under command
	6 – Restricted by her ability to manoeuvre
	7 – Constrained by her draught
	8 – <i>Spare</i>
	9 – No additional information

DG: dangerous goods
HS: harmful substances
MP: marine pollutants

NOTE 1 – The symbol should be constructed by selecting the appropriate first and second digits. For example, a message addressed to “all tankers” would use symbol No. 80 while an identification report from a passenger ship containing no additional information would use symbol No. 69.

For example, calls addressed to all pilot boats in a geographical area would insert the character “50” between the format specifier and geographical address. Calls addressed to all tanker type ships constrained by draught would use the character “87”.

5.2.3 The numerical geographic coordinate address

The numerical geographic coordinate address shall be constructed as follows:

- the designated geographical area will be a rectangle in Mercator projection;
- the upper left hand (i.e., North-West) corner of the rectangle is the reference point for the area;

5.2.3.1 the first digit indicates the azimuth sector in which the reference point is located, as follows:

- quadrant NE is indicated by the digit “0”;
- quadrant NW is indicated by the digit “1”;
- quadrant SE is indicated by the digit “2”;
- quadrant SW is indicated by the digit “3”;

5.2.3.2 the second to the seventh digits indicate the latitude of the reference point in tens and units of degrees and tens, units, tenths and hundredths of minutes;

5.2.3.3 the eighth to the fourteenth digits indicate the longitude of the reference point in hundreds, tens and units of degrees and tens, units, tenths and hundredths of minutes;

5.2.3.4 the fifteenth to the eighteenth digits indicate the vertical (i.e. North to South) side of the rectangle in tens, units, tenths and hundredths of minutes;

5.2.3.5 the nineteenth to the twenty second digits indicate the horizontal (i.e. West to East) side of the rectangle in tens, units, tenths and hundredths of minutes;

5.2.4 for example, the characters necessary to compose the geographical address defining an area with a reference point of 27° 40.30' N and 082° 57.80' W, a vertical side of 06.00' and a horizontal side of 17.0' would be:

“12” “74” “03” “00” “82” “57” “80” “06” “00” “17” “00”.

6 Category

6.1 The category “information” indicates a safety call related to VTS operation. Symbol No. 103 is used to indicate this purpose. This category definition is an addition to Recommendation ITU-R M.493.

7 Self-identification

7.1 The MMSI assigned to the calling station, coded as indicated in Recommendation ITU-R M.493, is used for self-identification.

8 Messages

8.1 The message included in a transmission sequence will comprise one or more, up to a maximum of 4, of the symbols given in Table 4. Certain symbols from Table 4 are followed by an appropriate symbol or symbols, from No. 00 to No. 99, constructed as follows:

8.1.1 symbol No. 100 should be followed by twelve or thirteen symbols as follows:

8.1.1.1 the first digit indicates the azimuth sector in which the position is located, as follows:

- quadrant NE is indicated by the digit “0”;
- quadrant NW is indicated by the digit “1”;
- quadrant SE is indicated by the digit “2”;
- quadrant SW is indicated by the digit “3”;