

RECOMMENDATION ITU-R M.476-5*

**DIRECT-PRINTING TELEGRAPH EQUIPMENT
IN THE MARITIME MOBILE SERVICE****

(Question ITU-R 5/8)

(1970-1974-1978-1982-1986-1995)

Summary

The Recommendation provides in Annex 1 characteristics for error detecting and correcting systems for existing direct-printing telegraph equipment. Annex 1 contains the technical characteristics of the transmission, the code and the modes of operation to be employed in the maritime-mobile service. New equipment should conform to Recommendation ITU-R M.625.

The ITU Radiocommunication Assembly,

considering

- a) that there is a requirement to interconnect mobile stations, or mobile stations and coast stations, equipped with start-stop apparatus employing the ITU-T International Telegraph Alphabet No. 2, by means of radiotelegraph circuits;
- b) that direct-printing telegraphy communications in the maritime mobile service can be listed in the following categories:
 - b.a telegraph service between a ship and a coast station;
 - b.b telegraph service between a ship and an extended station (ship's owner) via a coast station;
 - b.c telex service between a ship and a subscriber of the (international) telex network;
 - b.d broadcast telegraph service from a coast station to one or more ships;
 - b.e telegraph service between two ships or between one ship and a number of other ships;
- c) that those categories are different in nature and that consequently different degrees of transmission quality may be required;
- d) that the categories given in b.a, b.b and b.c above may require a higher transmission quality than categories b.d and b.e for the reason that data could be handled through the services in the categories b.a, b.b and b.c, while the messages passed through the service of category b.d, and via the broadcast service of category b.e are normally plain language, allowing a lower transmission quality than that required for coded information;

* This Recommendation should be brought to the attention of the International Maritime Organization (IMO) and the Telecommunication Standardization Sector (ITU-T).

** This Recommendation is retained in order to provide information concerning existing equipment, but will probably be deleted at a later date. New equipment should conform to Recommendation ITU-R M.625 which provides for the exchange of identification signals, for the use of 9 digit maritime mobile service identification signals and for compatibility with existing equipment built in accordance with this Recommendation.

Note by the Secretariat: The references made to the Radio Regulations (RR) in this Recommendation refer to the RR as revised by the World Radiocommunication Conference 1995. These elements of the RR will come into force on 1 June 1998. Where applicable, the equivalent references in the current RR are also provided in square brackets.

- e) that the service in category b.d and the broadcast service in category b.e cannot take advantage of an ARQ method, as there is in principle no return path;
- f) that for these categories of service which by their nature do not allow the use of ARQ, another mode, i.e. the forward error-correcting (FEC) mode should be used;
- g) that the period for synchronization and phasing should be as short as possible and should not exceed 5 s;
- h) that most of the ship stations do not readily permit simultaneous use of the radio transmitter and radio receiver;
- j) that the equipment on board ships should be neither unduly complex nor expensive,

recommends

- 1 that when an error-detecting and correcting system is used for direct-printing telegraphy in the maritime mobile service, a 7-unit ARQ system or a 7-unit forward acting, error-correcting and indicating time-diversity system, using the same code, should be employed;
- 2 that equipment designed in accordance with § 1 should meet the characteristics laid down in Annex 1.

ANNEX 1

1 General (Mode A, ARQ and Mode B, FEC)

1.1 The system in both Mode A (ARQ) and Mode B (FEC) is a single-channel synchronous system using the 7-unit error-detecting code as listed in § 2 of this Annex.

1.2 FSK modulation is used on the radio link at 100 Bd. The equipment clocks controlling the modulation rate should have an accuracy of better than 30 parts in 10^6 .

NOTE 1 – Some existing equipments may not conform to this requirement.

1.3 The terminal input and output must be in accordance with the 5-unit start-stop ITU-T International Telegraph Alphabet No. 2 at a modulation rate of 50 Bd.

1.4 The class of emission is F1B or J2B with a frequency shift on the radio link of 170 Hz. When frequency shift is effected by applying audio signals to the input of a single-sideband transmitter, the centre frequency of the audio spectrum offered to the transmitter should be 1 700 Hz.

NOTE 1 – A number of equipments are presently in service, using a centre frequency of 1 500 Hz. These may require special measures to achieve compatibility.

1.5 The radio frequency tolerance of the transmitter and the receiver should be in accordance with Recommendation ITU-R SM.1137. It is desirable that the receiver employs the minimum practicable bandwidth (see also Report ITU-R M.585).

NOTE 1 – The receiver bandwidth should preferably be between 270 and 340 Hz.

2 Table of conversion

2.1 Traffic information signals

TABLE 1

Combination No.	Letter case	Figure case	International Telegraph Alphabet No. 2 Code	Emitted 7-unit signal ⁽¹⁾
1	A	—	ZZAAA	BBBYYYB
2	B	?	ZAAZZ	YBYYBBB
3	C	:	AZZZA	BYBBBY
4	D	☒ ⁽³⁾	ZAAZA	BBYYBYB
5	E	3	ZAAAA	YBBYBYB
6	F	(2)	ZAZZA	BBYBBYY
7	G	(2)	AZAZZ	BYBYBBY
8	H	(2)	AAZAZ	BYBYBBB
9	I	8	AZZAA	BYBBYYB
10	J	Audible signal	ZZAZA	BBBYBY
11	K	(	ZZZZA	YBBBBYY
12	L	)	AZAAZ	BYBYBBB
13	M	.	AAZZZ	BYBBBBY
14	N	,	AAZZA	BYBBYB
15	O	9	AAAZZ	BYYYBBB
16	P	0	AZZAZ	BYBBYBY
17	Q	1	ZZZAZ	YBBBYBY
18	R	4	AZAZA	BYBYBYB
19	S	,	ZAZAA	BBYBYBY
20	T	5	AAAAZ	YYBYBBB
21	U	7	ZZZAA	YBBBYBY
22	V	=	AZZZZ	YYBBBBY
23	W	2	ZZAAZ	BBBYBY
24	X	/	ZAZZZ	YBYBBY
25	Y	6	ZAZAZ	BBYBYBY
26	Z	+	ZAAAZ	BBYYYBB
27	← (Carriage return)		AAAZA	YYYBBBB
28	≡ (Line feed)		AZAAA	YYBBYBB
29	↓ (Letter shift)		ZZZZZ	YBYBBYB
30	↑ (Figure shift)		ZZAZZ	YBBYBBY
31	Space		AAZAA	YYBBBYB
32	Unperforated tape		AAAAA	YBYBYBB

- (1) B represents the higher emitted frequency and Y the lower.
- (2) At present unassigned (see ITU-T Recommendation F.1 C8). Reception of these signals, however, should not initiate a request for repetition.
- (3) The pictorial representation shown is a schematic of ☒ which may also be used when equipment allows (ITU-T Recommendation F.1).

2.2 Service information signals

TABLE 2

Mode A (ARQ)	Emitted signal	Mode B (FEC)
Control signal 1 (CS1)	BYBYBB	Phasing signal 1 Phasing signal 2
Control signal 2 (CS2)	YBYBYBB	
Control signal 3 (CS3)	BYBBYB	
Idle signal β	BBYYBBY	
Idle signal α	BBBBYYY	
Signal repetition	YBBYYBB	

3 Characteristics

3.1 Mode A (ARQ) (see Figs. 1 and 2)

A synchronous system, transmitting blocks of three characters from an information sending station (ISS) towards an information receiving station (IRS), which stations can, controlled by the control signal 3 (see § 2.2), interchange their functions.

3.1.1 Master and slave arrangements

3.1.1.1 The station that initiates the establishment of the circuit (the calling station) becomes the “master” station, and the station that has been called will be the “slave” station;

this situation remains unchanged during the entire time in which the established circuit is maintained, regardless of which station, at any given time, is the information sending station (ISS) or information receiving station (IRS);

3.1.1.2 the clock in the master station controls the entire circuit (see circuit timing diagram, Fig. 1);

3.1.1.3 the basic timing cycle is 450 ms, and for each station consists of a transmission period followed by a transmission pause during which reception is effected;

3.1.1.4 the master station transmitting time distributor is controlled by the clock in the master station;

3.1.1.5 the slave station receiving time distributor is controlled by the received signal;

3.1.1.6 the slave station transmitting time distributor is phase-locked to the slave station receiving time distributor; i.e. the time interval between the end of the received signal and the start of the transmitted signal (t_E in Fig. 1) is constant;

3.1.1.7 the master station receiving time distributor is controlled by the received signal.

3.1.2 The information sending station (ISS)

3.1.2.1 Groups the information to be transmitted into blocks of three characters (3×7 signal elements), including, if necessary, “idle signals β ” to complete or to fill blocks when no traffic information is available;

3.1.2.2 emits a “block” in 210 ms after which a transmission pause of 240 ms becomes effective, retaining the emitted block in memory until the appropriate control signal confirming correct reception by the information receiving station (IRS) has been received;

3.1.2.3 numbers successive blocks alternately “Block 1” and “Block 2” by means of a local numbering device. The first block should be numbered “Block 1” or “Block 2” dependent on whether the received control signal (see § 3.1.4.5) is a control signal 1 or a control signal 2. The numbering of successive blocks is interrupted at the reception of:

- a request for repetition; or
- a mutilated signal; or
- a control signal 3 (see § 2.2);

3.1.2.4 emits the information of Block 1 on receipt of control signal 1 (see § 2.2);

3.1.2.5 emits the information of Block 2 on receipt of control signal 2 (see § 2.2);

3.1.2.6 emits a block of three “signal repetitions” on receipt of a mutilated signal (see § 2.2).