SECTION 8B: MARITIME MOBILE SERVICE; TELEGRAPHY AND RELATED SUBJECTS

REPORT 585-4

# INTRODUCTION OF DIRECT-PRINTING TELEGRAPH EQUIPMENT IN THE MARITIME MOBILE SERVICE

(Question 5/8)

(1974-1978-1982-1986-1990)

1. This Report discusses some operational and procedural considerations in the introduction of direct-printing equipment in the maritime mobile service. As a goal, it is considered that provision should be made for fully automatic and unattended operation. Provision should also be made for attended operation, particularly during the period of time leading up to the implementation of fully-automated systems [CCIR, 1970-74a, b, c, d, e, f, g and h].

2. Automatic operation gives the possibility of messages being exchanged irrespective of the hours of duty of the radio operator on board the ship. The ultimate objective would be for ships to be treated in the same way as a subscriber using the international telex network. Where non-automatic operation is employed, it should still be possible for calls to be established by direct-printing equipment. Selective-calling is an important element of the operation of both the attended and fully-automatic systems.

3. Many administrations have installed direct-printing equipment with varying degrees of automation.

The use of frequency scanning, computer control and message switching techniques in conjunction with narrow-band, direct-printing has permitted fully automatic establishment of calls from ships to telex subscribers on shore.

Store-and-forward facilities with, in some cases, the automatic storage of ship's watchkeeping frequencies or ship's position, have enabled automation of calling and message exchange from telex subscribers in the shore-to-ship direction.

Since the introduction of the first such system in 1972, the principles and procedures have become well-established. Recommendation 492 describes operational procedures, including those used for automatic services.

The need for close frequency tolerance is stressed in [CCIR 1970-74g] and the results of laboratory tests to determine the effects of receiver off-tune on bit error ratios are given (see Figs. 1 and 2). These results relate to tests upon a specific type of receiver demodulator. In the document it is considered that automatic frequency control is one solution to the problem of detuning. During the discussion it was noted that other solutions to the problem could include the use of other demodulator techniques or closer frequency tolerances.

The effect of receiver selectivity upon bit error ratios is also considered in the document and curves are given (see Figs. 3 and 4) of the effect upon bit error ratio of different values of selectivity without and in the presence of adjacent channel interference. (Similar curves in the contribution mentioned above are in terms of character error-rate.) In discussion it was also noted that the selectivity problem was closely related to the phase-delay characteristics of the receiver filters. The document considers that further study of these aspects is required.

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* This Report should be brought to the attention of the CCITT.

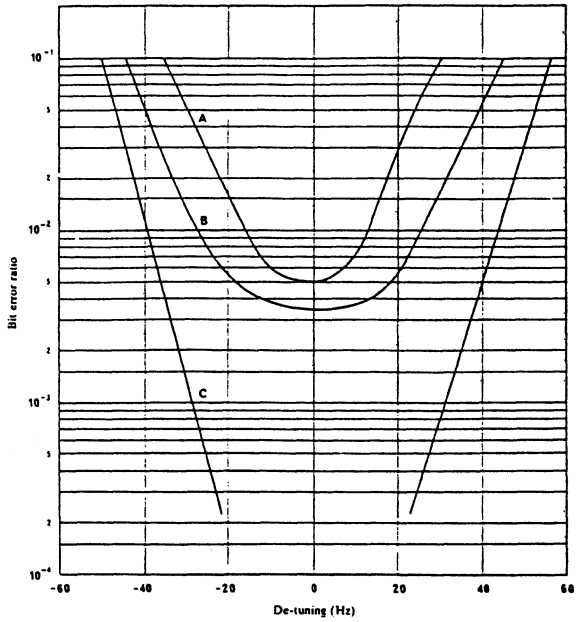


FIGURE 1 – *Bit error ratio as a function of de-tuning*
(No fading)

Receiver input voltage:
Curves A: −22 dB(1μV)
B: −20 dB(1μV)
C: −18 dB(1μV)

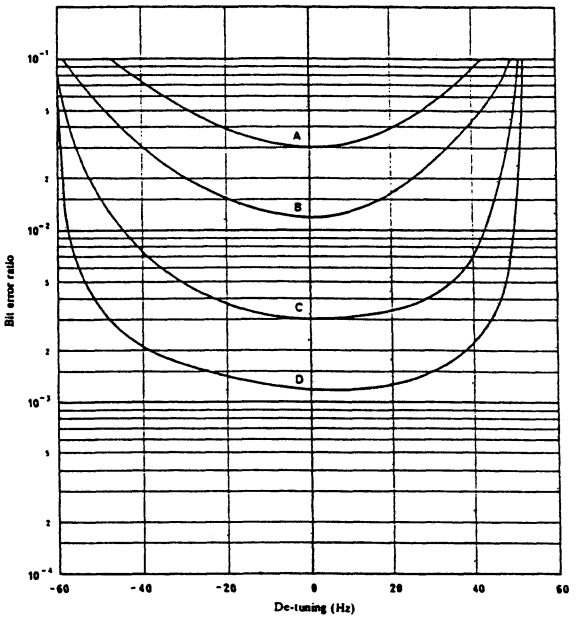


FIGURE 2 – *Bit error ratio as a function of de-tuning*
(Under random fading close to Rayleigh distribution, with fading rate of 15 fades/min)

Receiver input voltage (median value):
Curves A: −8 dB(1μV)
B: −3 dB(1μV)
C: 2 dB(1μV)
D: 7 dB(1μV)

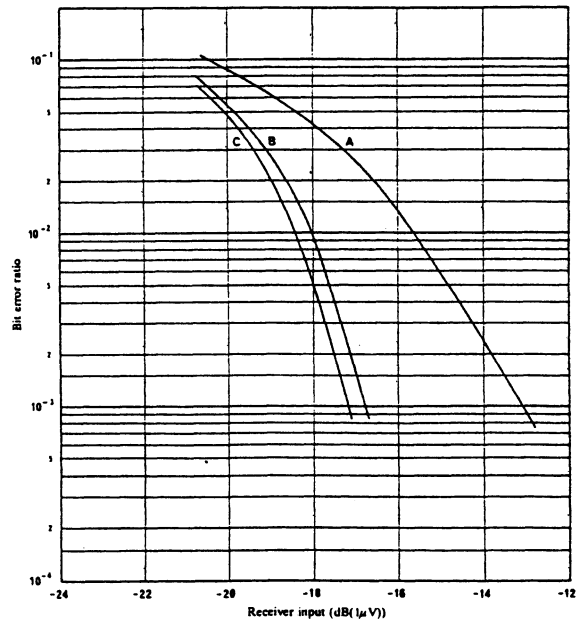


FIGURE 3 – *Bit error ratio as a function of receiver input for variation in receiver bandwidths under no interference conditions*

Receiver bandwidth:

| | <6 dB | >66 dB |
|---|---|---|
| Curves A: | 210 Hz | 500 Hz |
| B: | 240 Hz | 560 Hz |
| C: | 310 Hz | 700 Hz |

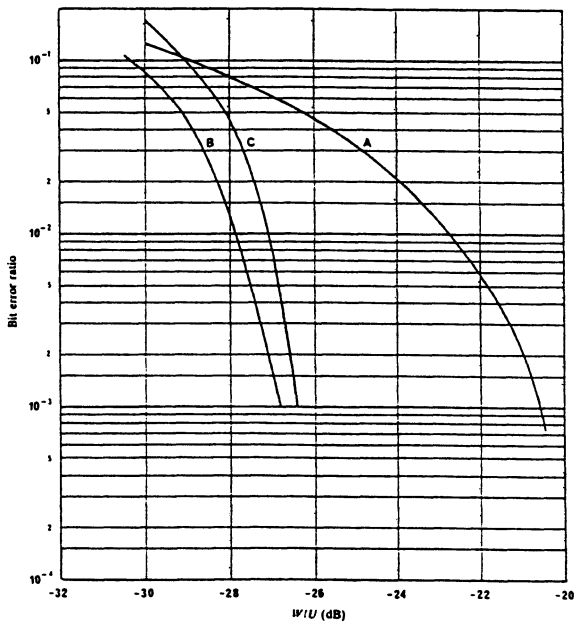


FIGURE 4 – *Bit error ratio as a function of W/U (ratio of wanted to unwanted signal) with different receiver bandwidths in the presence of adjacent channel interference*

Wanted signal: 1 μV at receiver input
Unwanted signal: 100 bit/s dot signal, separated from desired signal by 500 Hz

Receiver bandwidth:

| | <6 dB | >66 dB |
|---|---|---|
| Curves A: | 210 Hz | 500 Hz |
| B: | 240 Hz | 560 Hz |
| C: | 310 Hz | 700 Hz |

4. At the Final Meeting 1981, it was brought out that problems have occurred due to lack of automatic exchange of identification signals [CCIR, 1978-82c]. In order to solve these problems, Interim Working Party 8/11 was established by Decision 49.

4.1 Interim Working Party 8/11 prepared a new Recommendation (Recommendation 625) which incorporated automatic identification during establishment and re-establishment of communications (phasing and re-phasing) and expanded the address capability up to 9 digits. This new Recommendation was intended to replace Recommendation 476 and be used for all new designs.

4.2 Subsequently, Recommendation 625 was adopted by the XVIth Plenary Assembly, Dubrovnik, 1986. A footnote was added to Recommendation 476, warning of its future deletion and of the need to use Recommendation 625 for new designs.

4.3 Recommendation 625 provides for full compatibility with equipment designed in accordance with Recommendation 476. Equipment built in accordance with Recommendation 625 can operate using the 9-digit identities, and is also capable of following the procedures described in Recommendation 476, including the use of 4- or 5-digit identities, both as a calling and as a called station.

4.4 Although Recommendation 625 accommodates 4-, 5- and 9-digit addresses, 9-digit addresses can only be used for communications between equipments built according to Recommendation 625. To enable interoperation between existing equipments built in accordance with Recommendation 476 and new equipments in accordance with Recommendation 625, new equipments (Recommendation 625) should be assigned a 4- or 5-digit address in addition to their 9-digit address.

4.5 Complete compatibility with equipment built according to Recommendation 476 should be maintained for a time period sufficiently long in order to permit recovery of the investment made for such equipment.

5. The statements under §§ 4.4 and 4.5 above have the following implication:

5.1 In order that the assignment of selective call numbers to be used for the sequential single frequency code (SSFC) system of Appendix 39 of the Radio Regulations does not prematurely limit the address capacity of the present direct printing system, the Interim Working Party recommended that at the next competent World Administrative Radio Conference the coupling between the addresses of the two systems be removed.

This decoupling was approved at WARC-87 (see Appendix 38(Rev.) MOB-87, sub-paragraph(g)).

6. The exchange of identities is considered as a part of the set-up of the radio circuit and is therefore not a part of the traffic information exchange following phasing. Nevertheless, provision should be made in the ARQ equipment to make the identity of the calling station available to the radio station operator or radio station equipment. However, such information should not be transmitted into the network. Examples of the use of this information for operational purposes are:

6.1 Coast stations that provide automatic connection of ship stations to public switched networks could use the caller identity to automate associated accounting and billing procedures.

6.2 The caller identity could be used for logging and recording incoming calls.

6.3 The caller identity could be used to determine the eligibility of calling stations.

6.4 The caller identity could be used to facilitate the re-establishment of the circuit at a later moment and the making of enquiries about messages even if an answerback operational procedure is not followed.

6.5 The caller identity and other additional information could be used together with stored relevant information about ship stations to improve the quality of communication e.g. by selecting appropriate antennas.

6.6 It would be possible to provide facilities enabling stations to call and collect stored messages using the self-identifying procedures to authorize release of stored information. This facility could be very useful in store-and-forward message-handling systems.

7. With respect to the use of "free channel" signals it was noted at the Interim Meeting, 1984, that this can be a source of interference to other users of the channel. With reference to Article 18 of the Radio Regulations and the heavy loading of the frequencies available for NBDP in the HF bands, the emission of free channel signals should be avoided as far as possible. If such signals are necessary they should, preferably, be transmitted on only one channel per HF band and the duration should be kept as short as possible. The use of a restricted duty cycle of, for example 10%, could be considered in this respect but other solutions may be possible and this matter should be further studied.

## REFERENCES

*CCIR Documents*

[1970-74]: **a.** 8/3 (United Kingdom); **b.** 8/9 (USA); **c.** 8/74 (Netherlands); **d.** 8/80 (Sweden); **e.** 8/93 (Japan); **f.** 8/94 (U.S.S.R.); **g.** 8/192 (Japan); **h.** 8/261 (CCIR).

[1974-78]: **a.** 8/313 (Australia); **b.** 8/365 (Sweden).

[1978-82]: **a.** 8/23 (Japan); 8/292 (CCIR Secretariat); **b.** 8/365 (United Kingdom); 8/405 (Sweden); **c.** 8/427 (Netherlands).