INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

R.117

(03/93)

TELEGRAPHY

TELEGRAPH TRANSMISSION

END-TO-END ERROR PERFORMANCE FOR TELEGRAPH, TELEX AND GENTEX CONNECTIONS INVOLVING REGENERATIVE EQUIPMENT

ITU-T Recommendation R.117

(Previously “CCITT Recommendation”)

FOREWORD

The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the International Telecommunication Union. The ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Conference (WTSC), which meets every four years, established the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

ITU-T Recommendation R.117 was prepared by the ITU-T Study Group IX (1988-1993) and was approved by the WTSC (Helsinki, March 1-12, 1993).

NOTES

1 As a consequence of a reform process within the International Telecommunication Union (ITU), the CCITT ceased to exist as of 28 February 1993. In its place, the ITU Telecommunication Standardization Sector (ITU-T) was created as of 1 March 1993. Similarly, in this reform process, the CCIR and the IFRB have been replaced by the Radiocommunication Sector.

In order not to delay publication of this Recommendation, no change has been made in the text to references containing the acronyms "CCITT, CCIR or IFRB" or their associated entities such as Plenary Assembly, Secretariat, etc. Future editions of this Recommendation will contain the proper terminology related to the new ITU structure.

2 In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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Recommendation R.117

END-TO-END ERROR PERFORMANCE FOR TELEGRAPH, TELEX AND GENTEX CONNECTIONS INVOLVING REGENERATIVE EQUIPMENT

(Helsinki, 1993)

The CCITT,

considering

(a) that telegraphy essentially involves the transmission of digital information;

(b) that errors reflect either losses or invalid information;

(c) that signals can be regenerated at several points along the link (*inter alia* by multiplexers and/or switching exchanges), so that distortion is no longer the main criterion of performance;

(d) that Recommendation F.10 recommends as an objective, for communications in the public telegram, telex and leased circuit services operated by 5-unit start-stop equipment with a modulation speed of 50 bauds, a maximum error rate tolerance of 3 in 100 000 alphabetic telegraph signals transmitted;

(e) that transmission equipment is increasingly based on digital systems such as R.100-Series Recommendations multiplexers;

(f) that, since increasing use will be made of digital network, performance criteria should be consistent with those of Recommendation G.821,

recommends

that the definitions and approach adopted in Table 1 and its associated clauses be used.

1 General

In digital telegraph multiplexers, the time slots corresponding to the telegraph channels are distributed and this reinforces the distribution and equiprobability of errors between different channels.

1.1 Error distribution

Errors resulting from transmission anomalies may arise in the following two ways:

1.1.1 As isolated errors or in small packets (limited to less than about 10 errors), which may therefore be regarded as isolated within each channel. These are generally due to white or impulsive noise.

1.1.2 As a particular aggregate channel state, lasting up to a few tens of milliseconds. This is caused by micro-breaks or AIS (Alarm Indication Signal) effects from higher-order multiplexers.

1.2 Correspondence between bit and character errors

In the case of the first type of error degradation described in 1.1.1 above, bit errors may be considered as being sufficiently far apart for each bit error to be matched by at least one character error, since errors occurring at the start and stop instants may desynchronize the receiver.

2 Definitions

Throughout this Recommendation:

– A "**degraded interval**" means a transmission of lower quality than that stipulated in Recommendation F.10, but which remains limited to less than one error per message, as the reference duration being one day.

– An "**errored interval"** is one which may contain up to one error every two lines, the reference duration being one minute.

– A "**severely errored interval"** is one in which the number of errors exceeds the limit established above. Taking the minute as the reference duration, such intervals must be short if they are not to become unacceptable.

– An "**garbled interval**" is one in which the number of errors approaches or exceeds one in ten characters and the message is rendered incomprehensible.

NOTES

1 According to an analysis of telex traffic, it can be assumed that the average message comprises 30 lines of 35 characters, corresponding to a call of three and a-half minutes and roughly 1 200 characters transmitted.

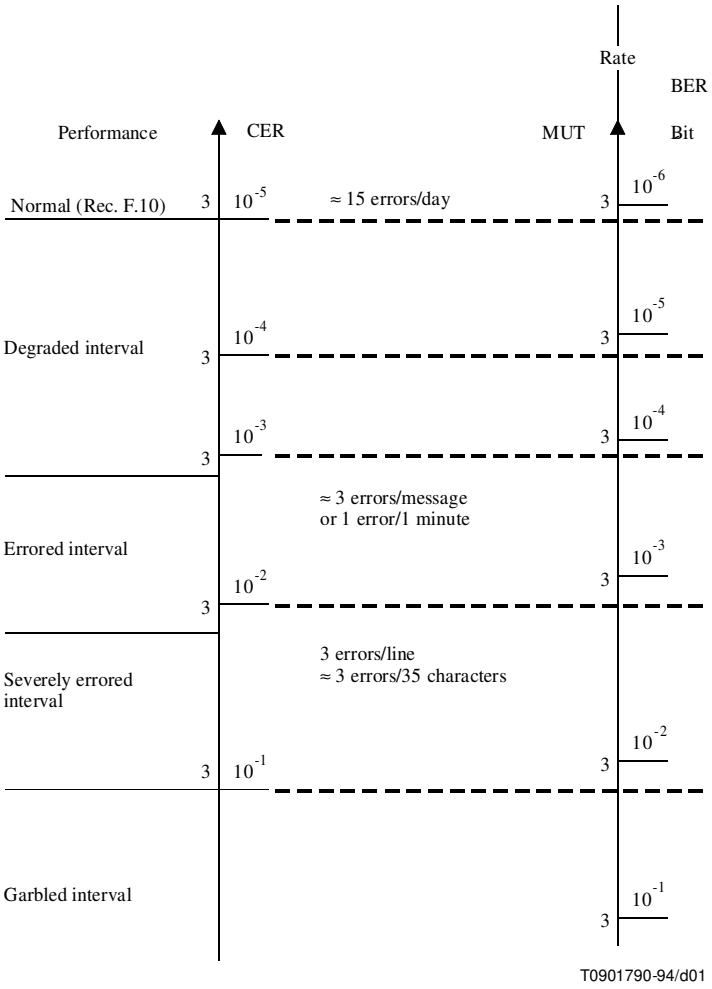
2 These definitions do not imply that the level in question is acceptable or not.

3 Correspondence between BER, CER and performance

The correspondence among bit error rate, character error rate and performance for a practical assessment of performance objectives including transmitter and receiver is given in Table 1.

TABLE 1/R.117

End-to-end error rate for telegraphy, telex and gentex



CER Character error rate
BER Bit error rate

4 Performance objective

The end to end error performance objective for telegraphy, telex and gentex networks involving regenerative TDM is defined in Table 2.

TABLE 2/R.117

End-to-end error performance objective for telegraphy, telex and gentex

Performance classification	Objective
Degraded days	Fewer than 10% of days to have more than 15 errors
Errored minutes	Fewer than 0.05% of one-minute intervals to have 3 errors or more