

Note 1 — Burst tones do not occur in the call channel after call set-up has taken place.

Note 2 — Burst rates are in the order of 10 to 25 Hz.

Note 3 — Charge metering pulses are of long duration, e.g. 150/450 ms and are evaluated as a continuous tone.

References

- [1] CCITT Recommendation *Recommendations relating to the accuracy of carrier frequencies*, Vol. III, Rec. G.225, § 1.
- [2] CCITT Recommendation *Pilots on groups, supergroups, etc.*, Vol. III, Rec. G.241, § 1.
- [3] *Ibid.*, § 2.
- [4] *Ibid.*, § 3.
- [5] CCITT Recommendation *Assumptions for the calculation of noise on hypothetical reference circuits for telephony*, Vol. III, Rec. G.223, Table 3/G.223, § 6.
- [6] CCITT Recommendation *Measurement of circuit noise in cable systems using a uniform-spectrum random noise loading*, Vol. III, Rec. G.228, §§ A.1, A.2.2.
- [7] CCITT Recommendation *Assumptions for the calculation of noise on hypothetical reference circuits for telephony*, Vol. III, Rec. G.223, § 2.1.
- [8] CCITT Recommendation *Measuring method and through-connection filters for noise produced by modulating equipment*, Vol. III, Rec. G.230.
- [9] CCIR Recommendation *Measurement of performance by means of a signal of a uniform spectrum for systems using frequency-division multiplex telephony in the fixed satellite service*, Vol. IV, Rec. 482, ITU, Geneva, 1978.
- [10] CCITT Recommendation *Assumptions for the calculation of noise on hypothetical reference circuits for telephony*, Vol. III, Rec. G.223, § 7.
- [11] CCITT Recommendation *Conventional telephone signal*, Vol. III, Rec. G.227.
- [12] CCITT Recommendation *12-channel terminal equipments*, Vol. III, Rec. G.232, §§ 5.1, 5.2.
- [13] CCITT Recommendation *Through-connection of groups, supergroups, etc.*, Vol. III, Rec. G.242, § 1.
- [14] CCITT Recommendation *12-channel terminal equipments*, Vol. III, Rec. G.232, §§ 12.1, 12.2 and Annex A.
- [15] CCITT Recommendation *Signal sender*, Vol. VI, Rec. Q.414, Figure 6/Q.414.
- [16] CCITT Recommendation *12-channel terminal equipments*, Vol. III, Rec. G.232.
- [17] *Ibid.*, § 12.3 and Annex B.
- [18] CCITT Recommendation *1020 Hz reference test frequency*, Vol. IV, Rec. O.6.

Recommendation G.793

CHARACTERISTICS OF 60-CHANNEL TRANSMULTIPLEXING EQUIPMENTS

(Geneva, 1980; further amended)

1 Introduction

The 60-channel transmultiplexer is a transmultiplexing equipment which satisfies Recommendations G.791 and G.792 and provides interconnection between two digital signals at 2048 kbit/s and an analogue supergroup (60-channel TMUX-S).

2 Digital interfaces

2.1 Coding law

The coding law used is A-law specified in Recommendation G.711.

2.2 Interfaces

The 2048-kbit/s interfaces satisfy Recommendation G.703, § 6.

2.3 *Frame structure*

The structure is specified in Recommendation G.704, § 3.3.1.

§ 4.1. The strategy and the criteria for loss and recovery of frame alignment satisfy Recommendation G.706,

2.4 *Multiframe structure*

The multiframe structure of time slot 16 satisfies Recommendation G.704, § 3.3.3.

§ 5.2. The strategy and the criteria for loss and recovery of multiframe alignment satisfy Recommendation G.732,

3 *Analogue interfaces*

3.1 *Ports*

The analogue interface consists of a 60-channel supergroup (band 312-552 kHz) which satisfies Recommendation G.233 [1].

The preferred signal levels at the supergroup distribution frame should be:

- for sending – 36 dBr
- for receiving – 30 dBr

The impedances are: 75 ohms (unbalanced).

3.2 *Pilots*

The 60-channel transmultiplexer should transmit the following pilots:

TMUX-S: A supergroup pilot with a frequency 411 920 Hz and a level of – 20 dBm0,
one pilot per group with a level of – 20 dBm0 and frequencies of:

Group 1: 335 920 Hz

Group 2: 383 920 Hz

Group 3: 431 920 Hz

Group 4: 479 920 Hz

Group 5: 527 920 Hz

The transfer of pilot alarms individually for each group in a supergroup and the consequence for the split channels of group 3 can be seen in Figure 1 of Supplement No. 32.

Other sets of pilots as recommended in Recommendation G.241 can be used. Special attention should be given to the compatibility of the set of pilots adopted with the out-of-band signalling system using a frequency at 3825 Hz.

The characteristics relating to the generation and transmission of these pilots are given in Recommendation G.241 [2].

3.3 *Pilot detection and regulation*

The transmultiplexer may or may not regulate levels on the basis of the levels of the group and supergroup pilots. If so, the transmultiplexer must meet the conditions of the Recommendation cited in [2]. Detection of the levels of the group pilots and or supergroup mentioned in § 3.2 should, however, be effected to ensure operation of the interruption control system (Recommendation Q.416 [3]), when R2 signalling is used.

4 *Correspondence between analogue and digital channels*

A fixed correspondence is established between the analogue and digital channels. The correspondence shown in Table 1/G.793 (which facilitates the transfer of alarms and results in a natural order of the channels on the analogue side) is recommended.

TABLE 1/G.793

PCM 1 channels 1 to 12	Group 1 312-360 kHz
PCM 1 channels 13 to 24	Group 2 360-408 kHz
PCM 1 channels 25 to 30	Group 3 408-432 kHz
PCM 2 channels 1 to 6	Group 3 432-456 kHz
PCM 2 channels 7 to 18	Group 4 456-504 kHz
PCM 2 channels 19 to 30	Group 5 504-552 kHz

Note — In national networks or by agreement between Administrations, other schemes of correspondence between analogue and digital channels may be used.

5 Plesiochronous operation of incoming PCM streams

Sixty-channel transmultiplexers should be able to accept two mutually plesiochronous incoming PCM streams within the limits laid down in Recommendation G.703 (bit rate 2048 kbit/s, $\pm 50 \cdot 10^{-6}$).

In the case of transmultiplexers with digital filtering, this means that the two input ports at 2048 kbit/s are fitted with frame aligners (jump or repetition of samples) and multiframe aligners for synchronizing the incoming PCM streams with the transmultiplexer clock. In order to avoid a major slip frequency, the two incoming PCM streams should be either synchronous with the transmultiplexer or plesiochronous with each other and with the transmultiplexer clock, so that Recommendation G.811 on the plesiochronous network is satisfied.

6 Synchronization of transmultiplexer

The transmultiplexer must produce virtual analogue carrier frequencies with the accuracy specified in Recommendation G.225 [4] ($\pm 10^{-7}$).

For this purpose, it is recommended:

- a) either that the transmultiplexer should have an internal clock of sufficient accuracy;
- b) or that the transmultiplexer should be synchronizable with an external signal which may be:
 - 1) a frequency (see Note 3) produced by a central FDM generator: 4, 12 or 124 kHz;
 - 2) or one of the incoming PCM streams which has sufficient accuracy (this may be the case, for example, when this PCM stream at 2048 kbit/s is produced by a TDM switching equipment). If both 2048-kbit/s streams are of sufficient accuracy, the use of PCM stream No. 1 is preferred. In most cases this avoids, at the digital filtering transmultiplexer input, the slipping phenomena which, when too frequent, cause high error rates on in-band data signals.