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G.733

GENERAL ASPECTS OF DIGITAL TRANSMISSION SYSTEMS

TERMINAL EQUIPMENTS

CHARACTERISTICS OF PRIMARY PCM MULTIPLEX EQUIPMENT OPERATING AT 1544 kbit/s

ITU-T Recommendation G.733

(Extract from the *Blue Book*)

NOTES

1   ITU-T Recommendation G.733 was published in Fascicle III.4 of the *Blue Book*. This file is an extract from the *Blue Book*. While the presentation and layout of the text might be slightly different from the *Blue Book* version, the contents of the file are identical to the *Blue Book* version and copyright conditions remain unchanged (see below).

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

Recommendation G.733

CHARACTERISTICS OF PRIMARY PCM MULTIPLEX EQUIPMENT
OPERATING AT 1544 kbit/s

(Geneva, 1972; further amended)

1   General characteristics

1.1   *Fundamental characteristics*

The encoding law used is the µ-law as specified in Recommendation G.711. The sampling rate, load capacity and the code are also specified in that Recommendation.

The number of quantized values is 255. Two character signals are reserved for zero value (11111111 and 01111111).

In some networks the all-0 character signal (00000000) is eliminated to avoid loss of timing information to the digital line, resulting in 254 quantized values.

1.2   *Bit rate*

The nominal bit rate is 1544 kbit/s. The tolerance on this rate is ± 50 parts per million (ppm).

1.3   *Timing signal*

It should be possible to derive the transmitting timing signal of a PCM multiplex equipment from an internal source, from the incoming digital signal and also from an external source.

2   Frame structure

Refer to §§ 3.1.1 and 3.1.2 of Recommendation G.704 for frame structure and use of derived channel time slots.

3   Loss and recovery of frame alignment

The strategy for the loss and recovery of frame alignment should be according to Recommendation G.706, § 2.1.

4   Fault conditions and consequent actions

4.1   *Fault conditions*

The PCM multiplex equipment should detect the following conditions:

4.1.1   Failure of power supply.

4.1.2   Loss of incoming signals at 1544 kbit/s.

4.1.3   Loss of frame alignment.

4.1.4   Alarm indication received from the remote PCM multiplex equipment.

4.2   *Consequent actions*

Further to the detection of a fault condition, appropriate actions should be taken as specified in Table 1/G.733. The consequent actions are as follows:

4.2.1   A service alarm indication should be generated to signify that the service provided by the PCM multiplex is no longer available. This indication should be forwarded to the switching and/or signalling equipment depending upon the arrangement provided.

4.2.2   The service alarm described in § 4.2.1 above should be used to automatically remove the associated circuits from service and to restore them to service when frame alignment has been recovered.

Note - The removal of the associated circuits described in § 4.2.2 above should be done in such a way that the circuits are not needlessly removed in the case of a brief isolated loss of frame alignment but are removed in the case of a permanent or intermittent loss of frame alignment.

It is also important to minimize the impact of signalling errors which may occur during periods of loss of frame alignment. These functions should be provided in the PCM multiplex equipment or in the switching/signalling equipment.

4.2.3   A prompt maintenance alarm indication should be generated to signify that performance is below acceptable standards and maintenance attention is required locally.

4.2.4   An alarm indication to the remote end should be generated by either forcing bit 2 in every channel time slot to the value 0 or by modifying the S-bit as described in § 3.1.3.2.2 of Recommendation G.704 for the 12 frame multiframe or by sending a frame alignment alarm sequence (1111111100000000) as described in § 3.1.1.3 (A)-(3) of Recommendation G.704 for the 24-frame multiframe.

4.2.5   Transmission should be suppressed at the analogue outputs.

4.2.6   *Rapid indication of loss of frame alignment*

An indication should be given to the Signalling System No. 6 equipment (digital version) when the PCM multiplex equipment (local end only) detects a loss of frame alignment. The average time to detect and give an indication of random bits in the frame alignment signal bit positions should not be greater than 3 ms. This indication will serve the same function as that provided by the data carrier failure alarm in the analogue version (see Recommendation Q.275 [1]).

5   Signalling

5.1   *Signalling arrangement*

Refer to § 3.1.3 of Recommendation G.704.

5.2   *Loss of multiframe alignment in case of channel associated signalling on 12 frame multiframe*

Loss of multiframe alignment is assumed to have taken place when loss of frame alignment occurs.

5.3   *Minimization of quantizing distortion in case of channel associated signalling*

In the signalling frame only seven bits are available for encoding of voice frequencies. In order to minimize the quantizing distortion, the decoder output values are shifted slightly. All even numbered decoder output values y_n, are changed to be equal to the next higher decision value, i.e. x_{n+1},. All odd numbered decoder output values y_{n+1} are changed to be equal to the same numbered decision value, i.e. x_{n+1}, as shown on Figure 1/G.733.

When suppression of the all 0 character signal is required, the value of the seventh bit is forced to be 1 when all the other bits of the character signal have the value 0.

Fault conditions and consequent actions for the PCM multiplex equipment

Equipment part	Fault conditions	Consequent actions			
		Service alarm indication generated	Prompt maintenance alarm indication	Alarm indication to the remote end generated	Transmission suppressed at the analogue outputs
Multiplexer and demultiplexer	Failure of power supply	Yes	Yes	Yes (if practicable)	Optional
Demultiplexer only	Loss of incoming signals at 1544 kbit/s	Yes	Yes	Yes	Yes
	Loss of frame alignment	Yes	Yes	Yes	Yes
	Alarme indication received from the remote end	Optional	Yes		Optional

Note 1 - A *Yes* in the table signifies that an action should be taken as a consequence of the relevant fault condition. An *open space* in the table signifies that the relevant action should *not* be taken as a consequence of the relevant fault condition, if this condition is the only one present. If more than one fault condition is simultaneously present the relevant action should be taken if, for at least one of the conditions, a *Yes* is defined in relation to this action.

Note 2 - Indications of additional fault conditions, such as codec failure and excessive bit errors, are left to the discretion of individual Administrations.
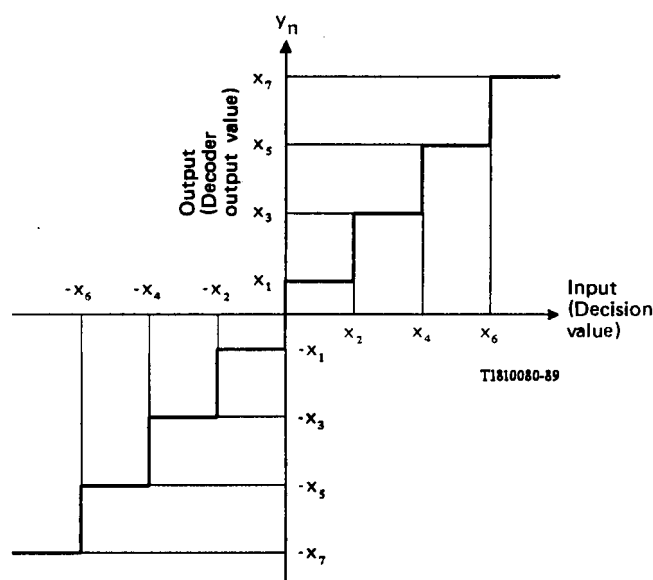

FIGURE 1/G.733

Seven-bit codec transfer characteristic

6   Interfaces

Analogue: Refer to Recommendations G.712, G.713 and G.714.

Digital: Refer to Recommendation G.703.

Reference

[1]   CCITT Recommendation *Data channel failure detection,* Vol. VI, Rec. Q.275.