



INTERNATIONAL TELECOMMUNICATION UNION

**ITU-T**

TELECOMMUNICATION  
STANDARDIZATION SECTOR  
OF ITU

**G.213**

**INTERNATIONAL ANALOGUE CARRIER SYSTEMS**

**GENERAL CHARACTERISTICS COMMON TO ALL  
ANALOGUE CARRIER-TRANSMISSION SYSTEMS**

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**INTERCONNECTION OF SYSTEMS IN A MAIN  
REPEATER STATION**

**ITU-T Recommendation G.213**

(Extract from the *Blue Book*)

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## NOTES

1 ITU-T Recommendation G.213 was published in Fascicle III.2 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.213

### INTERCONNECTION OF SYSTEMS IN A MAIN REPEATER STATION

(Geneva, 1964; further amended)

The CCITT finds it necessary to define separation points between various types of equipment, both in cable systems and in radio-relay systems. These separation points are defined below and the CCIR has adopted the same definitions when preparing its Recommendation 380 [1] (see also Recommendation G.423).

#### 1 Definition of telephony input and output points for the line link<sup>1)</sup>

These are points (marked  $T$  and  $T'$  in Figure 1/G.213) located in principle in a main repeater station <sup>1)</sup> where the standard conditions given below are found at the output and input of a line link (comprising a cable system or radio link). These standard conditions permit interconnection with other line links or with telephony equipment (including, where appropriate, direct through-connection filters as well as translating equipment).

At such a point,  $T$ , on the receiving side, the following conditions apply:

- 1) All the telephony groups (groups, supergroups, mastergroups, etc.) are still assembled in the positions in the frequency spectrum which they occupy on the line.
- 2) All the line-regulating, monitoring or frequency-comparison pilots on the H.F. line are, or can be, suppressed (the recommended suppression attenuations are given in Recommendations G.242 and G.243), according to whether the station is at the end of a regulated-line section or not<sup>2)</sup>.
- 3) The relative level of all the telephony channels is independent of frequency, i.e. any de-emphasis network is included in the line equipment.
- 4) No special suppression of additional measuring frequencies is foreseen (CCITT Recommendation G.423 for cable systems, CCIR Recommendation 381 [2] for radio-relay systems).

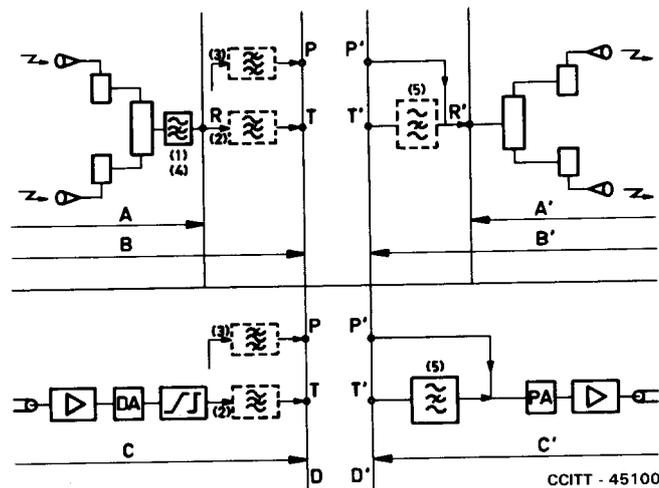
A similar point  $T'$  is defined for the sending side, where the following conditions are met:

- a) All the telephony groups (groups, supergroups, mastergroups, etc.) are still assembled in the positions in the frequency spectrum which they occupy on the line, except where use is made of direct through-connection filters provided as part of the line equipment.
- b) [Follows from the situation at  $T$  according to condition 2) above.]
- c) The relative level of all the telephony channels is independent of frequency, i.e. any pre-emphasis network is included in the line equipment.
- d) The additional measuring frequencies are transmitted.

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<sup>1)</sup> See definitions of Recommendation G.211.

<sup>2)</sup> The interconnecting point between a radio-relay system and a long cable system is always the terminal of a regulated-line section (CCIR Recommendation 381 [2] and hence all these pilots are suppressed at that point. For the distinction between a "short" and a "long" cable system, see Recommendation G.423, § 1.2).



- A, A' = radio-relay system  
 B, B' = line link by means of radio-relay system  
 C, C' = line link by means of cable system  
 D, D' = boundary of the high-frequency line equipment  
  
 R = radio-relay system output  
 R' = radio-relay system input  
 Point P' = provided for possible injection of regulating pilots  
  
 Between T and T' = telephony terminating equipment and/or direct through-connection equipment  
 DA = de-emphasis network  
 PA = pre-emphasis network

- (1) blocking of continuity pilots and, if necessary, of regulating pilots  
 (2) blocking, if necessary, of regulating pilots, and pilots that must not go beyond the line link.  
 (3) through-connection filter for regulating pilots, if necessary; through-connection filter for telephone groups can, if necessary, be inserted  
 (4) blocking of unspecified pilots or supervisory signals  
 (5) filter for blocking any unwanted frequency before injecting a pilot, ensuring with (2) the requisite protection against a pilot (or other) frequency coming from another regulated-line section (B or C, as the case may be)

FIGURE 1/G.213

*General remarks*

*Note 1* - Figure 1/G.213 gives an example only.

*Note 2* - If the station is within a regulated line section, provision must be made for the line-regulating pilots to be passed through, either by means of the telephony direct through-connection filter itself or by means of a special pilot through-connection filter. To cater for this case, and for the case where the station forms a boundary between two regulated line sections, a pilot input to, and output from, the line link, separate from the telephony input and output points T and T', should be provided; these are points P and P' in Figure 1/G.213.

*Note 3* - (Applicable to all systems, irrespective of the number of channels):

When there is direct through-connection of part of the groups, supergroups, etc. with the aid of the direct through-connection filters fitted into the line equipment for this purpose, it is up to each Administration to fix the relative levels at the filter access points (which are different from the access point T and T' mentioned above).

*Note 4* - The levels at points  $T$  and  $T'$  have been chosen so as to permit the insertion of the various direct through-connecting and translating equipments which may be necessary in the main station. The difference in level between points  $R$  and  $T$  and between points  $T'$  and  $R'$  allows for the cabling interconnecting these points, which may be at some distance from each other and, in favourable circumstances, for a blocking filter having only a small loss in the passband.

## **2 Definition of the points of international connection at baseband frequencies of a radio-relay system**

The points of international interconnection at baseband frequencies, called  $R'$  and  $R$ , form the input and output of a radio-relay system, conforming to CCITT Recommendation G.423 and CCIR Recommendation 380 [1].

At the output of the radio-relay system (point  $R$ ), the following conditions are found in the baseband:

- 1) All the telephony groups (groups, supergroups, mastergroups, etc.), and the pilots (line regulating, frequency comparison and monitoring pilots) included in the baseband are assembled in the position in which they are transmitted, as defined in the CCITT and CCIR Recommendations mentioned above.
- 2) All the continuity and switching pilots and other signals transmitted in a radio-relay system outside the telephony band, inherent to the radio equipment, are suppressed in accordance with CCIR Recommendation 381 [2].
- 3) Any radio-relay protection switching shall be performed as part of the radio-relay system. With diversity reception, the combined output of the receivers used corresponds to point  $R$ .
- 4) Any de-emphasis networks are part of the radio equipment, so that the relative levels of the telephone channels are independent of frequency, within the limits of the tolerances stated in Note 7 of CCIR Recommendation 380 [1] ( $\pm 2$  dB relative to the nominal value).

A similar point  $R'$  is defined for the baseband input of a radio-relay system, where similar conditions are to be met.

## **3 Relative levels recommended by the CCITT at the telephony output and input (Points $T$ and $T'$ in Figure 1/G.213)**

At the interconnection points  $T$  and  $T'$  for telephony defined in § 1 above, Table 1/G.213 shows the relative levels which are recommended for cable systems, each of which is defined by the maximum number of telephone channels that it can provide. (Similar levels are recommended by the CCITT and the CCIR for radio systems of corresponding capacity - see Recommendation G.423 and CCIR Recommendation 380 [1].)

The cable systems to which this Recommendation applies are modern systems with transistor equipment and to new versions of other systems previously standardized by the CCITT.

The recommended levels at  $T$  and  $T'$  make it possible to insert all the translating or direct through connecting equipment which may be necessary; this does not define the relative levels in translating and direct through-connecting equipment, which depend on other considerations.

TABLE 1/G.213

**Recommended relative levels for interconnection of various cable systems**

Maximum number of telephone channels	Impedance (ohms)	Relative power level per channel at a main station		Remarks
		Receiving (Point <i>T</i> ) (dBr)	Sending (Point <i>T'</i> ) (dBr)	
24, 36, 48	150 (bal.)	-23	-36	
60 120	150 (bal.) or 75 (unbal.)	-23	-36	
300	75 (unbal.)	-23	-36	
600, 960, 1200 1260	75 (unbal.)	-23 or -33	-36 or -33	See note
2700	75 (unbal.)	-33	-33	See also Recommendations G.33 and J.77 [3]
3600	75 (unbal.)	-33	-33	See also Recommendations G.334 and J.77 [4]
10 800	75 (unbal.)	-33	-33	

*Note* - For 600, 960, 1200 and 1260 channel systems Administrations have the choice between the alternative pairs of level shown for points *T* and *T'* which apply in the following circumstances:

- 1) - 23 dBr at point *T*,  
- 36 dBr at point *T'*,  
where conformity with well-established equipment using similar levels is necessary;
- 2) - 33 dBr at each of the points *T* and *T'*,  
in other cases, for example, to new stations wholly equipped with transistor equipments.

**References**

- [1] CCIR Recommendation *Interconnection at baseband frequencies of radio-relay systems for telephony using frequency-division multiplex*, Vol. IX, Rec. 380, Dubrovnik, 1986.
- [2] CCIR Recommendation *Conditions relating to line regulating and other pilots and to limits for the residues of signals outside the baseband in the interconnection of radio-relay and line systems for telephony*, Vol. IX, Rec. 381, Dubrovnik, 1986.
- [3] CCITT Recommendation *Use of a 12-MHz system for the simultaneous transmission of telephony and television*, Vol. III, Rec. J.73.
- [4] CCITT Recommendation *Characteristics of the television signals transmitted over 18-MHz and 60-MHz systems*, Vol. III, Rec. J.77.