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THE INTERNATIONAL
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CONSULTATIVE COMMITTEE

G.100

(11/1988)

SERIES G: TRANSMISSION SYSTEMS AND MEDIA,
DIGITAL SYSTEMS AND NETWORKS

General characteristics of international telephone
connections and circuits – General

DEFINITIONS USED IN FASCICLE III.1

Reedition of CCITT Recommendation G.100 published in
Blue Book Fascicle III.1 (1988)

NOTES

1 CCITT Recommendation G.100 was published in Fascicle III.1 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.

DEFINITIONS USED IN FASCICLE III.1

(Melbourne, 1988)

Introduction

The definitions given below have been found to be useful in the study of telephone connections and telephone circuits.

The detailed definitions appearing in Recommendation G.102 are referred to, but not reproduced.

The definitions of specialized terms which are not mentioned here can be found in:

- Recommendation G.106, for availability and reliability;
- Recommendation G.117 as concerns unbalance about earth;
- Annex A to Recommendation G.111 as concerns speech transmission performance;
- Paragraph 1.6 of this fascicle for echo suppressors, echo cancellers, compandors, etc.

1 General terms

1.1 hypothetical reference connection (HRX)

F: communication fictive de référence

S: conexión fictiva de referencia (CFR)

A hypothetical connection of defined structure, length and performance in a telecommunication network for analogue or digital (or mixed) signal transmission, to be used as a model in which studies relating to overall performance may be made, thereby allowing comparisons with standards and objectives.

1.2 input/output (Recommendations G.111, G.121, etc.)

F: entrée/sortie

S: entrada/salida

Terms used to indicate the direction of transmission at an interface of an equipment item. These terms avoid the ambiguity encountered in the use of “transmit/receive” or “send/receive”.

1.3 relative level (at a point on a circuit)

F: niveau relatif (en un point d'un circuit)

S: nivel relativo (en un punto de un circuito)

The expression $10 \log_{10} (P/P_0)$ dBr where P represents the power of a test signal of 1000 Hz at the point concerned and P_0 the power of that signal at the *transmission reference point*.

Note – This quantity is independent of P_0 , it is a composite gain (level difference). For further details, see Recommendation G.101, § 5.3.2.

1.4 transmission reference point

F: point de référence pour la transmission

S: punto de referencia para la transmisión

A hypothetical point at or near to the sending end of each channel (preceding the virtual switching point specified by the CCITT), used as the “zero relative level point” in the computation of nominal relative levels.

1.5 **return loss**

F: affaiblissement d'adaptation

S: pérdida de retorno

Quantity characterizing the degree of match between two impedances, Z_1 and Z_2 . It is given by the expression:

$$L_R = 20 \log_{10} \left| \frac{Z_1 + Z_2}{Z_1 - Z_2} \right| \text{ dB.}$$

2 **Transmission performance objectives**

2.1 **performance objective**

F: objectif pour la qualité de fonctionnement

S: objetivo de calidad de funcionamiento

(Defined in Recommendation G.102.)

2.2 **design objective**

F: objectif pour les projects

S: objetivo de diseño

(Defined in Recommendation G.102.)

2.3 **commissioning objective**

F: objectif pour la mise en service

S: objetivo de puesta en servicio inicial

(Defined in Recommendation G.102.)

2.4 **limits for maintenance purposes (maintenance limits)**

F: limites de maintenance

S: límites de mantenimiento

(Defined in Recommendation G.102.)

3 **Transmission impairments**

3.1 **group-delay distortion**

F: distorsion de temps de propagation de groupe

S: distorsión por retardo de grupo

The difference between group delay at a given frequency and minimum group delay, in the frequency band of interest.

3.2 **quantizing distortion unit (qdu)**

F: unité de distorsion de quantification (udq)

S: unidad de distorsión de cuantificación (udc)

(For this concept see Recommendation G.113.)

4 Propagation time, echo and stability

4.1 balance return loss

F: affaiblissement d'équilibrage

S: atenuación de equilibrado

At a 4-wire terminating set ("hydrid"), that portion of the *semi-loop loss* which is attributable to the degree of match between the impedance, Z_2 , connected to the 2-wire line terminals, and the balance impedance, Z_B . It is given approximately by the expression:

$$L_{BR} = 20 \log_{10} \left| \frac{Z_2 + Z_B}{Z_2 - Z_B} \right| \text{ dB}$$

Note – Under most circumstances the expression given is sufficiently accurate. However, for some worst case evaluations, the exact expression must be used. The exact expression is:

$$L_{BR} = 20 \log_{10} \left| \frac{Z_0 + Z_B}{2Z_0} - \frac{Z_2 + Z_0}{Z_2 - Z_0} \right| \text{ dB}$$

where Z_0 is the 2-wire input impedance. (If $Z_0 = Z_B$ the two expressions become identical.)

4.2 echo

F: écho

S: eco

Unwanted signal delayed to such a degree that, for instance in telephony, it is perceived as distinct from the wanted signal (i.e. the signal directly transmitted).

Note 1 – Distinction is made between *talker echo* and *listener echo*.

Note 2 – An echo is usually considerably attenuated with respect to the wanted signal.

4.3 echo balance return loss

F: affaiblissement d'équilibrage pour l'écho

S: atenuación de equilibrado para el eco

Balance return loss averaged with 1/f power weighting over the telephone band, in accordance with Recommendation G.122, § 4.

4.4 echo control device

F: dispositif de réduction de l'écho

S: dispositivo de control de eco

A voice-operated device placed in the 4-wire portion of the circuit and used for reducing the effect of echo.

Note – This reduction is in practice carried out either by subtracting an estimated echo from the circuit echo (i.e. cancelling it) or by introducing loss in the transmission path to suppress the echo (echo suppression).

4.5 echo loss, L_{ECHO}

F: affaiblissement d'écho A_{ECHO}

S: atenuación de eco, A_{ECO}

Semi-loop loss averaged with 1/f power weighting over the telephone band, in accordance with Recommendation G.122, § 4.

Note 1 – In cases where a point *t* (2-wire point) exists, the echo loss is approximately equal to the sum of the transmission losses *a-t* and *t-b* and the *echo balance return loss*. (Points *a* and *b* are shown in Recommendation G.122.)

Note 2 – Distinction may be made between the echo loss of a given piece of equipment and that of a national system (cf. *Note 2* to definition in § 4.11).

4.6 **talker echo loudness rating (of an international connection)**

F: l'équivalent à la sonie pour l'écho pour la personne qui parle (d'une communication internationale)

S: índice de sonoridad del eco para el hablante (en una conexión internacional)

The sum of the sending loudness rating, receiving loudness rating of the talker's national system, twice the loss of the international chain and the *echo loss* (*a-b*) of the listener's national system, as defined at the virtual switching point. (Points *a* and *b* are shown in Recommendation G.122.)

4.7 **listener echo (receive end echo)**

F: l'écho à la réception

S: eco para el oyente (eco en la recepción)

Echo produced by double reflected signals and disturbing the listener, receiving voice-band data equipment, etc.

Note 1 – The term “received end echo” is a term preferred by some Administrations.

Note 2 – With small delay against the wanted signal (less than about 3 ms) listener echo may cause *hollowness* in telephony. In transmission of voice-band data signals, listener echo may cause bit errors and, in any case, reduces the margin against other disturbances.

4.8 **listener echo loss (receive echo loss)**

F: affaiblissement de l'écho à la réception

S: atenuación para el oyente (atenuación de eco en la recepción)

Degree of attenuation of the double reflected signal with respect to the wanted signal. In terms of the absolute losses of both signals, the listener echo loss is (see Figure 1/G.100): $LE = L_2 - L_1$.

Note – For practical purposes the listener echo loss is equal to the *open-loop loss* (valid if the latter exceeds 8 dB). The listener echo loss characterizes the degree of disturbance by *hollowness*, as well as the disturbing effect on voice-band data modem receivers.

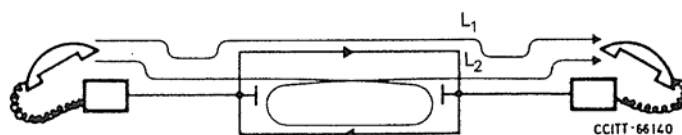


FIGURE 1/G.100

4.9 **hollowness**

F: son caverneux

S: cavernosidad

Distortion in telephony caused by double reflected signals and subjectively perceived as a “hollow sound”, i.e. as if the talker would speak into some hollow vessel.

Note – Hollowness is to be distinguished from *listener echo*.

4.10 **open-loop loss (OLL)**

F: affaiblissement en boucle ouverte

S: atenuación en bucle abierto (ABA)

In a loop formed by a 4-wire circuit (or a cascade connection of two or more 4-wire circuits) and terminated by 2-wire ends (i.e. having “4-wire terminating sets”, or hybrids, at both ends), the loss measured by breaking the loop at

some point, injecting a signal and measuring the loss incurred in traversing the open loop. All impedance conditions should be preserved while making the measurement. See Figure 2/G.100.

Note 1 – In practice the OLL is equal to the listener echo loss.

Note 2 – The OLL is also equal to the sum of the two *semi-loop losses* associated with a loop.

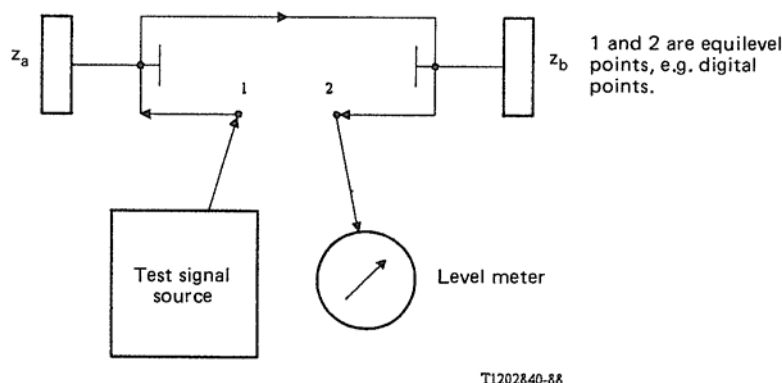


FIGURE 2/G.100

4.11 path a-t-b (transmission loss of . . .); semi-loop loss

F: *affaiblissement du trajet a-t-b; affaiblissement en demi-boucle*

S: *atenuación del trayecto a-t-b; atenuación en semibucle*

The transmission loss between the points “a” and “b” of the 4-wire termination (as defined at the virtual switching points) independent of whether there exists or not a physical point “t”.

4.11.1 Possible alternative to the definition in § 4.11

semi-loop loss

F: *affaiblissement en demi-boucle*

S: *atenuación en semibucle*

In an arrangement comprising a 4-wire circuit (or a cascade connection of several 4-wire circuits) with unwanted coupling between the go and return direction at the ends of the circuit – usually via a 4-wire terminating set, or via acoustical coupling – the loss measured between the input and output. See Figure 3/G.100.

Note 1 – The semi-loop loss is an important quantity in determining *echo balance return loss*, *echo loss*, *listener echo loss* (see also *open-loop loss*).

Note 2 – Distinction may be made between the semi-loop loss of a given piece of equipment and the semi-loop loss of a national system. The latter is measured at equi-level points in an ISC which serves as a national gateway exchange.

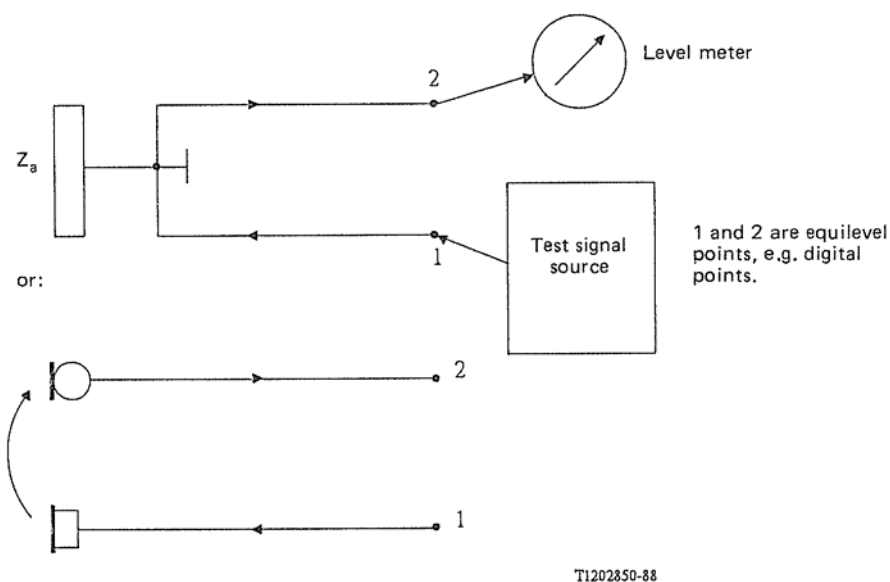


FIGURE 3/G.100

4.12 **stability loss**

F: *affaiblissement pour la stabilité*

S: *atenuación para la estabilidad*

The lowest value of the semi-loop loss in the frequency band to be considered.

4.13 **talker echo**

F: *écho pour la personne qui parle*

S: *eco para el hablante*

Echo produced by reflection near the listener's end of a connection, and affecting the talker.

4.14 **test balance return loss (TBRL)**

F: *affaiblissement d'équilibrage en position de mesure*

S: *atenuación de equilibrado en posición de medida (AEPM)*

The *balance return loss* measured against a test impedance (i.e. in this case the impedance Z_2 – cf. definition of *balance return loss* – is a specified test impedance).

Note – The TBRL characterizes the precision of the balance network.

4.15 **mean one-way propagation time**

F: *temps de propagation moyen dans un sens*

S: *tiempo medio de propagación en un sentido*

In a connection, the mean of the propagation times in the two directions of transmission.

Note – The use of this concept is explained in Recommendation G.114.

5 Equipment

5.1 R or T pads (in telephone extension)

F: compléments de ligne *R* ou *T* (dans un système national)

S: atenuadores *R* o *T* (en la prolongación telefónica)

The R or T pad represents the transmission loss between the 0 dBr points at the digital/analogue codec and the 2-wire side of the 2-wire/4-wire terminating unit or the same in the reversed direction, respectively.

Note – The transmission loss introduced by the combination of the R and T pads in the subject of CCITT Recommendations.

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