



INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

G.232

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

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

12 - CHANNEL TERMINAL EQUIPMENTS

ITU-T Recommendation G.232

(Extract from the *Blue Book*)

NOTES

1 ITU-T Recommendation G.232 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.

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Recommendation G.232

12-CHANNEL TERMINAL EQUIPMENTS

(amended at Geneva, 1964; further amended)

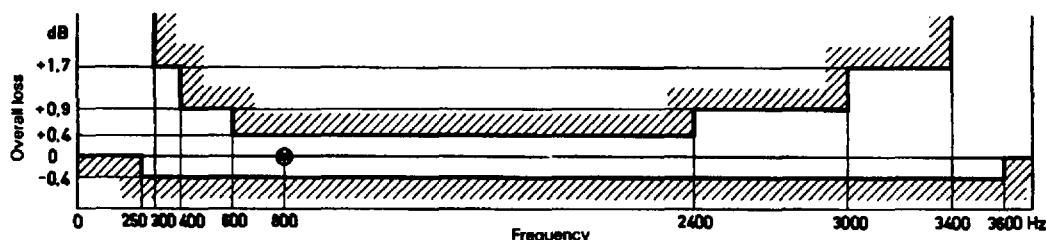
The CCITT recommends that,

except in the particular cases cited in Recommendations G.234 and G.235, channel terminal equipment should provide 12 channels in a basic group, with 4-kHz spaced carrier frequencies, in conformity with the present Recommendation.

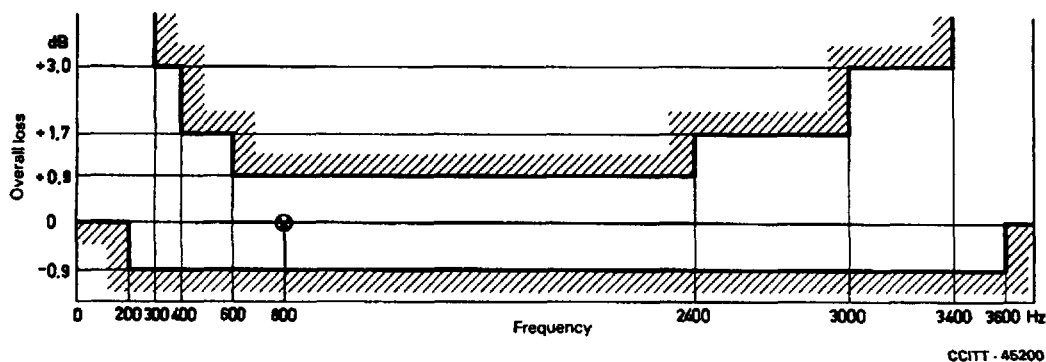
1 Attenuation distortion

The following three conditions should be satisfied simultaneously:

- 1) The variation with frequency of the mean of the overall losses of the 12 pairs of channel transmitting and receiving equipments of one terminal equipment should not exceed the limits shown in Graph A of Figure 1/G.232.
- 2) For each pair of channel transmitting and receiving equipments of one terminal equipment, the variation of overall loss with frequency should not exceed the limits shown in Graph B of Figure 1/G.232.
- 3) For the transmitting equipment of any channel, the attenuation/frequency distortion should not exceed the limits in Graph C of Figure 2/G.232 where:
 - the frequencies shown as abscissae are audio frequencies, before modulation,
 - the ordinates give the limits of relative power level measured at carrier frequency.



Graph A - Limits for the average variation of overall loss of 12 pairs of equipment of one 12-channel terminal equipment



Graph B - Limits for any pair of channel transmitting and receiving equipments

FIGURE 1/G.232

Permissible limits for the variation with frequency of the overall loss of transmitting and receiving equipments of one 12-channel terminal equipment

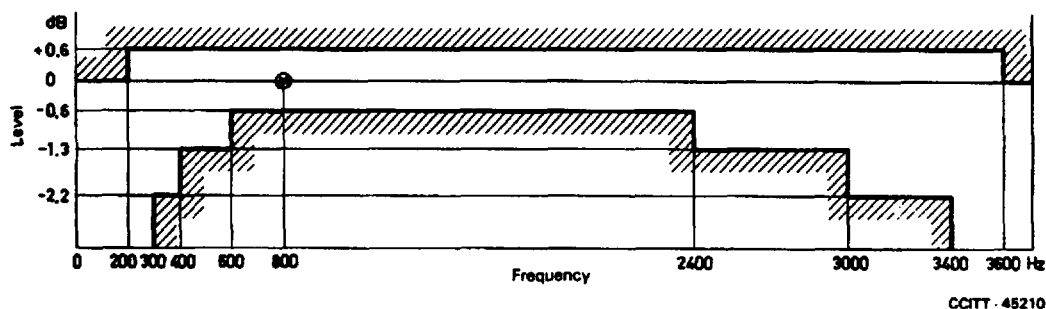


FIGURE 2/G.232

Graph C - Allowable limits for the variation, as a function of frequency, of the relative power level at the output of the sending equipment of any channel or of the receiving equipment of any channel of a 12-channel terminal

For the receiving equipment of any channel, the attenuation/frequency distortion should not exceed the limits of this same Graph C where, this time:

- the frequencies shown as abscissae are audio frequencies, after demodulation,
- the ordinates give the limits of relative power level measured at each frequency, at the audio output terminals.

This last recommendation (under 3) above) is based on the assumption that the transmitting and receiving equipments will be treated on an equal footing, and that the overall tolerances will be equally shared between the transmitting and receiving sides.

Note - Some Administrations use, for circuits interconnecting international centres of the higher orders, i.e. CT1s and CT2s (international transit centres), channel-translating equipment that gives an improved loss/frequency response by comparison with equipment meeting the above recommendation. (See [1].) Such equipment does not incorporate outband signalling.

2 Limits for the response outside the band 300 to 3400 Hz

The CCITT recommends that in order to secure the values referred to in Table 1/G.122 of Recommendation G.122 [2], these terminal equipments should show a loss (and not a gain) in relation to the value for 800 Hz at all frequencies below a value f and all frequencies above a value F .

For Graph B of Figure 1/G.232 the recommended values are the following:

$$f = 200 \text{ Hz and } F = 3600 \text{ Hz}$$

The values recommended for Graphs A and C are:

Graph A: $f = 250 \text{ Hz and } F = 3600 \text{ Hz};$

Graph C: $f = 200 \text{ Hz and } F = 3600 \text{ Hz}.$

3 Group-delay distortion

The group-delay distortion produced by all types of 4-kHz channel terminal equipment is normally found to be quite acceptable so that no special equalization is needed. To ensure that this remains true for the future, it is recommended that the limits in Table 1/G.232 for the group-delay distortion (relative to the minimum delay) should not be exceeded by a pair of channel transmitting and receiving equipments of one 12-channel terminal equipment.

Group-delay distortion values which are encountered in practice and which are unlikely to be exceeded are 5 ms at 300 Hz and 2.5 ms at 3300 Hz. (This information may be of interest to network designers.)

TABLE 1/G.232

Frequency band	Group-delay distortion
400- 500 Hz	5 ms
500- 600 Hz	3 ms
600- 1000 Hz	1.5 ms
1000- 2600 Hz	0.5 ms
2600-3000 Hz	2.5 ms

4 Stability of virtual carrier frequencies

See Recommendation G.225.

5 Carrier leak

5.1 Carrier leaks within the basic group band 60-108 kHz

The carrier leaks are measured at the group distribution frame (or an equivalent point).

The absolute power level of these leaks, referred to a point of zero relative level, should be lower than the following values:

- carrier leak measured on one channel: -26 dBm0;
- sum of carrier leak powers of the various channels, measured within a group: -20 dBm0.

However, if the group is transmitted via open-wire lines over the whole or part of its length, and if it is desired to guard against the risk of conversations over the open-wire line being picked up by an ordinary wireless receiver, the carrier leak must be further reduced.

The place and method to be used for the supplementary suppression of carrier leak, when a group on a cable is transferred to an open-wire line, should be agreed to by the Administrations concerned.