INTERNATIONAL TELECOMMUNICATION UNION

ITU-T O.71

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

SPECIFICATIONS FOR MEASURING EQUIPMENT

IMPULSIVE NOISE MEASURING EQUIPMENT FOR TELEPHONE-TYPE CIRCUITS

ITU-T Recommendation O.71

(Extract from the *Blue Book*)

NOTES

1 ITU-T Recommendation O.71 was published in Fascicle IV.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 O.71[1)]

IMPULSIVE NOISE MEASURING EQUIPMENT FOR TELEPHONE-TYPE CIRCUITS

(Geneva, 1972; amended Geneva, 1976 and Melbourne, 1988)

The requirements for the characteristics of an instrument capable of assessing the impulsive noise performance of telephone-type circuits are described below and must be adhered to in order to ensure compatibility of results obtained by equipments standardized by the CCITT and produced by different manufacturers.

1 Principle of operation

The instrument will record the number of times that the instantaneous voltage of the input signal exceeds a predetermined threshold during the period of measurement. The maximum rate at which the instrument can record impulses exceeding the threshold is 8 ± 2 counts per second. The threshold level is calibrated in terms of the r.m.s. value of a sinusoidal input signal (dBm) whose peak value is just sufficient to cause the instrument to operate the counting mechanism.

2 Definition

2.1 **dead time**

For the purpose of this specification the dead time is defined as the time after which the counter is ready to register another pulse following the start of the preceding pulse.

3 Specification clauses

3.1 *Input impedance* (frequency range 300 Hz to 4 kHz)

– Balanced, earth free

– Input longitudinal interference loss ..... ≥ 46 dB

3.1.1 *Terminating impedance* (other impedances optional)..... 600 ohms

– Return loss ..... ≥ 30 dB

3.1.2 *High impedance* ..... approx. 20 kohms

– Bridging loss across 300 ohms ..... ≤ 0.15 dB

3.2 *Input balance*

With a pulse which is 60-dB higher than the threshold setting applied between the midpoint of the source impedance and the earth terminal of the instrument the counter shall not operate.

3.3 *Operate level range*

The minimum operate level range to which the instrument responds shall be from 0 to –50 dBm (i.e. 0 to –50 dB with respect to 1.1 V, which is the peak voltage of a sine wave having a power of 1 mW in 600 ohms). The threshold shall be adjustable in 3 dB steps (± 0.5 dB) and the thresholds for positive and negative polarities of input pulse shall not differ by more than 0.5 dB.

3.4 *Dead time*

Whatever values of dead time are included in a particular instrument, a value of 125 ± 25 ms shall be provided in all cases.

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1) The text of this Recommendation has been established under the responsibility of Study Groups IV and XVII. Further elaboration of this Recommendation shall be the joint responsibility of these Study Groups.

3.5 *Attenuation/frequency characteristics*

3.5.1 *Flat bandwidth*

Response within the range ± 1 dB from 275 to 3250 Hz:

– 3 dB point ± 1 dB at 200 Hz;

– below 200 Hz, the attenuation shall rise at about 18 dB per octave; at 100 Hz, minimum attenuation 17 dB;

– above 3250 Hz, the rise in attenuation shall be compatible with the sensitivity requirement indicated in § 3.7 below.

3.5.2 *Optional bandwidths*

By means of additional filters the equipment may provide other optional bandwidths.

In any case it should be designed so that external filters can be added.

One of the filters shall have the following characteristics:

Flat within ± 1 dB from 750 Hz to 2300 Hz:

– 3 dB points at 600 Hz and 3000 Hz;

– below 600 Hz and above 3000 Hz the response shall fall off at about 18 dB per octave.

For measurements of impulsive noise in the 75 bit/s return channel, a filter with the following characteristics has been used:

– 3 dB points at 300 Hz and 500 Hz;

– below 300 Hz and above 500 Hz the response shall fall off at about 18 dB per octave.

For measurements of impulsive noise with a 1020 Hz test signal (see Recommendation O.6) applied to the circuit under test, a notch filter at 1020 Hz shall be provided as an option. This filter shall have the characteristics given in Table 1/O.71.

TABLE 1/O.71

Characteristics of the notch filter

Frequency (Hz)	Attenuation (dB)
< 400 > 1700	< 0.5
< 700 > 1330	< 1.0
< 860 > 1180	< 3.0
1000 to 1025	> 50.0

Note – It should be noted that measurement results may differ if measurements are performed with and without test tone.

3.6 *Calibration*

With the instrument switched to the *flat* condition, a continuous sinusoidal 1000 Hz signal applied to the input at a voltage equivalent to 0 dBm in 600 ohms, and with the operate level control set to 0 dBm the instrument shall be adjusted by means of a calibration control to register 8 ± 2 counts per second. When the input signal is reduced in level to –1 dBm the instrument shall not count.

When the input level is reduced to any value within the operate level range, the operate level setting at which the instrument just fails to count shall not differ from the actual input level by more than 1 dB.

3.7 *Sensitivity*

With the instrument calibrated in accordance with § 3.6 in the *flat* condition and the operate level set to 0 dBm, rectangular pulses of either polarity of 50 milliseconds duration having a peak amplitude of 1.21 V with an interval between pulses in excess of the dead time shall be applied to the instrument and cause the counter to operate at the correct rate. When the width of these pulses is gradually reduced, the counter shall count at the correct rate when the pulses have a duration of 50 microseconds but shall not count when the pulses are 20 microseconds.

3.8 *Display of measurement results*

3.8.1 *Impulsive noise counter*

Each event to be counted shall be recorded as one unit on a counter. The counter shall be able to register at least 999 events.

3.8.2 *Relative duration of impulsive noise events* (optional)

To allow an easier estimation of data transmission errors which may result from impulsive noise, the instrument shall provide means to calculate and indicate the relative duration of the impulsive noise events. This quantity is the ratio of the time that the input signal exceeds a designated threshold to the total measurement time. Results shall be indicated in a range of 1×10^{-1} to 1×10^{-8}.

3.8.3 *Seconds containing impulsive noise events* (optional)

As a further option, the instrument shall provide means to calculate and indicate the percentage of seconds containing one or more occurrences of impulsive noise. Results shall be indicated in a range 0 to 100% with one digit after the decimal point.

3.9 *Timer*

A built-in timer capable of switching off the instrument after a predetermined time shall be provided. This timer shall be adjustable from 5 to 60 minutes in steps of 1 minute.

Significant testing intervals will be 5, 15, 30 and 60 minutes.

4 Operating environment

The electrical performance requirements shall be met when operating at the climatic conditions as specified in Recommendation O.3, § 2.1.