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MAINTENANCE : INTERNATIONAL TELEPHONE CIRCUITS

SETTING UP AND LINING UP AN INTERNATIONAL CIRCUIT FOR PUBLIC TELEPHONY

ITU-T Recommendation M.580

(Extract from the *Blue Book*)

NOTES

- 1 ITU-T Recommendation M.580 was published in Fascicle IV.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.

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SETTING UP AND LINING UP AN INTERNATIONAL CIRCUIT FOR PUBLIC TELEPHONY

1 Introduction

This Recommendation applies to all circuits operated on a manual, semi-automatic or fully automatic basis, whether provided solely by analogue transmission and switching systems or by a mixture of analogue and digital systems.

As an alternative to the procedures given in §§ 7 to 14 which require testing personnel to be present at both ends of the circuit, § 15 gives a procedure involving the use of the CCITT Automatic Transmission Measuring and Signalling Testing Equipment (ATME) No. 2 (Recommendation O.22 [1]) (with Type a responding equipment) which may be used subject to the agreement of the Administrations involved.

2 Organization

The guiding principles for the general maintenance organization of international circuits are given in Recommendation M.70.

2.1 An international circuit may consist of various national and international circuit sections; these circuit sections consist of two telephony channels, one for each direction of transmission, or a mixed analogue/digital terminal section or a digital terminal section. The types of circuits and circuit sections for public telephony are described in Recommendation M.562.

2.2 At the terminal stations of the circuit, access points are provided in accordance with Recommendation M.110 (see also Recommendation M.565). At intermediate stations an access point is provided (see also Recommendation M.110 for transit circuits), its position in the circuit being so chosen that as much as possible of the audio-frequency apparatus in the station is included in any measurement made at that station in the direction of transmission concerned.

2.3 In establishing an international circuit, the circuit, line and circuit section access points define the limits of the circuit, line and circuit section, and these are used as the basic elements involved in setting-up, lining-up, and fault location.

Note – The line access point at the terminal station will also be used as the circuit section access point at that station.

3 Limits for the overall loss of a circuit and circuit sections

3.1 Limits for overall loss at 1020 Hz

The objective is to make the value of overall loss at 1020 Hz as near as possible to its nominal value. When adjustment is provided in steps, these should enable the loss to be adjusted to within ± 0.3 dB of the nominal value.

3.2 Limits for the overall loss/frequency characteristic

National telephone networks are planned and provided by Administrations to give satisfactory telephone transmission on national calls in the most economical way and will, in consequence, have but little margin against additional transmission impairment in calls on the longest connections.

International telephone calls require the two corresponding parts of the national networks in the terminal countries to be interconnected by a switched chain of international circuits. The present CCITT plan for worldwide telephone connections specifies a maximum of six international circuits in a connection. In some circumstances the nominal reference equivalent of the connection could be 3 dB greater than in the past. This additional loss, in combination with increased line noise, makes it very desirable to minimize the transmission impairments introduced by the international circuits.

In order to have an objective for a circuit for maintenance purposes, the following principles should be applied.

3.2.1 The overall loss/frequency distortion of a circuit depends on whether it is set up entirely on 4-kHz spaced channels, or entirely on 3-kHz spaced channels or on combinations of such channels, even including small sections of audio cable. Three sets of limits are given in Tables 1/M.580, 2/M.580 and 3/M.580.

The principles on which the tables are based are as follows:

- the maximum loss in the relevant frequency range should not be greater than 9.0 dB relative to the loss at 1020 Hz in order to avoid disturbing the noise power distribution in the circuit to any extent;
- the use of equalizers at intermediate stations should be avoided as far as possible;
- where a mixed type of composition is used the arrangement of 3-kHz plus 4-kHz spaced channels in a circuit would cater for most of the cases of composition likely to be encountered in practice (for example, one 3-kHz channel in series with two 4-kHz channels);
- Administrations should be allowed some flexibility to use a measure of pre-equalization if necessary in order to avoid low-level signals entering a long section.

TABLE 1/M.580

Limits for the overall loss/frequency characteristic between circuit access points and the access points of circuit sections for circuits and circuit sections using 4 kHz spacing

Frequency Hz	Overall loss relative to that at 1020 Hz	
	Between circuit access points	At the access point at intermediate stations
	dB	dB
Below 300	not less than 0.0 otherwise unspecified	not less than –3.0 otherwise unspecified
300 to 400	+3.5 to –1.0	+9.0 to –3.0
400 to 600	+2.0 to –1.0	+6.0 to –3.0
600 to 2400	+1.0 to –1.0	+6.0 to –3.0
2400 to 3000	+2.0 to –1.0	+6.0 to –3.0
3000 to 3400	+3.5 to –1.0	+9.0 to –3.0
Above 3400	not less than 0.0 otherwise unspecified	not less than –3.0 otherwise unspecified

TABLE 2/M.580

Limits for the overall loss/frequency characteristic between circuit access points and the access points of circuit sections for circuits and circuit sections using 3 kHz spacing

Frequency Hz	Overall loss relative to that at 1020 Hz	
	Between circuit access points	At the access point at intermediate stations
	dB	dB
Below 200	not less than 0.0 otherwise unspecified	not less than –1.5 otherwise unspecified
200 to 250	+10.5 to –0.5	not less than –1.5 otherwise unspecified
250 to 300	+6.5 to –0.5	+9.0 to –1.5
300 to 2700	+1.0 to –0.5	+7.0 to –1.5
2700 to 2900	+2.5 to –0.5	+7.0 to –1.5
2900 to 3050	+6.5 to –0.5	+9.0 to –1.5
Above 3050	not less than 0.0 otherwise unspecified	not less than –1.5 otherwise unspecified

TABLE 3/M.580

Limits for the overall loss/frequency characteristic between circuit access points and the access points of circuit sections for circuits and circuit sections using 3 kHz and 4 kHz spacing

Frequency Hz	Overall loss relative to that at 1020 Hz	
	Between circuit access points	At the access point at intermediate stations
	dB	dB
Below 300	not less than 0.0 otherwise unspecified	not less than –3.0 otherwise unspecified
300 to 400	+3.5 to –1.0	+9.0 to –3.0
400 to 600	+2.0 to –1.0	+6.0 to –3.0
600 to 2400	+1.0 to –1.0	+6.0 to –3.0
2400 to 2700	+2.0 to –1.0	+6.0 to –3.0
2700 to 2900	+2.5 to –1.0	+9.0 to –3.0
2900 to 3050	+6.5 to –1.0	+9.0 to –3.0
Above 3050	not less than 0.0 otherwise unspecified	not less than –3.0 otherwise unspecified

3.2.2 Table 1/M.580 is based on the limits recommended for a pair of 4-kHz channel equipments (Recommendation G.232 [2]), a small addition having been made to the recommended limits to allow for the additional distortions likely to be introduced by the group link and by the circuit and exchange apparatus. The equalization limits are three times the circuit limits.

Table 2/M.580 is similarly based on the limits recommended for a pair of 3-kHz channel equipments (Recommendation G.235 [3]) with an allowance for the group link and for circuit and exchange apparatus.

For international circuits composed of 4-kHz and 3-kHz sections, the limits given in Table 3/M.580 are a combination of the limits given in Tables 1/M.580 and 2/M.580, taking into account the factors given in 3.2.1 a) to 3.2.1 c) above.

The limits to be imposed on the loss/frequency characteristic at intermediate stations are also shown in Tables 1/M.580, 2/M.580 and 3/M.580.

Where a circuit or circuit section contains mixed analogue/digital channels, the table to be used should be based on the channel spacing of the analogue carrier associated with the mixed circuit or circuit section.

A circuit section or that portion of a circuit made up of wholly digital channels should be treated as an analogue circuit section or circuit having 4 kHz spaced channels.

Circuit sections made up of digital or mixed analogue/digital terminals should follow the limits given for measurements between circuit access points in Table 1/M.580.

4 Setting up and lining up analogue and mixed circuit sections

4.1 The circuit sub-control stations responsible for the various national and international circuit sections should arrange to set up these sections.

The circuit sections are lined up and the overall loss/frequency characteristic of each is recorded from terminated-level measurements.

This is done by sending at a level of -10 dBm0 at the reference test frequency at the access point at the intermediate sub-control station or at the line access point at the control station or terminal sub-control station and adjusting the received level at the access point at the adjacent intermediate sub-control station as close as possible to its nominal level in the direction of transmission concerned.

4.2 The loss/frequency characteristic should then be measured at frequencies chosen from the following list, according to the characteristics of the circuit section to be set up:

200, 250, 300, 400, 600, 800, 1000, 1400, 2000, 2400, 2700, 2900, 3000, 3050 and 3400 Hz.

Technical services may agree to make measurements at other frequencies if it is considered useful to do so. The test signals should be applied at a level of -10 dBm0.

For circuit sections effectively transmitting up to only 3000 Hz (for example, circuits using 3 kHz spaced channels) the measurement at 3400 Hz is, of course, not applicable.

The overall loss at 1020 Hz¹⁾ should be as near as possible to the nominal value.

The overall loss at other frequencies should lie within the limits given in Tables 1/M.580, 2/M.580 and 3/M.580 (see § 3.2.1).

For each circuit section the results for each direction of transmission are forwarded to the control and terminal sub-control stations.

At terminal stations, during these measurements, the signalling connections to the automatic equipment should be disconnected if the signalling units are incorporated in the carrier terminal equipment. When the line-signalling relay sets are included in the lines and apparatus being measured, any voice-frequency signalling receiver must be made inoperative.

¹⁾ For further information about the choice of test signal frequency, refer to Recommendation O.6 [4].