



INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

M.650

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

**MAINTENANCE:
INTERNATIONAL TELEPHONE CIRCUITS**

**ROUTINE LINE MEASUREMENTS TO BE
MADE ON THE LINE REPEATERS OF
AUDIO-FREQUENCY SECTIONS OR CIRCUITS**

ITU-T Recommendation M.650

(Extract from the *Blue Book*)

NOTES

1 ITU-T Recommendation M.650 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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Recommendation M.650

ROUTINE LINE MEASUREMENTS TO BE MADE ON THE LINE REPEATERS OF AUDIO-FREQUENCY SECTIONS OR CIRCUITS

Besides the routine tests made from end-to-end on the complete circuit, routine maintenance measurements of the equipment of audio-frequency circuits should be made throughout the line for purposes of repeater maintenance.

These routine measurements comprise:

- measurements of repeater gain (where there is little or no feedback);
- measurements of *relative level* at the output of the repeaters (when measuring overall loss on the complete circuit, in the frontier stations and wherever else such measurements are considered necessary);
- measurements of circuit *stability* and test for determining singing points (with 2-wire repeaters).

The measurement of stability is obtained from the definition of stability σ of the circuit considered:

$$\sigma = q - (q_1 + q_2)/2$$

q being the mean of the nominal overall loss of the circuit in each of the two directions of transmission under normal working conditions and q_1 and q_2 being the singing points measured for the two directions of transmission respectively.

In order to measure these singing points in the case of a 2-wire circuit, singing is started by increasing, step-by-step and simultaneously for the two directions of transmission, the gains of one or of several repeaters (preferably those in the middle of the circuits because they are usually in the most critical position from the point of view of singing). Having done this, without touching the adjustment which has been obtained, the transmission in the reverse direction is suppressed and the overall loss of the circuit at 1020 Hz is measured for the forward direction of transmission; this is the singing point q_1 above. Next the transmission in the first direction is suppressed and the overall loss of the circuit at 1020 Hz is measured for the reverse direction of transmission: this is the singing point q_2 above.

When the circuit is composed of 2-wire and 4-wire sections, or carrier sections, the method of measurement given for 2-wire circuits is valid.

This stability should be determined with the ends of the circuit open-circuited; when there are high-impedance relays permanently connected across the line during a call, these relays may remain during stability tests.