



INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

R.80

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

TELEGRAPHY

TELEGRAPH TRANSMISSION

**CAUSES OF DISTURBANCES TO SIGNALS
IN VFT CHANNELS AND THEIR EFFECT ON
TELEGRAPH DISTORTION**

ITU-T Recommendation R.80

(Extract from the *Blue Book*)

NOTES

1 ITU-T Recommendation R.80 was published in Fascicle VII.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.

Recommendation R.80

CAUSES OF DISTURBANCES TO SIGNALS IN VFT CHANNELS AND THEIR EFFECT ON TELEGRAPH DISTORTION

*(former CCIT Recommendation B.41, 1951;
amended at Arnhem, 1953 and Geneva, 1956 and 1964)*

The CCITT,

considering

- (a) that the great majority of international telegraph circuits are routed on voice-frequency telegraph (VFT) channels;
- (b) that VFT channels are liable to disturbance from the following causes:
 - i) variations in the voltage and frequency of the source of telegraph carrier frequency due to variations in the power supply, and variations in the signalling load in the case where the carrier source supplies several channels;
 - ii) abrupt or gradual changes in the transmission equivalent of the telephone-type circuit;
 - iii) intelligible crosstalk from other telephone-type circuits, particularly near-end crosstalk;
 - iv) unintelligible crosstalk resulting from the cross-modulation of telephone-type circuits when operated by carrier currents;
 - v) noise induced from electrical power and traction systems;
 - vi) telegraph crosstalk from other telegraph channels, e.g. production of odd harmonics of the telegraph carrier frequencies in certain channels falling within the passband of other channels, intermodulation in filter coils, etc.;
 - vii) variations of power supplies affecting the amplifier and detector of the VFT channel and sometimes the receiving relay;
 - viii) the effects of mechanical vibration upon valves (microphonics) and relays;
 - ix) bad contacts (e.g. test point and valve bases) and badly soldered joints;
 - x) deterioration of component parts, e.g. ageing valves;
 - xi) failure of power supplies, e.g. on changeover from main to reserve supply;
 - xii) accidental disconnections made during the course of maintenance and construction work;
 - xiii) on overhead lines, effects of atmospheric electricity, frost, etc.;
- (c) that the disturbances account for practically all the distortion in telegraph channels, except for characteristic distortion (which is chiefly a function of filter and amplifier-detector design), some bias (due to misadjustment of controls and relays, etc.) and, in the case of the lower frequency channels, the distortion that arises from the low ratio of carrier frequency to signalling frequency;
- (d) that many of the causes of disturbance are individually negligible and the more important of the others have been found, in the experience of several Administrations, to be capable of elimination by careful maintenance both on the VFT equipment and at all points on the bearer circuit;
- (e) that the CCITT is also studying the causes of disturbance in telephone circuits and the precautions to be taken to minimize their occurrence;
- (f) that the results of the CCITT study will be of great importance to telegraphy;
- (g) that, as a result of the considerable investigations already made by certain Administrations on the causes of disturbances in telephone and telegraph circuits, the relative order of importance of these causes appears to be approximately as follows:

- i) *in the case of telephone circuits:*
 - high resistance and unsoldered connections;
 - noisy and microphonic valves, and poor contact between valve pins and valve holders;
 - working parties engaged on cable operations;
 - noisy and high-resistance U-links;
 - changes in line level not compensated at the detector input;
 - crosstalk;
 - errors in setting up, for example incorrect equalization, line transformers incorrectly connected, faulty components;
- ii) *in the case of VFT equipment*
 - high resistance and unsoldered connections;
 - valves deteriorated beyond permissible limits;
 - bad contacts;
 - faults on power changeover equipment;
 - frequency error of the carrier supply;

unanimously declares the view

(1) that it is desirable for Administrations to undertake investigations of the causes, and frequency of occurrence of disturbances of VFT channels routed on the various types of bearer circuit likely to be employed for international telegraph circuits;

(2) that in doing these tests and in order that the results may be of the greatest use to telegraphy and telephony, the incidence of disturbances should be measured according to their duration as follows: less than 1 ms, 1 to 5 ms, 5 to 10 ms, 10 to 20 ms, 20 to 100 ms, 100 to 300 ms and those more than 300 ms;

(3) that the results should be classified according to the type of bearer circuit, viz. audio or carrier, cable or overhead line.

(4) Measurements of disturbances should be made at the direct current output of the VFT channel that is under observation.