



INTERNATIONAL TELECOMMUNICATION UNION

**ITU-T**

TELECOMMUNICATION  
STANDARDIZATION SECTOR  
OF ITU

**Q.1**

**GENERAL RECOMMENDATIONS ON TELEPHONE  
SWITCHING AND SIGNALLING**

**SIGNALLING IN THE INTERNATIONAL MANUAL  
SERVICE**

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**SIGNAL RECEIVERS FOR MANUAL  
WORKING**

**ITU-T Recommendation Q.1**

(Extract from the *Blue Book*)

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## NOTES

1 ITU-T Recommendation Q.1 was published in Fascicle VI.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 Q.1

### SIGNAL RECEIVERS FOR MANUAL WORKING

In 1934 (CCIF *White Book*, Volume III, Xth Plenary Assembly, Budapest, 1934), a signalling current having a frequency of  $500 \text{ Hz} \pm 2\%$ , interrupted at a frequency of  $20 \text{ Hz} \pm 2\%$  was provisionally chosen for manually-operated international circuits.

500 Hz was chosen as the frequency to be transmitted, under normal conditions, by carrier terminal equipment and line repeaters. To avoid false operation due to speech currents, it was also considered desirable to interrupt the 500 Hz signalling current at low frequency. The use of a uniform interruption frequency of 20 Hz enables a high degree of selectivity to be obtained in signal receivers.

The effective power produced by the signalling current, when not interrupted, is fixed at 1 milliwatt at a zero relative level or an absolute power level of zero (with a tolerance of  $\pm 1$  decibel) which corresponds to an average power for the interrupted signalling current of 0.5 milliwatt, with a tolerance of  $\pm 1$  decibel.

The power levels specified above were chosen in 1954 (XVIIth CCIF Plenary Assembly, Geneva, 1954) on the basis of the limit imposed for the maximum energy which can be transmitted by signals during the busy hour; it must not exceed 2.5 microwatt-hours or 9000 microwatt-seconds at a zero relative level point. A reasonable value for the number of calls, or attempted calls, on a circuit during the busy hour was assumed and 2 seconds was assumed to be the sending duration of the signalling current to line by operation of the operator's ringing key.

On outgoing circuits from an international exchange, where the 500/20 Hz signals are liable to be sent over wideband carrier systems (coaxial carrier systems) it is desirable, to avoid overloading the repeaters, that the duration of the 500/20 Hz signals sent to line should not exceed 2 seconds and they should be limited to this value by automatic means.

Since, in general, the *Instructions for the International Telephone Service* (Article 32) [1] require the signalling current sent over an international circuit to have a duration of at least 2 seconds to avoid the risk of signals being undetected at the incoming end, the means for limiting the sending duration of the signalling current will generally consist of an arrangement which controls the sending duration independently of the time the ringing key is operated and which automatically fixes that duration at 2 seconds.

*Note* - In the case of short 2-wire circuits, it may be economical to use, by agreement between the Administrations concerned, a low-frequency signalling current (either between 16 and 25 Hz or 50 Hz).

#### ANNEX A

(to Recommendation Q.1)

#### **Basic technical clauses of a model specification for the provision of 500/20-Hz voice-frequency signalling sets (signal transmitters and receivers) intended for manually-operated circuits**

##### A.1 *Sending of signals*

*Power* - The signal transmitted shall supply a sinusoidal current at a frequency of  $500 \text{ Hz} \pm 2\%$  interrupted at a frequency of  $20 \text{ Hz} \pm 2\%$ .

The effective mean power of the 500/20-Hz current is fixed at 0.5 milliwatt or an absolute power level of -3 dBm (with a tolerance of  $\pm 1$  dB) at a zero relative level point.

Every precaution should be taken to avoid unbalance effects in the circuit during the transmission of a 500/20-Hz signalling current.

### *Reception of signals*

*Sensitivity* - The signal receiver shall operate correctly when the 500/20-Hz current at the input to the signal receiver is within the following limits:

$$-8.5 + n \leq N \leq + 2.5 + n \text{ dB}$$

where  $n$  is the relative power level at the point of the circuit at which the signal receiver is connected.

The limits take account of the tolerances indicated above for the transmitted power level and include a margin of  $\pm 4.5$  decibels on the nominal absolute power level of the 500/20 Hz current received at the input to the signal receiver. This margin allows for variations in transmission conditions on international circuits.

*Tuning* - Tuning should be such that the signal receiver operates only at a frequency of 500 Hz guaranteed to within  $\pm 2\%$  and at an interrupting frequency of 20 Hz guaranteed to within  $\pm 2\%$ .

*Delay* - The delay, i.e. the time which elapses between the application of the signalling voltage and the operation of the signal receiver, must be long enough for the signal receiver to remain insensitive to all speech currents which normally flow in the circuit to which it is connected. The duration of this delay must, however, be less than 1200 milliseconds. (In other words, 1200 milliseconds is the maximum signal recognition time within which a signal has to be recognized.)

*Selectivity* (resulting from the tuning of the resonant circuit and the delay mentioned above) - The receipt of a speech (or noise) current circulating in the circuit must not give rise to a current liable to cause the operation of the signalling equipment and, in consequence, to cause a wrong indication to be given on the international positions even though the speech (or noise) voltage reaches the maximum value likely to be met in practice. In particular, the signal receiver must not operate when a speech power not exceeding 6 milliwatts is applied at a zero relative level point.

*Insertion loss* - The insertion loss introduced by the signal receiver in the circuit with which the signalling set is associated must be less than 0.3 dB for any frequency effectively transmitted by the circuit.

### **Reference**

- [1] CCITT *Instructions for the international telephone service (1 October 1985)*, ITU, Geneva, 1985.