



INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

Q.451

**SPECIFICATIONS OF SIGNALLING SYSTEM R2
INTERREGISTER SIGNALLING
MULTIFREQUENCY SIGNALLING EQUIPMENT**

DEFINITIONS

ITU-T Recommendation Q.451

(Extract from the *Blue Book*)

NOTES

1 ITU-T Recommendation Q.451 was published in Fascicle VI.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 Q.451

4.4.2 DEFINITIONS

4.4.2.1 *Multifrequency signalling equipment*

During the exchange of multifrequency combinations the link or multi-link section is terminated at both ends by equipment allowing multifrequency combinations to be sent and received under mutual, compelled control, as indicated in Recommendation Q.440. Generally speaking, the equipment involved in the signal transfer at each end of the multi-link section has the following functions:

- reception of multifrequency combinations;
- protection against disturbances (e.g. 2-out-of- n -check, 0-out-of- n -check, see Recommendation Q.458);
- transfer of signals to and from the registers or equivalent equipment;
- sending of multifrequency combinations.

This equipment as a whole can be considered as a single functional unit, henceforth called the multifrequency signalling equipment.

The functions of the multifrequency signalling equipment may be distributed among a number of sub-units, according to the design principles adopted in each particular case; these, within certain limits, are open to choice.

For the purpose of the present specification, the multifrequency signalling equipment is divided into a sending part and a receiving part.

a) *Four-wire multifrequency signalling equipment*

Multifrequency signalling equipment connected to the speech path by two pairs of wires is called 4-wire multifrequency signalling equipment (see Figure 16/Q.451). In such cases, the speech path itself is generally 4-wire too.

In Figure 16/Q.451, point B is the output of the sending part and point C the input to the receiving part of the 4-wire multifrequency signalling equipment. The latter includes the devices for protection against disturbances and the equipment for transferring signals to the register or equivalent equipment.

b) *Two-wire multifrequency signalling equipment*

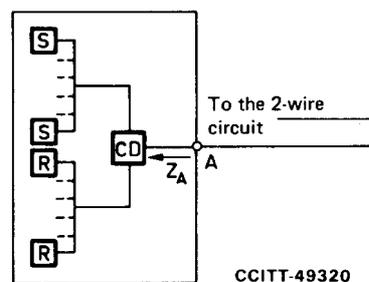
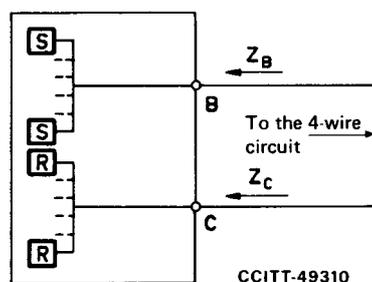
Because different frequencies are used for interregister signalling in the two directions of transmission, a single pair of wires connecting the speech path to the multifrequency signalling equipment can be used for simultaneous sending and reception of multifrequency combinations.

Multifrequency signalling equipment connected to the speech path by a single pair of wires is called 2-wire multifrequency signalling equipment (see Figure 17/Q.451).

In Figure 17/Q.451, point A is the output of the sending part and, at the same time, the input to the receiving part. The latter includes the devices for protection against disturbances and for transferring signals to the register or equivalent equipment.

4.4.2.2 *Operate and release times of the receiving part of the signalling equipment*

The speed and reliability of the compelled interregister signal transfer is dependent on the operation and release times T_0 , T_R , T'_0 and T'_R defined below. These times include the minimum recognition times referred to in § 4.4.5.3 below.



R = receiving part
 S = sending part
 CD = coupling device (e.g. hybrid, set of directional filters, etc.)

FIGURE 16/Q.451 **Four-wire multifrequency signalling equipment** FIGURE 17/Q.451 **Two-wire multifrequency signalling equipment**

a) *Operation time*

If the two frequencies making up a multifrequency combination are applied simultaneously to the input of the receiving part of the multifrequency signalling equipment, the time interval between the application of both frequencies and recognition of the multifrequency combination is called operation time T_0 .

If one of the two frequencies making up a multifrequency combination is applied to the input of the receiving part of the multifrequency signalling equipment somewhat after the other frequency, the time interval between the application of the second frequency and recognition of the multifrequency combination is called operation time T'_0 .

b) *Release time*

If the two frequencies making up a multifrequency combination are simultaneously cut off from the input of the receiving part of the multifrequency signalling equipment, the time interval between the cut-off and recognition of the end of the multifrequency combination is called release time T_R .

If one of the two frequencies making up a multifrequency combination is cut off from the input of the receiving part of the multifrequency signalling equipment somewhat after the other frequency, the time interval between the cut-off of the second frequency and recognition of the end of the multifrequency combination is called release time T'_R .

4.4.2.3 *Internal operation time*

a) If the equipment at a switching centre has to analyse one or more of the signals received and if it has to carry out routing and switching operations before being able to determine which backward signal should be sent, it can delay completion of the compelled signalling cycle. Such delay depends on the function the centre has and on the design of the switching equipment used in it. The delay cannot therefore be specified.

The time required by an incoming R2 register to determine which backward signal to send in reply to a forward signal is denoted as $T_{int 1}$. The duration of the cycle is increased by the whole of this time, which must therefore be kept to a minimum. Its value will be zero if the signal to be sent is already determined.

b) An outgoing R2 register sends a forward signal after interpreting the backward signal it has received. The time required to determine the appropriate signal is denoted as $T_{int 2}$.

c) At the end of a forward signal the incoming R2 register may have to perform certain functions in order to be ready to receive the next signal. The time required for these functions is denoted as $T_{int 3}$.