INTERNATIONAL TELECOMMUNICATION UNION

ITU-T V.1

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

DATA COMMUNICATION OVER THE TELEPHONE NETWORK

EQUIVALENCE BETWEEN BINARY NOTATION SYMBOLS AND THE SIGNIFICANT CONDITIONS OF A TWO - CONDITION CODE

ITU-T Recommendation V.1

(Extract from the *Blue Book*)

NOTES

1 ITU-T Recommendation V.1 was published in Fascicle VIII.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 V.1

EQUIVALENCE BETWEEN BINARY NOTATION SYMBOLS AND THE SIGNIFICANT CONDITIONS OF A TWO-CONDITION CODE

(New Delhi, 1960; amended at Geneva, 1964 and I972)

Binary numbering expresses numbers by means of two digits normally represented by the symbols 0 and 1. Transmission channels are especially well suited to the transmission of signals by a modulation having two significant conditions (two-condition modulation). These two significant conditions are sometimes called "space" and "mark" or "start" and "stop", or they may be called condition A or condition Z [1].

It is very useful to make the two conditions of a two-condition modulation correspond to the binary digits 0 and 1. Such equivalence will facilitate the transmission of numbers resulting from binary calculation, the conversion of codes for binary numbers and of codes for decimal numbers, maintenance operations and relations between transmission personnel and the personnel in charge of data-processing machines.

At first sight, it does not seem to matter whether the symbol 0 corresponds in transmission to condition A or condition Z, the symbol 1 then corresponding to condition Z or condition A or vice versa.

In telegraphy, however, when a telegraphic communication is set up and the sending of signals is stopped (called the idle condition of the line), the signal sent over the line consists of condition Z throughout the suspension of transmission.

It is logical (and for certain VF telegraph systems also essential) to use the same rule in data transmission. During the "idle periods" of transmission, condition Z should be applied to the circuit input.

Data transmission on a circuit is often controlled by perforated tape. On perforated tapes used for telegraphy, condition Z is represented by perforation. When binary numbers are represented by means of perforations, it is customary to represent the symbol 1 by a perforation. It is therefore logical to make this symbol 1 correspond to condition Z.

For these reasons, the CCITT

unanimously declares the following view:

1 In transmitting data by two-condition code, in which the digits are formed using binary notation, the symbol 1 of the binary notation will be equivalent to condition Z of the modulation, and the symbol 0 of the binary notation will be equivalent to condition A of the modulation.

2 During periods when there is no signal sent to the input of the circuit, the circuit input condition is condition Z.

3 If perforation is used, one perforation corresponds to one unit interval under condition Z.

4 In accordance with Recommendation R.31, the sending of symbol 1 (condition Z) corresponds to the tone being sent on a channel using amplitude modulation.

5 In accordance with Recommendation R.35, when frequency modulation is used, the sending of symbol 0 corresponds to the higher frequency, while the sending of symbol 1 corresponds to the lower frequency.

6 a) For phase modulation with reference phase:

the symbol 1 corresponds to a phase equal to the reference phase;

the symbol 0 corresponds to a phase opposed to the reference phase.

b) For differential two-phase modulation where the alternative phase changes are 0 degree or 180 degrees:

the symbol 1 corresponds to a phase inversion from the previous element;

the symbol 0 corresponds to a no-phase inversion from the previous element.

7 A summary of equivalence is shown in Table 1/V.1.

TABLE 1/V.1

Summary of equivalence (see Note 1)

	Digit 0 "Start" signal in start-stop code Line available condition in telex switching "Space" element of start-stop code Condition A	Digit 1 "Stop" signal in start-stop code Line idle condition in telex switching (Note 2) "Mark" element of start-stop code Condition Z
Amplitude modulation	Tone-off	Tone-on
Frequency modulation	High frequency	Low frequency
Phase modulation with reference phase	Opposite phase to the reference phase	Reference phase
Differential two-phase modulation where the alternative phase changes are 0 degree or 180 degrees	No phase inversion	Inversion of the phase
Perforations	No perforation	Perforation

Note 1 - The standardization described in this Recommendation is general, whether over telegraph-type circuits or over circuits of the telephone type, making use of electromechanical or electronic devices.

Note 2 - It primarily applies to anisochronous use.

Reference

[1] CCITT Definition: *Position A; position Z,* Vol. X, (Terms and Definitions).