Recommendation X.4

GENERAL STRUCTURE OF SIGNALS OF INTERNATIONAL ALPHABET No. 5 CODE FOR CHARACTER ORIENTED DATA TRANSMISSION OVER PUBLIC DATA NETWORKS[1)]

(Geneva, 1976; amended at Geneva, 1980 and Melbourne, 1988)

The CCITT,

I *considering, firstly,*

the agreement between the International Organization for Standardization (ISO) and the CCITT on the main characteristics of a seven–unit alphabet (International Alphabet No. 5) to be used for data transmission and for telecommunications requirements that cannot be met by the existing five–unit International Telegraph Alphabet No. 2;

the interest, both to the users and to the telecommunication services, of an agreement concerning the chronological order of transmission of bits in serial working;

recommends

that the agreed rank number of the unit in the alphabetical table of combinations should correspond to the chronological order of transmission in serial working on telecommunication circuits;

that, when this rank in the combination represents the order of the bit in binary numbering, the bits should be transmitted in serial working with the low order bit first;

that the numerical meaning corresponding to each information unit considered in isolation is that of the digit:

0 for a unit corresponding to condition A (travail = space), and

1 for a unit corresponding to condition Z (repos = mark),

in accordance with the definitions of these conditions for a two–condition transmission system;

II *considering, moreover,*

that it is often desirable, in character oriented data and messages transmission, to add an extra “parity” unit to allow for the detection of errors in received signals;

the possibility offered by this addition for the detection of faults in terminal equipment;

the need to reserve the possibility of making this addition during the transmission itself, after the seven information units proper have been sent;

recommends

that signals of International Alphabet No. 5 code for data and messages transmission should in general include an additional “parity” unit;

that the rank of this unit and, hence, the chronological order of the transmission in serial working should be the eighth of the combination thus completed;

III *considering*

that, in start–stop systems working with electromechanical equipment, the margin of such equipment and the reliability of the connection are considerably increased by the use of a stop element corresponding to the duration of two–unit intervals of the modulation;

that for start–stop systems using International Alphabet No. 5 at modulation rates of 200 and 300 bauds, Recommendations X.1 and S.31 specify that transmit devices should use a stop element lasting at least two units;

that the previously expressed preference for a two–unit stop element arises from a transmission point of view where anisochronous public data networks are concerned;

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1) See Recommendation V.4 for data transmission over public telephone networks.

recommends

that in start–stop systems using combinations of International Alphabet No. 5 normally followed by a parity unit, the first information unit of the transmitted combination should be preceded by a start element corresponding to condition A (space);

that the duration of this start element should be a one–unit interval for the modulation rate under consideration, at transmitter output;

that the combination of seven information units, normally completed by its parity unit, should be followed by a stop element corresponding to condition Z (mark);

that for public anisochronous data networks, data terminal equipment using International Alphabet No. 5 should comply with Recommendations X.1 and S.31 and use a stop element lasting at least two units;

that the start–stop receivers should be capable of correctly receiving start–stop signals from a source which appears to have a nominal cycle of 10 units (i.e., with a nominal one–unit stop element). However, for certain electromechanical equipment the receivers may only be capable of correctly receiving signals when the stop element is not reduced below one unit (even in the presence of distortion);

IV considering, finally,

that the direction of the parity unit can only be that of the even parity on the perforated tapes, particularly owing to the possibility of deletion (combination 7/15 of the alphabet) which causes a hole to appear in all tracks;

that, on the other hand, the odd parity is considered essential in the equipment which depends on transitions in the signals to maintain synchronism [in cases where combination 1/6 (SYNC) of the alphabet does not permit an economical solution];

recommends

that the parity unit of the signal should correspond to the even parity in links or connections operated on the principle of the start–stop system;

that this parity should be odd on links or connections using end–to–end character oriented synchronous operation;

that arrangements should be made when necessary to reverse the direction of the parity unit at the input and output of the synchronous equipment connected either to apparatus working on the start–stop principle or receiving characters on perforated tape;

that the detection of a character out–of–parity may be represented by:

a) a reverse question mark graphic character or a representation of the capital letter SB (see ISO 2047) provided that this letter occupies a single character position on a screen or printer, and which could have been entered by a single key stroke. It is recognized that it may be difficult to achieve a legible “SB” character from some matrix printers or displays where the characters are printed; or

b) a recording of the 1/10 (SUB) character in the tape or other storage medium, where provided.

Where a SUB character occurs in a received transmisson, or is presented to a DTE via a storage medium, e.g. paper tape, then the reaction should be as in a) and b) above.