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PART II

Series S Recommendations

ALPHABETICAL TELEGRAPH

TERMINAL EQUIPMENT

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SECTION 1

START-STOP TERMINALS

Recommendation S.1

INTERNATIONAL TELEGRAPH ALPHABET No. 2

(Malaga-Torremolinos, 1984; amended Melbourne, 1988)

1 Introduction

1.1 This Recommendation defines the repertoire of the graphic and control characters used in International Telegraph Alphabet No. 2 (ITA2) and the coded representation of these characters for communication purposes. It also contains provisions concerning the use of certain specific combinations.

1.2 The coded character set of ITA2 is based on a 5-unit-structure.

1.3 ITA2 is also defined in Recommendation F.1 for the international public telegram service, and it is specified in Recommendation F.60 that it should also be used for the telex service. It may also be used for other applications, such as specialized or leased circuits.

1.4 For definitions concerning alphabetic telegraphy, see definitions in Recommendation R.140 and the International Electrotechnical Vocabulary (IEV), Chapter 721.

2 Character repertoire

2.1 Graphic characters that have a corresponding signal in ITA 2 are:

— the 26 latin alphabetic characters: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z;

— decimal figures: 0 1 2 3 4 5 6 7 8 9;

— punctuation marks and miscellaneous signs:

Full Stop .

Comma ,

Colon or division sign :

Question mark ?

Apostrophe ’

Cross or addition sign +

Hyphen or dash or subtraction sign —

Fraction bar or division sign	B/F
Equal sign or double hyphen	=
Left-hand bracket (parenthesis)	(
Right-hand bracket (parenthesis)	)

2.2 Three graphic characters (such as accented letters and currency signs) may be applied for national or private use (see § 4.2)

2.3 This Recommendation does not define the particular printing style, font or case (capital or small letters) of graphic characters, nor does it define the layout of keyboards in teleprinters or similar terminal devices.

2.4 The control characters provided in ITA2 are:

— ‘‘Who are you?’’ (operation of the answerback unit of the corresponding installation)

— operation of an audible signal of the corresponding installation;

— carriage return;

— line-feed;

— letter-shift;

— figure-shift;

— space or blank;

— all-space or null (no tape perforation).

3 Coding

3.1 The 32 combinations available in ITA2 are produced by a sequence of five units, each of which may assume one of two significant conditions (A or Z), as shown in Table 1/S.1.

3.2 Condition A corresponds to start polarity, no perforation in paper tape and symbol 0 of the binary notation. Condition Z corresponds to stop polarity, perforation in paper tape and symbol 1 in the binary notation.

For the equivalent frequency and amplitude modulation corresponding to conditions A and Z in voice-frequency telegraph equipment, see Recommendation V.1 and the relevant Series R Recommendations.

Note 1 — The level and polarity of voltage and current corresponding to conditions A and Z (e.g. in the local end with its termination) are national options and hence are not defined internationally.

Note 2 — The terms ‘‘start’’ and ‘‘stop’’, ‘‘space’’ and ‘‘mark’’ have also been used to describe conditions A and Z respectively (see definition 31.37 in Recommendation R.140)

4 Particular combinations

4.1 In accordance with Recommendation S.8 and the Series U Recommendations, ‘‘WRU’’ (who are you? combination No. 4 in figure case), is used to operate the answerback unit of the corresponding instrument in the international telex and gentex services, and may also provide a printed symbol (as in Table 2/S.1)

4.2 Since some Administrations assign combination Nos. 6, 7 and 8 in figure case for internal use whereas others do not, it is desirable to avoid varying interpretation in these circumstances that might result if they were used freely in international services. Consequently the use of combination Nos. 6, 7 and 8 in figure case is not defined and therefore should not be used in international services, except by direct agreement between Administrations; and it is recommended:

— that, in all services, they should be shown in some special manner on the keyboards and:

— that services in which they are not used should place on the secondary position on the printing blocks (or on the equivalent mechanism) an arbitrary sign, for the letters F, G and H such as, for instance, a square. The appearance of such sign on the paper is to indicate an abnormal impression.

4.3 Combination No. 10 ‘‘audible signal’’, may also provide a printed symbol (as in Table 2/S.1)

4.4 Combinations Nos. 29 and 30, ‘‘letter-shift’’ and ‘‘figure-shift’’, respectively, are used to place the terminal installation in the ‘‘letter’’ or ‘‘figure’’ position, so that:

— any combination No. 1 to 26 received engenders a printed signal in the ‘‘ letter’’ case (second column of Table 1/S.1) if the last shift signal received is a ‘‘ letter-shift’’ signal ;

— any combination No. 1 to 26 received engenders a printed signal in the ‘‘ figure’’ case (third column of Table 1/S.1) if the last shift signal received is a ‘‘ figure-shift’’ signal and 4.3.

H.T. [T1.1]

TABLE 1/S.1

International Telegraph Alphabet No. 2 (ITA2)

lw(30p) | lw(30p) | lw(30p) | lw(12p) | lw(12p) | lw(12p) | lw(12p) | lw(12p) .

Table 1/S.1 [T1.1], p.

4.5 Combinations Nos. 29 (letter-shift), 30 (figure-shift) and 32 (all-space, null or no tape perforation) shall not affect the spacing movement of terminal machines, except where their reception is indicated by printing a symbol, as mentioned in § 5 below.

4.6 *Use of capital and small letters*

4.6.1 In ITA2, it is possible to use teleprinters with two series of letter characters, capital and small letters.

4.6.2 It is possible to use sequences of the shift combinations of ITA2 for transfer from one series to the other.

4.6.3 If this possibility is used, it is essential to obtain compatibility with teleprinters having only one series of letter characters.

4.7 *Use of combination No. 32*

4.7.1 Combination No. 32 can be used in certain sequences of switching signals; these uses are set out in Recommendations U.11, U.20, U.22 and S.4.

4.7.2 Combination No. 32 must not be used during the phase of communication (after a call is set up) in the international telex service.

4.7.3 Combination No. 32 can be used during the phase of communication after a call is set up in domestic national service or by bilateral agreement between two Administrations, as a command signal for certain functions, e.g. transfer to a national alphabet other than ITA2;

4.7.4 Combination No. 32 must not be used for transfer from one form of characters to another while remaining within ITA2, nor for transfer from one international telegraph alphabet to another.

5 Graphic representation of control characters

Where a graphic indication of the reception or transmission of certain control characters is required, this should be effected by printing the symbols shown in Table 2/S.1.

H.T. [T2.1]

TABLE 2/S.1

Printed symbols for control characters

Function	Combination No.	Case	Symbol	Alphabetic representation
Who are you? (WRU)	4	Figure	(see Note 1)	EQ
Audible signal (bell)	10	Figure		BL
Carriage-return	27	Either		CR
Line-feed	28	Either	≡	LF
Letter-shift	29	Either	↓	SL or LS
Figure-shift	30	Either	↑	SF or FS
Space	31	Either	Δ"	SP
All-space: Null	32	Either	□	NU

Note 1 — The pictorial representation shown is a schematic of , which may also be used when equipment allows.

Note 2 — Each alphabetic representation is to be considered as a single symbol. It may occupy one position on a printed or displayed line.

Table 2/S.1 [T2.1], p.

Recommendation S.2

CODING SCHEME USING INTERNATIONAL TELEGRAPH ALPHABET No. 2 (ITA2) TO ALLOW THE TRANSMISSION OF CAPITAL AND SMALL LETTERS

(Melbourne, 1988)

The CCITT,

considering

(a) that CCITT Recommendation S.1, International Telegraph Alphabet No. 2 (ITA2), permits capital or small letter printing;

(b) that there are advantages in establishing an international standard for the transmission of capital and small letters using International Telegraph Alphabet No. 2,

unanimously declares the view

(1) that the ability to transmit and print capital and small letters should be based on an extended use of ITA2;

(2) that figure-shift (FS) and letter-shift (LS) should be the only shift characters used;

(3) that the number of shift characters introduced in the transmitted information should be minimized;

(4) that the operating principles described in this Recommendation should apply.

1 Scope

1.1 Existing terminal equipment making use of ITA2 may not discriminate between capital and small letter printing. The decision to print in all capital or all small letters is a national matter and not affected by the received code combination of ITA2.

1.2 This Recommendation specifies a procedure whereby the terminal equipment may transmit information to allow the receiving terminal to discriminate between capital and small letter printing.

1.3 To assist understanding, Figure 1/S.2 shows diagrammatically the operating procedure of existing terminal equipment; Figure 2/S.2 shows the operating procedure specified in this Recommendation.

Figure 1/S.2, p.

Figure 2/S.2, p.

2 Operating principles

2.1 *Operating modes*

2.1.1 The terminal equipment should operate in the following two modes:

Mode 1 — Transmission/reception of small letters, single capital letters and figures;

Mode 2 — Transmission/reception of capital letters and figures.

The introduction of two modes of operation is to minimize the number of shift-characters transmitted.

2.1.2 At the beginning of any transmission, it may normally be assumed, that the equipment concerned is in Mode 1, small letters. If an initialization sequence is required it should consist of a contiguous sequence of FS, LS, LS characters.

2.2 *Selection within operating modes*

2.2.1 Where the terminal equipment is set to small letters in Mode 1 and a single capital letter is to be transmitted it should be denoted as a capital letter by preceding the character transmission with a single LS character. Two LS characters will be required when the previously transmitted character was a figure. If the next character is a non-shift character then it will be transmitted/printed and the terminal equipment should be reverted to small letter operation. If the next character is a shift character, the terminal equipment should be prepared to branch on the next character.

2.2.2 In Mode 1 a single FS character should change the terminal equipment from small letter to figure transmission/reception.

2.2.3 In Mode 2 a single FS or LS character should change the terminal equipment between figure and capital letter operation respectively.

2.3 *Selection of operating mode*

2.3.1 Where the terminal equipment is set to Mode 1 and a group of three or more capital letters is to be transmitted, ignoring any non-letter characters separating them, then to improve efficiency of transmission, the terminal equipment may be set to Mode 2 (capital letters) and precede subsequent letter character transmission by a contiguous sequence of a single FS and a single LS character.

The receiving terminal equipment on detecting the FS, LS sequence should set the receiving terminal to Mode 2 and print all following received letter characters as capital letters.

2.3.2 Where the terminal is set to Mode 2 and small letter is to be transmitted the termminal equipment should be set to Mode 1 and precede subsequent letter character transmission by a single LS character. Two LS characters will be required where the previously transmitted character was a figure.

The receiving terminal equipment on detecting the one or two LS characters respectively should set the receiving terminal to Mode 1 and print the following received letter character as a small letter.

2.4 *Manual terminal operation*

2.4.1 For manual operation the terminal should be provided with, in addition to the normal shift key, a capital-lock key or a shift-lock key or both.

2.4.2 Where the terminal is set to Mode 1 the condition of the lock key should be examined for the groups of capital letters. If the locked condition is detected the terminal should be set to Mode 2 and the subsequent letter character transmission preceded by the transmission of a contiguous sequence of a single FS and single LS character.

2.4.3 Where the terminal is set to Mode 2 the shift key (single character) and the lock key (groups of characters) should be simultaneously examined. If neither the shift key is operated nor the locked condition is detected, the terminal should be set to Mode 1 and the subsequent letter character transmission should be preceded by a single extra LS character.

2.4.4 A start key to generate the initialization sequence may be provided.

2.5 *Automatic terminal operation*

2.5.1 Where the terminal is set to Mode 1 and the next letter character to be transmitted is a capital letter, the next two letter characters should be examined for capital letters, ignoring any non-letter characters separating them. If all three letter characters are capital letters then the terminal should be set to Mode 2 and subsequent letter character transmission should be preceded by a contiguous sequence of a single FS and a single LS character. If the first letter character to be transmitted is a capital letter but either, or both, of the two subsequent letter characters are not, the first letter character should be transmitted preceded by a single extra LS character.

2.5.2 Where the terminal is set to Mode 2 the next character to be transmitted should be examined and if it is a small letter the terminal should be set to Mode 1.

3 Transmission of WRU and answerback

3.1 The coding and transmission of the WRU and answerback signals is not affected by this Recommendation.

4 Provision of LS and FS functions

4.1 It should be noted that in some circumstances it may be necessary to generate separate LS and FS characters for national applications.

5 National versions

5.1 The use of ITA2 combination No. 32, either in an escape sequence or as a single character, to enter a national alphabet is not affected by this Recommendation.

5.2 It is possible to apply the principles described in this Recommendation to small and capital letter transmission/printing of a national alphabet.

5.3 Figure 3/S.2 of this Recommendation gives some guidance to Administrations, who may wish to include national capital and small letters.

Figure 3/S.2, p.

Recommendation S.3

TRANSMISSION CHARACTERISTICS OF THE LOCAL END

WITH ITS TERMINATION (ITA2)

(based on former Recommendations S.3, S.3 | fR bis and S.3 | fR ter,
Geneva, 1976, 1980 and Malaga-Torremolinos, 1984

and on Recommendation S.31, Geneva 1972; amended at Geneva, 1976

and at Melbourne, 1988)

The CCITT,

considering

(a) that this Recommendation defines the characteristics from a transmission point of view of start-stop terminal equipment working at rates up to 300 bauds;

(b) that this Recommendation applies — except where otherwise specified — to start-stop apparatus in general: i.e. it applies to teleprinters, data terminal equipment, multiplexer tributaries, etc.;

(c) that user classes of service 1 and 2 in Recommendation X.1 [1] should be taken into account;

(d) that some equipment (using telegraph modems in accordance with Recommendation R.20 [2], or single current working, for instance) cannot be separated during operation from its supply and repeater devices; hence the measurements under operating conditions must apply to the local end with its termination [3];

(e) that the characteristics laid down below are those that should be evident in service conditions on local ends with their terminations that are likely to be connected to the international network. It should be noted however that in the case of d.c. transmission (including DCEs at the point of interconnection between the DCE and the DTE) they apply to such local ends with their terminations only if the influence of the line in the local end produces negligible distortion. In the case of equipment incorporating telegraph modems the modem-to-modem distorition as given in Recommendation R.20 [2] must be included.

unanimously declares the view :

1 General characteristics

1.1 The nominal modulation rate should be chosen from Table 1/S.3.

1.2 The difference between the real mean modulating rate of signals when in service and the nominal modulation rate should not exceed ± 0.1%.

Note — There is early equipment in service at rates up to 100 bauds with difference of ± 0.75%.

1.3 The nominal duration of the transmitting cycle should be chosen from Table 1/S.3. For 50 and 75-baud working, the stop element should be at least 1.4 units (preferably 1.5). For higher rates, the stop element should not be less than its nominal length.

1.4 The receiver must be able to translate correctly in service the signals coming from a source that appears to give stop elements equal to or greater than

1.0 unit at 50 or 75 bauds

1.2 unit at 100 or 200 bauds (when using nominally 7.5 unit characters)

1.0 unit at 110 baud

1.0 unit at 200 and 300 bauds (when using nominally 11 unit characters)

0.8 unit at 100, 150, 200 or 300 bauds (when using nominally 10 unit characters)

0.8 unit at 134.5 bauds (when using nominally 9 unit characters)

H.T. [T1.3]
TABLE 1/S.3

Modulation rate (baud)	Character structure	
	Character length (units)	Stop element (units)
50 |	7.5	1.5
75 |	7.5	1.5
100 |	7.5	1.5
100 |	10 |	1 |
110 |	11 |	2 |
134.5	9 |	1 |
150 |	10 |	1 |
200 |	7.5	1.5
200 |	10 |	1 |
200 |	11 |	2 |
300 |	10 |	1 |
300 |	11 |	2 |

Table 1/S.3 [T1.3], p.

2 Transmitter characteristics

2.1 *Transmit distortion*

2.1.1 The transmit distortion with a d.c. interface should not exceed:

a) 5% for equipment working at rates up to 100 bauds.

Note — A figure of 3% is recommended for new equipment.

b) 3% for equipment working at rates between 110 and 300 bauds.

2.1.2 The transmit distortion with a scvf interface, measured at the in-station modem, should not exceed:

Rate (baud) 50 75 100 110 134.5 150 200 300

Distortion (%) 10* 11* 12* 10 11 | 12 14 18

Note 1 — This is derived from the sum of the assumed transmit distortion at a d.c. interface and the modem-to-modem distortion given in Recommendation R.20. (*New equipment, having an assumed distortion of 3% at the d.c. interface will have a correspondingly lower figure for the resultant transmit distortion from the in-station modem.)

Note 2 — A higher modem-to-modem (R.20) distortion applies in the case of frequency error, so that a correspondingly higher resultant transmit distortion from the in-station modem will be obtained.

2.2 In all cases ‘‘distortion’’ should be taken as gross start-stop distortion [4], using the appropriate alphabet.

It is recommended that the measurement should be made with a start-stop distortion measuring set, for a period in accordance with Recommendation R.5 [5].

3 Receiver characteristics

3.1 *Receive Margin*

3.1.1 The receive margin with a d.c. interface should not be less than 40%.

3.1.2 The receive margin with a scvf interface, as measured at the in-station modem, should not be less than:

Rate (baud)	50	75	100	110	134.5	150	200	300
Marging (%)	35	34	33	33	32	31	29	25

Note 1 — This is derived from the assumed terminal margin at a d.c. interface of 40% and the modem-to-modem distortion as given in Recommendation R.20.

Note 2 — A higher modem-to-modem (R.20) distortion applies in the case of frequency error so that a correspondingly lower resultant marging at the in-station modem will be obtained.

3.2 In all cases ‘‘marging’’ should be taken as effective net margin [6], using the appropriate alphabet.

It is recommended that the measurement should be made under the following conditions, in service:

— character structure appropriate to the equipment under test chosen from Table 1/S.3;

— use of one of the standardized texts in Recommendation R.52 [7];

— test with the appropriate degree of start element distortion, long and short;

— reading the margin when one error per test sentence is obtained (the marging is the lesser of two values of the degree of distortion obtained from the two measurements).

Note — It will be up to Administrations using some other measuring method to work out for their own use figures to give equivalent results to those which would have been obtained by the recommended method.

References

[1] CCITT Recommendation *International user classes of service in public data networks and integrated services digital networks (ISDNs)* , Rec. X.1.

[2] CCITT Recommendation *Telegraph modem for subscriber lines* , Rec. R.20.

[3] CCITT Recommendation *Definition of essential technical terms relating to apparatus for alphabetic telegraphy* , Rec. S.140, Definition, No. 26 local end (with its termination).

[4] CCITT Recommendation *Definitions of essential technical terms in the field of telegraph transmission* , Rec. R.140, Definition, No. 33.09, degree of gross start-stop distortion.

[5] CCITT Recommendation *Observation conditions recommended for routine distortion measurements on international telegraph circuits* , Rec. R.5.

[6] CCITT Recommendation *Definitions of essential technical terms relating to apparatus for alphabetic telegraphy* , Rec. S.140, Definitions, Nos. 59 and 60, margin and effective margin (of a given apparatus).

[7] CCITT Recommendation *Standardization of international texts for the measurement of the margin of start-stop equipment* , Rec. R.52.

Recommendation S.4

SPECIAL USE OF CERTAIN CHARACTERS OF THE INTERNATIONAL | TELEGRAPH ALPHABET No. 2

(former CCIT Recommendations C.7, C.8 and C.12;

modified at New Delhi, 1960, Geneva, 1964, 1972, 1976, 1980,

Malaga-Torremolinos, 1984 and Melbourne, 1988)

1 Sequences of combinations used for special purposes

As quoted in Recommendations F.1, F.30, R.79, S.11, S.15, U.21 and U.22, certain sequences of combinations from International Telegraph Alphabet No. 2 are devoted to special purposes (see Table 1/S.4) and they should not be used for other purposes when the equipment on such networks introduces special facilities for which these sequences are reserved. These are:

1) **ZCZC** start-of-message signal in retransmission systems using perforated tape or equivalent devices;

2) **+ | | |** end-of-input signal ;

3) **NNNN** end-of-message signal , a switching signal in switching systems using perforated tape or equivalent devices for retransmission; also used for restoring the waiting signal device in accordance with Recommendation U.22 ;

4) **CCCC** for switching into circuit, by remote control, a reperforator (or equivalent device);

5) **SSSS** for switching into circuit data transmission equipment, in accordance with Recommendation S.15. In addition, this sequence may be used for switching into circuit, by remote control, equipment operating with a nationally standardized alphabet;

6) **FFFF** for switching out of circuit, by remote control, a reperforator (or equivalent device);

7) **KKKK** ready-for-test signal , for automatic tests of transmission quality, in accordance with Recommendation R.79;

8) **KLKL** for switching into circuit, by remote control, a reader (or equivalent device);

9) **XXXXX** error signal when using automatic error correction devices (see Recommendation F.1]).

Note — The sequences of secondaries of these combinations — although they are not to be used for the purposes devoted to these sequences — are subject to the same restrictions in use, the equipment having to recognize only the sequence of combinations. In international services these sequences are:

+ : + : corresponding to **ZCZC** (combinations Nos. 26, 3, 26, 3),

ZZZZ corresponding to **+ | | |** (combinations Nos. 26, 26, 26, 26),

, | | | corresponding to **NNNN** (combinations Nos. 14, 14, 14, 14),

: | | | corresponding to **CCCC** (combinations Nos. 3, 3, 3, 3),

’ | | | corresponding to **SSSS** (combinations Nos. 19, 19, 19, 19),

(| | | corresponding to **KKKK** (combinations Nos. 11, 11, 11, 11),

(| (| **corresponding to KLKL** (combinations Nos. 11, 12, 11, 12),

/ | | | | corresponding to **XXXXX** (combinations Nos. 24, 24, 24, 24, 24).

10) the line-feed signal (combination No. 28) followed by 4 carriage-return signals (combination No. 27) for the operator-recall signal on a telex connection made over a radiotelegraph circuit (see Recommendation U.21);

11) **HHHH** to prevent transmission of the delay signals described in Recommendation U.22 made up from combination No. 32 as described in § 2 below.

12) **TTT** . | | to stop transmission from the distant terminal as described in Recommendation F.60.

13) . | | one or more combinations No. 10 in figure-case after the call is established could trigger the transmission of a ‘‘conversation impossible’’ ‘‘CI’’ sequence of signals and/or a pre-recorded message from distant terminal (it should be noted that the combination No. 10 in figure-case could also be used to attract the operator’s attention).

14) **MMMM** during a broadcast call, to signal the desire of the calling party to know those parties who cleared prematurely. See Recommenations U.44 and S.20.

Note — This sequence is to be recognized in letter shift mode only. A minimum of 4 Ms would clear a telex broadcast call, usage of a 5th or more Ms is a national matter.

15) **LLLL** to signal the desire of the calling party to terminate the present call and to make a follow-on call as described in Recommendation U.43. Usage of a 5th or more Ls is a national matter.

This combination should be recognized in letter shift mode only.

H.T. [T1.4]
TABLE 1/S.4
Montage:
Reprendre les originaux du Livre Rouge
(sans corr.)

BLANC
H.T. [T1.13]
TABLE A-1/S.13
Montage:
Reprendre les originaux du Livre Rouge
(sans corr.)

BLANC
H.T. [T2.13]
TABLE A-2/S.13

{ Proportion of full-channel character rate } Combination of fundamental subchannels }	{
(1) quarter (2) quarter (3) half	No. 1 No. 3 Nos. 2 and 4
(1) half (2) half	Nos. 1 and 3 Nos. 2 and 4
(1) quarter (2) three-quarters	No. 1 Nos. 2, 3 and 4

Table 1/S.4 [T1.4], p.

2 Use of combination No. 32

In addition to the purposes described in Recommendation S.1, combination No. 32 can be used for the following purposes:

2.1 Combination No. 32, repeated at intervals of 1.2 seconds, can be used as a delay signal to indicate that the error-correcting device is controlling a repetition.

2.2 Combination No. 32, repeated at intervals of 5 seconds, can be used as a delay signal to indicate that the storage device is not yet empty.

2.3 The reception of combination No. 32 shall not cause any spacing of the paper on tape-printing or page-printing teleprinters.

Note — §§ 1, 10) and 1, 11) as well as §§ 2.1 and 2.2 apply directly only to start-stop equipment operating at 50 bauds, since this is the modulation rate for telex. However, in the event of suitable synchronous error-correcting systems being used for the inter-connection of start-stop circuits that operate at higher modulation rates, similar facilities might be desirable and could be provided by similar means.

Recommendation S.5

STANDARDIZATION OF PAGE-PRINTING START-STOP EQUIPMENT AND COOPERATION BETWEEN PAGE-PRINTING AND TAPE-PRINTING START-STOP EQUIPMENT (ITA2)

(Brussels, 1948; amended at New Delhi 1960, Geneva, 1964, 1976 and 1980)

The CCITT,

unanimously declares the view

(1) that the number of characters that the line of text in page-printing equipment may contain should be fixed at 69;

(2) that tape- or page-printing start-stop equipment should, with a view to interworking, be fitted with:

a) two keys for the transmission of the carriage-return and line-feed signals;

Note — New equipment may, in addition, be fitted with a single key for both carriage-return and line-feed, in accordance with the procedures described in Recommendation F.60 [1].

b) means to draw attention of the operator to the need to transmit carriage-return and line-feed signals in time to prevent overprinting on the 69th character;

Note — New equipment may, in addition, be fitted with means preventing the input of any printing character after the 69th character of a line. This condition is signalled to the operator optically and/or acoustically. The carriage-return function cancels the signal and releases the input of characters.

(3) that for controlling the alarm, several ‘‘figures J’’ signals, one carriage-return signal and one line-feed signal should be transmitted in the order indicated;

(4) that such Administrations as are desirous of confirming on a tape machine the reception or transmission of the carriage-return and line-feed signals shall effect this confirmation by printing:

a) the symbol < for the carriage-return signal;

b) the symbol ≡ for the line-feed signal;

(5) that, if the printing of the symbols indicated in § 4 above is not desired, the reception of at least one of these signals shall nevertheless cause the paper to move forward. When only one of these signals causes the paper to move forward, it should preferably be the line-feed.

Reference

[1] CCITT Recommendation *Operational provisions for the international telex service* , Rec. F.60.

Recommendation S.6

CHARACTERISTICS OF ANSWERBACK UNITS (ITA2)

(based on former Recommendations S.6 [1], *S.6 | is* [2]
and S.6 | er [3],

Geneva, 1976, 1980 and Malaga-Torremolinos, 1984)

The CCITT,

considering

(a) Recommendations F.60 [4] and F.21 [5] concerning the telex and gentex services respectively;

(b) that start-stop equipment is capable of receiving communications without the help of an operator;

(c) that this advantage is useful to users of the international telegraph services that employ International Telegraph Alphabet No. 2 (ITA2);

(d) that it is therefore desirable that the identity of either the calling or the called party should be capable of being checked;

(e) that it may be necessary to verify the correct functioning of the line and of the distant terminal equipment;

(f) that it is desirable to give confidence to the calling party that the reception of the called station's answer-back code is related to the proper working of that station as a whole,

unanimously declares the view

(1) that a code transmitter filling the requirements specified below should be supplied for the subscribers' sets taking part in the international telex and gentex services and, upon request, for other telegraph services using start-stop equipment and ITA2;

(2) that operation of the code transmitter should be effected by the sequence of signals figure-shift **D** (combinations Nos. 30 and 4) in ITA2;

As regards the information to be conveyed by answerback codes and the order of presentation of that information, reference should be made to the Recommendation cited in [6] for the telex service or to Recommendation F.21 [5] for the gentex service or to Recommendation F.130 [7] for maritime mobile services.
(3) that, for services other than gentex, the answerback code emission should be composed of a series of 20 signals, as follows:

1 letter-shift or figure-shift;

1 carriage-return;

1 line-feed;

16 signals chosen by each Administration

| for the subscriber's code signal;

1 letter-shift; (optional — see the Recomendation cited in [8]);

(4) that, for the gentex service , the answerback code emission should be composed of a series of 20 signals, as follows:

1 carriage-return,

1 line-feed,

1 figure-shift,

16 signals chosen by each Administration

| in accordance with Recommendation F.21 [5],

1 letter-shift;

(5) that, when a telex or gentex answer-back code includes less than 16 significant characters chosen by the Administration, the necessary number of filling characters should be inserted in accordance with Recommendation F.60 [4] or F.21 [5] respectively;

(6) that, for services other than telex and gentex, when the answerback code includes less than 16 significant characters, it is necessary to insert as many letter-shifts as are necessary, by distributing them among the significant characters, to make up the total of 16 signals. This would give the calling subscriber the chance of noting clearly the end of the requested code transmission;

(7) that if a complex installation connected to the telex network incorporates both outgoing-only terminals and terminals which may be called, then the call number of the group of terminals which may be called, or of one of them, should appear in the answerback code of the outgoing-only terminal.

Administrations may also wish to apply this to public installations connected to the telex network which not only transmit but also receive and distribute messages;

(8) that the answerback signals should comply with the transmission characteristics specified in Recommendation S.3;

(9) that the delay between the beginning of reception of the start unit of combination No. 4 by the equipment in the ‘‘figures’’ position and the beginning of the start unit of the first signal in the answerback sent by this equipment should lie between:

— 150 and 600 ms for 50-baud equipment;

— 100 and 600 ms for 75-baud equipment;

— 75 and 600 ms for 100-baud equipment;

(10) that the start-stop equipment in the telex service should be designed so that reperforators should not perforate the *Who are you?* (WRU) signal (figure-shift **D**);

(11) that manufacturers should be informed that the answer-back mechanism should preferably be constructed so that the 20 positions in the answer-back code may be freely used for any combination in ITA2.

References

[1] CCITT Recommendation *Characteristics of answer-back units for start-stop apparatus of the telex service* , Green Book, Vol. VII, Rec. S.6, ITU, Geneva, 1973.

[2] CCITT Recommendation *Answer-back units for 75-baud start-stop apparatus in accordance with International Alphabet No. 2* , Green Book, Vol. VII, Rec. S.6 **|** fIbis , ITU, Geneva, 1973.

[3] CCITT Recommendation *Answer-back units for 100-baud start-stop apparatus in accordance with International Alphabet No. 2* , Green Book, Vol. VII, Rec. S.6 **|** fIter , ITU, Geneva, 1973.

[4] CCITT Recommendation *Operational provisions for the international telex service* , Rec. F.60.

[5] CCITT Recommendation *Composition of answer-back codes for the international gentex service* , Rec. F.21.

[6] CCITT Recommendation *Operational provisions for the international telex service* , Rec. F.60, § 3.4.2.

[7] CCITT Recommendation *Maritime answer-back codes ,* Rec. F.130.

[8] CCITT Recommendation *Operational provisions for the international telex service* , Rec. F.60, § 3.4.2.4.

Recommendation S.7

CONTROL OF TELEPRINTER MOTORS

(former CCIT Recommendation C.13; amended at Arnhem, 1953, and Geneva, 1976)

The CCITT,

considering

(a) that, in the case of public and private point-to-point circuits, it is desirable that the teleprinter motors should be started with the commencement of traffic signalling and stopped with the cessation of such signalling;

(b) that the general practice on such circuits is to utilize a time-delay device associated with the teleprinter which allows of such operation,

unanimously declares the view

(1) that, in the case of public and private point-to-point circuits, the terminal apparatus shall be so equipped as to allow of the starting and stopping of the teleprinter motors with the commencement and completion respectively of the traffic;

(2) that these facilities shall normally be provided by means of a time-delay device incorporated in the teleprinter, whereby the teleprinter motor is started immediately upon commencement of the signalling of traffic and is stopped within a time not less than 45 seconds after the last traffic signal;

considering

(c) that more strict unification of the delay-time of these automatic devices might give rise to serious technical complications;

(d) that precautions should thus be taken lest an operator, should transmit signals while the motor of his apparatus is still rotating, to an apparatus in which the motor has just stopped,

unanimously declares the view

(3) that, in the case of a pause in transmission for a period equal to or longer than 30 seconds, operators or subscribers are recommended to send a letter-shift (combination No. 29 in International Telegraph Alphabet No. 2) and to wait at least 2 seconds after the emission of this signal before recommencing transmission;

considering

(e) that, for reasons associated with the unification of terminal apparatus and for others, certain Administrations have expressed a preference for the utilization of a method whereby calling and clearing signals are used, as in the telex service, to effect the starting and stopping of the teleprinter motors,

unanimously declares the view

(4) that, notwithstanding (2) above, Administrations can, if they find it convenient, arrange between themselves to use an alternative method whereby the teleprinter motor is started by the use of a call signal , and stopped by the use of a clearing signal. In such cases the calling and clearing signals employed should conform to those standardized for the telex service, namely Recommendation U.1 [1].

Reference

[1] CCITT Recommendation *Signalling conditions to be applied in the international telex service* , Rec. U.1.

Recommendation S.8

INTERCONTINENTAL STANDARDIZATION OF THE MODULATION RATE OF START-STOP APPARATUS AND OF THE USE

OF COMBINATION No. 4 IN FIGURE CASE

(former CCIT Recommendations C.5 and C.11, Arnhem, 1953)

The CCITT,

considering

(a) that the standardized modulation rate recommended for start-stop apparatus employed in international (including intercontinental) service is 50 bauds, in accordance with Recommendation S.3;

(b) that there are nevertheless certain areas (notably in the USA) in which a different modulation rate for start-stop apparatus is employed;

(c) that, even though it is recognized that universal adoption

of a standardized modulation rate would be advantageous in the intercontinental service, it is not possible at present to secure universal adoption of a standard;

(d) that it is essential to do everything possible to facilitate the establishment of intercontinental services, notwithstanding differences in modulation rates that may exist between the start-stop apparatus employed;

(e) that there are in existence methods, employing automatic storage equipment in the circuit, that enable start-stop apparatus having different modulation rates to interwork;

(f) that, furthermore, on certain intercontinental circuits, e.g. radio circuits, the employment of special forms of synchronous equipment in association with storage equipment is sometimes essential and is already in use in the intercontinental sections of start-stop circuits.

unanimously declares the view

(1) that, when it is necessary in the intercontinental service to operate between start-stop apparatus having a modulation rate of 50 bauds and start-stop apparatus having a non-standard modulation rate, then conversion equipment, for example automatic storage and retransmission equipment must be inserted in the international circuits concerned in a manner to be agreed bilaterally between the Administrations and/or private recognized operating agencies concerned;

considering

(g) that the use of different signs or functions for combination No. 4 in the figure case of International Telegraph Alphabet No. 2 on start-stop apparatus having to work together in the same system leads to operational difficulties that ultimately amount to rendering the use of this combination impossible;

(h) that the use of this combination to operate the answer-back unit, by allowing the caller to check the connection and the satisfactory working of his correspondent's apparatus, results in a considerable reduction in the time of establishing the communication, thereby facilitating operation of the service,

unanimously declares the view

(2) that combination No. 4 (figure case) of International Telegraph Alphabet No. 2 should be reserved exclusively, both in international service and in intercontinental service, for operating the answer-back unit;

(3) that, in intercontinental service, when apparatus not permitting the use of the answer-back unit is being operated, the methods of using combination No. 4 (figure case), should be the subject of bilateral agreement between the Administrations and/or private recognized operating agencies concerned.

Recommendation S.9

SWITCHING EQUIPMENT OF START-STOP APPARATUS

(former CCIT Recommendation F.60; modified at New Delhi, 1960,

Geneva, 1980 and Melbourne, 1988)

The CCITT,

considering

Recommendation U.1 [1] relative to signalling conditions to be applied in the international telex service and Recommendation F.60 [2] relative to operational provisions for the international telex service,

unanimously declares the view

(1) that terminal apparatus participating in the international telex service should normally always be available to receive a call in accordance with the conditions set forth in Recommendations U.1 and F.60.

(2) that start-stop apparatus used in the telex service should be so equipped, or provided with the necessary devices, to permit of operation in accordance with Recommendations U.1 [1] and F.60 [2];

(3) that, if a subscriber's apparatus is such that he can use his teleprinter outside communication periods in order to prepare perforated tapes, for local checking of those tapes, for staff training, etc., the possibility of taking the answer-back may be delayed for a period not exceeding 3 seconds after connection of the called subscriber.

References

[1] CCITT Recommendation *Signalling conditions to be applied in the international telex service* , Rec. U.1.

[2] CCITT Recommendation *Operational provisions for the international telex service* , Rec. F.60.

Recommendation S.10

TRANSMISSION AT REDUCED CHARACTER TRANSFER RATE OVER A STANDARDIZED 50-BAUD TELEGRAPH CHANNEL

(Geneva, 1972)

The CCITT,

considering

(a) that there is a requirement for transmission at reduced character transfer rates on leased telegraph circuits;

(b) that the cost of devices to subdivide a standardized 50-baud telegraph channel for simultaneous use by a number of users is relatively high;

(c) that a number of Administrations meet the demand for transmission at reduced character transfer rates by providing a separate standardized 50-baud telegraph channel for each user and that the number of transmitted characters per minute is then limited by controlling the operation of the telegraph machine;

(d) that, in the case of a pause in transmission for a period equal to or longer than 30 seconds, operators or subscribers are recommended to send a letter-shift (combination No. 29 in International Telegraph Alphabet No. 2) and to wait at least 2 seconds after the emission of this signal before recommencing transmission [Recommendation S.7, § (3)],

unanimously declares the view

(1) that the preferred method of providing transmission at reduced character transfer rate on standardized 50-baud telegraph channels is an arrangement that employs one transmitted character followed by a period of stop polarity, the duration of which is determined in accordance with (2) and (3) below;

(2) for quarter-speed operation (100 characters per minute), the duration of the period of stop polarity required is equivalent to 3 character periods;

(3) for half-speed operation (200 characters per minute) the duration of the period of stop polarity required is equivalent to 1 character period.

Recommendation S.11

USE OF START-STOP REPERFORATING EQUIPMENT

FOR PERFORATED TAPE RETRANSMISSION

(former CCIT Recommendation C.19, Arnhem, 1953;

amended at New Delhi, 1960 and Geneva, 1980)

The CCITT,

considering

(a) that when a station is equipped with receiving reperforating equipment , it is often necessary to clear the perforated tape of the perforator to ensure transmission of the last characters of a message received during the perforation of the first characters of the next message;

(b) this operation of clearing the tape may lead to mutilation of the beginning of the message that is being perforated (particularly if insufficient message separation signals have been transmitted);

unanimously declares the view :

(1) It is recommended that arrangements be made to avoid the mutilation of signals transmitted at the head of a message and received on start-stop reperforating equipment.

(2) If the reperforator is provided with local means for feeding the paper, not more than one multilated signal should be tolerated. The wording of the message must make allowances for this fact.

(3) It is recommended that *message separation* signals should be sent at the end of a batch of telegrams following a given route at centres equipped with receiving reperforators. The choice of the type and number of signals to be sent for this purpose is left for agreement between the Administrations concerned. Use of a series of letter-shifts appears particularly desirable for this purpose.

(4) If the reperforator is to be switched into circuit and out of circuit under control of the transmitting station, the following sequences of signals should be used:

combination No. 3 repeated 4 times (**CCCC**) for switching the reperforator into circuit by remote control;

combination No. 6 repeated 4 times (**FFFF**) for switching the reperforator out of circuit by remote control.

(5) These operations may equally well be controlled by the secondaries of **CCCC** and **FFFF** but, for convenience in operating the primary signals, **CCCC** or **FFFF** only should be used by operating staff.

(6) If the **FFFF** sequence has not been received before the arrival of the clearing signal (or the end-of-message signal), receipt of the clearing signal (or the end-of-message signal) should cause disconnection of the reperforator. However, reception of the **FFFF** sequence should have no effect if the reperforator was previously connected by the operator at the receiving station. The **CCCC** and **FFFF** sequences should not affect the reperforator at the transmitting terminal.

Recommendation S.12

CONDITIONS THAT MUST BE SATISFIED BY SYNCHRONOUS SYSTEMS

OPERATING IN CONNECTION WITH STANDARD 50-BAUD TELEPRINTER

CIRCUITS

(former CCIT Recommendation C.23, Geneva, 1956;

amended at New Delhi, 1960 and Geneva, 1980)

The CCITT,

considering, on the one hand ,

(a) that the receiving portion of the sending end of the synchronous system can be linked to a start-stop receiver operating at the nominal modulation rate of 50 bauds,

unanimously declares the view

(1) that the receiving portion of the sending end of the synchronous system shall satisfy the conditions laid down for 50-baud operation in §§ 1.6 and 3.1 of Recommendation S.3, it being understood that start-stop signals would be received from a source complying with §§ 1.1, 1.2 and 1.3 of Recommendation S.3;

considering, on the other hand ,

(b) that the retransmitting portion of the receiving end of the synchronous system can be linked to a start-stop transmitter having special characteristics, because of the high speed stability of synchronous systems;

unanimously declares the view

(2) that the start-stop signals provided by the retransmitting portion of the receiving termination of the synchronous system shall have the following characteristics:

a) nominal modulation rate, 50-bauds;

b) gross start-stop distortion of the signals, less than 5%;

c) interval between the beginning of successive start elements, 145 | u$^{5}/_{6}$ milliseconds with a tolerance of ± | /10^{6}.

Note — For a better understanding of the Recommendation, the general arrangement of a communication system involving transmission over a synchronous channel is shown in Figure 1/S.12.

Figure 1/S.12, p.

Recommendation S.13

USE ON RADIO CIRCUITS OF 7-UNIT SYNCHRONOUS SYSTEMS

GIVING ERROR CORRECTION BY AUTOMATIC REPETITION

(former CCIT Recommendation C.24, Geneva, 1956; amended at New Delhi, 1960,

Geneva, 1964, Mar del Plata, 1968, and Geneva, 1972)

(This Recommendation corresponds to CCIR Recommendation 342-2, New Delhi, 1970)

The CCITT,

considering

(a) that it is essential to be able to interconnect terminal start-stop apparatus employing International Telegraph Alphabet No. 2 by means of radiotelegraph circuits;

(b) that radiotelegraph circuits are required to operate under varying conditions of radio propagation, atmospheric noise and interference, which introduce varying degrees of distortion that may at times exceed the margin of the receiving apparatus;

(c) that, in consequence, the transmission of 5-unit code signals over radio circuits is liable to errors and that such errors are not automatically detectable by the receiving apparatus;

(d) that an effective means of reducing the number of wrongly printed characters is the use of codes permitting the correction of errors by detecting the errors and automatically causing repetition;

(e) that the method using synchronous transmission and automatic repetition (ARQ) is now well proven;

(f) that it is desirable to permit the correct phase to be established automatically on setting up a circuit;

(g) that certain circumstances can occur that result in a loss of the correct phase relationship between a received signal and the receiving apparatus;

(h) that it is desirable to permit the correct phase relationship to be re-established automatically after such a loss, without causing errors;

(i) that to avoid misrouting of traffic, it is essential to prevent phasing to a signal that has been unintentionally inverted;

(j) that in certain cases there is a need to subdivide one or more channels in order to provide a number of services at a proportionately reduced character rate;

(k) that the method of automatically achieving the correct phase relationship between the received signal and the sub-channelling apparatus should be an integral part of the phasing process;

(l) that compatibility with existing equipment designed in accordance with the former Recommendation S.13 (New Delhi, 1960) is a requirement,

unanimously declares the view

(1) that, when the direct use of a 5-unit code on a radio circuit gives an intolerable error rate and there is a return circuit, a 7-unit ARQ system using International Telegraph Alphabet No. 3 should be used;

(2) when automatic phasing of such a system is required, the system described in the Annex should be adopted as a preferred system;

(3) that equipment, designed in accordance with (2) above, should be provided with switching, to permit operation with equipment designed in accordance with Recommendation S.13, New Delhi, 1960;

(4) that the start-stop sections of the receiving and transmitting portions of the radiotelegraph circuit, points X and Y in Figure 1/S.12, should satisfy the conditions of Recommendations S.3 and S.12. In conformity with Recommendation S.12, the aggregate modulation rate for a 2-channel time-division multiplex system will be 96 bauds and for a 4-channel system will be 192 bauds;

(5) that if such systems are used in establishing telex connections, the signalling position should conform to the arrangements shown in Recommendations U.11 [1], U.20 [2], U.21 [3], U.22 [4].

(5.1) For circuits on switched telegraph networks, the conditions of Recommendation U.20 [2] should apply. In this usage the polarity retransmitted by the terminal of the radio channel towards the start-stop section of the circuit during a repetition cycle shall be start polarity when the circuit is in the ‘‘free line’’ condition and stop polarity when the circuit is in the ‘‘busy circuit’’ condition.

(5.2) For point-to-point circuits, Administrations may adopt, at the terminal equipment under their jurisdiction, their own method of stopping and starting the motors of the receiving machines, based on Recommendation S.7. Signal β should normally be transmitted to indicate the idle circuit condition. However, for signalling purposes, the signals α and β may be employed.

ANNEX A
(to Recommendation S.13)

A.1 *Conversion table*

A.1.1 Table A-1/S.13 shows the correspondence between International Telegraph Alphabet No. 3 used in 7-unit ARQ systems and International Telegraph Alphabet No. 2 (defined in the Recommendation cited in [5]).

A.2 *Repetition cycles*

A.2.1 Four characters for normal circuits that are not subject to excessive propagation time. The cycle should comprise one signal repetition and three stored characters.

A.2.2 Eight characters on circuits for which the four-character repetition cycle is inadequate. The cycle should comprise one signal repetition, three signals β and four stored characters, or one signal repetition and seven stored characters.

A.3 *Channel arrangement*

A.3.1 *Channel A*

A.3.1.1 For equipments employing a 4-character repetition cycle: one character inverted followed by three characters erect [see (a) of Figure A-1/S.13].

A.3.1.2 For equipments employing an 8-character repetition cycle: one character inverted followed by seven characters erect [see (a) of Figure A-2/S.13].

A.3.2 *Channel B*

A.3.2.1 For equipments employing a 4-character repetition cycle: one character erect followed by three characters inverted [see (b) of Figure A-1/S.13].

A.3.2.2 For equipments employing an 8-character repetition cycle: one character erect followed by seven characters inverted [see (b) of Figure A-2/S.13].

A.3.3 *Channel C*

As for Channel B [see (c) of Figures A-1/S.13 and A-2/S.13].

A.3.4 *Channel D*

As for Channel A [see (d) of Figures A-1/S.13 and A-2/S.13].

Cuadro A-1/S.13 [T1.13], p.

A.3.5 *Order of transmission*

A.3.5.1 Characters of Channels A and B are transmitted consecutively [see (e) of Figures A-1/S.13 and A-2/S.13].

A.3.5.2 Elements of Channel C are interleaved with those of Channel A [see (g) of Figures A-1/S.13 and A-2/S.13].

A.3.5.3 Elements of Channel D are interleaved with those of Channel B [see (g) of Figures A-1/S.13 and A-2/S.13].

A.3.5.4 In the aggregate signal, A elements precede those of C, and B elements precede those of D [see (g) of Figures A-1/S.13 and A-2/S.13].

A.3.5.5 The first erect character on A, transmitted after the inverted character on A, is followed by the erect character on B [see (e) of Figures A-1/S.13 and A-2/S.13].

A.3.5.6 The erect character on C is followed by the inverted character on D [see (f) of Figures A-1/S.13 and A-2/S.13].

A.3.5.7 The inverted character on A is element-interleaved with the erect character on C [see (g) of Figures A-1/S.13 and A-2/S.13].

A.4 *Subchannel arrangement*

A.4.1 The character transmission rate of the fundamental subchannel should be a quarter of the standard character rate.

A.4.2 Subchannels should be numbered 1, 2, 3 and 4 consecutively.

A.4.3 Where a 4-character repetition cycle is used, subchannel 1 should be that subchannel which has opposite keying polarity to the other three subchannels of the same main channel [see (a), (b), (c) and (d) of Figure A-3/S.13]. When an 8-character repetition cycle is used, subchannel 1 should be that subchannel which has alternately erect and inverted keying polarity [see (e), (f), (g) and (h) of Figure A-3/S.13].

A.4.4 When subchannels of half-character rate, or three-quarter-character rate are required, combinations of the fundamental subchannels should be arranged as shown in Table A-2/S.13.

A.5 *Designation of aggregate signal*

To assist in identifying the signal condition when applying the aggregate telegraph signal to modulate the radio channel, the designation for the aggregate signal should be used as shown in Table A-3/S.13.

A.6 *Diagrams*

As a result of the characteristics specified in §§ A.2, A.3 and A.4 above, the transmission of characters will be as shown in Figures A-1/S.13, A-2/S.13 and A-3/S.13.

A.7 *Automatic phasing*

A.7.1 Automatic phasing should normally be used. It should be initiated either:

a) after a waiting period during which cycling due to the receipt of errors has occurred continuously on both channels on a 2-channel system, or on at least two main channels of a 4-channel system;

b) after equal counts of A and Z elements have been made over at least two consecutive system cycles whilst continuous cycling due to the receipt of errors is occurring on all main channels.

A.7.2 When the slave station is phasing, it should transmit in each channel, in place of the signal repetition, a 7-element signal in which all seven elements are of the same polarity, all other characters in the repetition cycle being transmitted unchanged.

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Figure A-1/S.13 p. 10

Figure A-2/S.13 p. 11

Figure A-3/S.13 p. 12

H.T. [T2.13]

TABLE A-2/S.13

{ Proportion of full-channel character rate } Combination of fundamental subchannels }	{
(1) quarter (2) quarter (3) half	No. 1 No. 3 Nos. 2 and 4
(1) half (2) half	Nos. 1 and 3 Nos. 2 and 4
(1) quarter (2) three-quarters	No. 1 Nos. 2, 3 and 4

Tableau A-2/S.13 [T2.13], p. 13

H.T. [T3.13]

TABLE A-3/S.13

Seven-unit code condition	Aggregate signal condition	
	Erect character	Inverted character
A	B	Y
Z	Y	B

Note — With a frequency shift system, the higher frequency should correspond to aggregate condition B and the lower frequency should correspond to aggregate condition Y.

Tableau A-3/S.13 [T3.13], p. 14

References

[1] CCITT Recommendation *Telex and gentex signalling on intercontinental circuits used for intercontinental automatic transit traffic (Type C signalling)* , Rec. U.11.

[2] CCITT Recommendation *Telex and gentex signalling on radio channels (synchronous 7-unit systems affording error correction by automatic repetition)* , Rec. U.20.

[3] CCITT Recommendation *Operator recall on a telex call set up on radiotelegraph circuit* , Rec. U.21.

[4] CCITT Recommendation *Signals indicating delay in transmission on calls set up by means of synchronous systems with automatic error correction by repetition* , Rec. U.22.

[5] CCITT Recommendation *Operational provisions for the international public telegram service* , Rec. F.1, § C.8.

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

Recommendation S.14

SUPPRESSION OF UNWANTED RECEPTION IN RADIOTELEGRAPH

MULTI-DESTINATION TELEPRINTER SYSTEMS

(former CCIT Recommendation C.22, Geneva, 1956;

amended at New Delhi, 1960)

The CCITT,

considering

(a) that in a radiotelegraph system in which a radio teleprinter transmitter broadcasts messages simultaneously to a number of receiving stations, this broadcast is sometimes required only by a restricted number of these stations;

(b) that it is desirable in such cases to prevent the reception of the message at the other offices to avoid wastage of paper;

(c) that such wastage can be avoided by the use of selective calling systems whereby only those stations required to receive the transmission are connected whilst it is in progress;

(d) that various technical methods are available for achieving this, using either pulse signalling (e.g. by dial), or signalling with 5-unit signals;

(e) that a wide variety of systems may be devised based upon the methods in (d) above;

(f) that such systems are normally used only for special services in which agreement can be reached on the particular type of system to be adopted;

unanimously declares the view

(1) that, when it is desired to avoid wastage of paper at receiving stations in radiotelegraph multi-destination teleprinter systems, a selective calling system should be used;

(2) that it is neither necessary nor desirable to recommend the use of any particular type of system for international use.

Recommendation S.15

USE OF THE TELEX NETWORK FOR DATA TRANSMISSION

AT 50 BAUDS

(former Recommendation V.10, Geneva, 1964; amended at Mar del Plata, 1968)

The CCITT,

considering

(a) that the telex network is well adapted for the economical transmission of data at fairly slow speeds, for the equipment required for binary transmission of data by telex stations, over and above the normal equipment, is relatively simple;

(b) but that some limits have to be imposed on data transmission codes used in the telex network because of:

— the need to make sure that telex calls will not be abruptly released;

— exaggerated distortion that may be introduced by amplitude-modulation voice-frequency telegraph systems when an excessively long-duration start (condition A) modulation element appears in a signal;

— the fact that in some networks there is regenerative repetition of start-stop signals, which can be handled only as if they were constructed like five-unit start-stop information signals;

— the possibility that certain long-distance calls may be established over synchronous systems that can handle only five-unit start-stop signals;

(c) that the limitation due to regenerative repeaters and synchronous systems imposes the use of a five-unit start-stop code for information, hence § 1 of the Recommendation (the more general procedure) deals with data transmission with a five-unit code on start-stop systems. But in certain circumstances alphabets with more than five units can be used for data transmission; hence § 2 of the Recommendation.

unanimously declares the following view:

1 Data transmission with a five-unit code on start-stop systems

1.1 Telex calls for data transmission may be set up in the international telex network, subject to the following provisions:

1.2 The call shall be set up between the caller and the called subscriber in accordance with the procedure recommended for the setting-up of a telex call and its supervision by exchange of answer-back codes (Recommendations F.60 [1] and U.1 [2]).

1.3 When one of the subscribers concerned wishes to introduce data transmission equipment into the connection, he shall transmit the sequence **SSSS** (or **' | | |**) of combination No. 19 from International Telegraph Alphabet No. 2 (signal for transfer to data). Upon reception of this sequence of combinations, the data transmission or reception equipment, as the case may be, shall be connected to the line. This changeover to the data position may be effected:

a) manually at both terminals;

b) automatically at both terminals;

c) manually at one terminal and automatically at the other.

In order to avoid any misunderstanding between the stations concerned, the calling operator should first check the equipment of the distant station (whether manual changeover or automatic changeover).

1.3.1 *Manual changeover at both terminals*

1.3.1.1 Once the connection has been set up, the following procedure should be followed.

1.3.1.2 The operator of the calling station sends the sequence of four combinations No. 19. This sequence should not connect the data equipment locally.

1.3.1.3 Upon reception of the **SSSS** (or **' | | |**) sequence, the operator of the called station likewise sends the sequence of four combinations No. 19, and then connects his data equipment to the line.

1.3.1.4 Upon reception of this answer sequence, the calling operator connects his data equipment to the line.

1.3.2 *Automatic changeover at both terminals*

1.3.2.1 Once the connection has been set up, the following procedure should be followed:

1.3.2.2 The calling station sends the sequence of four combinations No. 19 and must connect its data equipment to the line automatically within less than 500 milliseconds, starting from the end of transmission of the last signal of this sequence.

1.3.2.3 Reception of the sequence at the other terminal of the connection connects the called station to the data equipment line automatically within less than 500 milliseconds, starting from the end of reception of the last signal of this sequence.

1.3.2.4 The data transmission should not commence before the end of the 500-millisecond delay.

1.3.3 *Calling station with manual changeover and called station with automatic changeover*

1.3.3.1 Once the connection has been set up, the following procedure is followed:

1.3.3.2 The operator of the calling station sends the sequence of four combinations No. 19, and then immediately connects his data equipment to the line.

1.3.3.3 Upon reception of the sequence of four combinations No. 19 at the called station, the data equipment must be connected to the line within less than 500 milliseconds, starting from the end of reception of this sequence.

1.3.3.4 The data signals should not be transmitted before the end of the 500-millisecond delay.

1.3.4 *Calling station with automatic changeover and called station with manual changeover*

1.3.4.1 Once the connection has been set up, the following procedure should be followed:

1.3.4.2 The calling station invites its called correspondent, by a brief preliminary message, to send the sequence of four combinations No. 19. This message must not include within itself the sequence of four combinations No. 19. If the calling station is not equipped with a teleprinter attended by an operator, this preliminary message must be sent automatically.

1.3.4.3 The operator of the called station then sends the sequence of four combinations No. 19 and immediately connects his data equipment to the line.

1.3.4.4 Upon reception of this sequence at the calling station, connection of the data equipment to the line must be effected within less than 500 milliseconds, starting from the end of reception of the last combination No. 19 of the sequence.

1.3.4.5 Transmission of the data signals should not begin before the end of the 500-millisecond delay.

Note — The arrangements envisaged throughout § 1.3 above run counter to the inclusion of the sequence of four combinations No. 19 in the answer-back code of telex lines equipped with a simulator and at the same time in the answer-back of teleprinters equipped with an automatic device for changeover to data transmission. (This fact should be borne in mind in the further study of this Recommendation.)

1.4 The sequence of four combinations No. 19 will make ineffective, where necessary:

— devices that might conceivably emit signals disturbing to data transmissions, in particular the answer-back or, possibly, the delay signal used in connection with error-correcting synchronous radio systems (Recommendation U.22 [3]);

— devices that might be falsely operated by data signals, such as devices for operator-recall (Recommendation U.21 [4]).

1.5 Data transmission should be made by means of start-stop formed according to the structure of International Telegraph Alphabet No. 2 (ITA2). Users should be left free to decide how combinations should be allocated to the various components of the alphabet (of course ITA2 itself may be used).

1.6 When error control is necessary, one of the following methods of error control may be used:

— return of information to the transmitting station (information feedback system);

— block tansmission with check characters at the end of the block;

— character-by-character transmission with check bits (in the case of five-unit signals with redundancy).

1.7 Unless the exception stated in § 1.8 below is employed at the end of the data transmission, the telex clearing signal described in Recommendation U.1 [2] shall be emitted. This will cause the call to be cleared down and the terminal equipment to return to the telex position, and will cause the devices that might have been rendered inoperative on certain special circuits (see § 1.4 above) to go back to normal. This clearing signal must set off the clear-confirmation (see Recommendation U.1 [2]).

Note — Users may expect that some combinations No. 32, possibly followed by other combinations, may be received before the connection is cleared.

1.8 As soon as the telex connection has been transferred to the data transmission equipment, the transmission must be controlled by the data equipment at each terminal. If it is useful, for some reason, to return to telex operation, the data terminal equipment must control the transfer back to telex. This possibility of returning to the telex condition is used by a subscriber who considers it useful, after a data transmission, to return to teleprinter operation for a telex connection, instead of sending the clearing signal as mentioned in § 1.7 above. This return should be accompanied by the re-entry into service of the answer-back device. This control may be caused:

a) by the transmission of a special data signal over the line, causing the receiving installation to return to the telex position. The received data terminal equipment must send the same signal in the reverse direction to the opposite terminal before it causes transfer to the telex condition. This mutual signalling identifies the situations at the two terminals;

b) by a local control causing return to the telex situation, set off if no data or supervisory signal is transmitted or received during a given time interval agreed upon by the users.

Note — Telex connections that include error-correcting synchronous radio systems often insert long pauses into the message and due attention should be paid to this in selecting the agreed interval.

For these control operations, a special circuit should be set aside in the interface connecting the data terminal equipment to the transfer device.

Note — The provisions of § 1.8 above could be applied with advantage to the case of telex lines not equipped with teleprinter equipment but simply with answer-back unit simulators.

1.9 The signals transmitted by the data transmission devices must meet the requirements of §§ 1.1, 1.2, 1.3 and 2.1 in Recommendation S.3. The receiving equipment of the data reception devices must meet the requirements of §§ 1.1, 1.2, 1.6 and 3.1 in Recommendation S.3.

2 Data transmission with codes different from the start-stop code of ITA2

2.1 The attention of Administrations is drawn to the fact that it is impossible to send signals other than those of a five-unit start-stop code over international connections via time-division multiplex sections specially designed for a five-unit code. However, telex connections for data transmission may be set up over such relations in the conditions set out in § 1 of this Recommendation for the transmission of messages composed of signals different from those of the five-unit start-stop code. A service of this nature may be obtained by regrouping the units of these signals in the form of five-unit signals. Such regrouping calls for the use of additional code converters at the sending and receiving terminals.

2.2 Between telex networks that can take signals different from those of the five-unit start-stop code (that is to say, when telex calls between such networks do not call for regenerative repeaters, or for certain synchronous systems that would clash with them), by agreement between the Administrations concerned, data transmission with data transmission alphabets using these signals may be made, subject to the following:

a) Application of the procedure described under 1.2;

b) Application of the procedure described under 1.3;

c) Application of the procedure described under 1.4;

d) Use of a code with a modulation rate of 50 bauds should avoid composition of signals having more than seven consecutive elements of start polarity. (This limit is imposed to avoid clearing the connection unexpectedly in the exchanges as well as not to introduce excessive distortion on AMVFT channels.) Data may be transmitted by start-stop, or isochronously;

e) When error control is necessary, one of the following methods of error control may be used:

— return of information to the transmission station (information feedback system);

— block transmission with check characters at the end of the block;

— character-by-character protection by means of a parity check or a constant ratio code, for example the seven-unit code standardized in Recommendation S.13 (International Telegraph Alphabet No. 3).

In all cases item d) above should be taken into consideration;

f) Application of the procedure described under 1.7.;

g) Application of the procedure described under 1.8.

References

[1] CCITT Recommendation *Operational provisions for the international telex service* , Rec. F.60.

[2] CCITT Recommendation *Signalling conditions to be applied in the international telex service* , Rec. U.1.

[3] CCITT Recommendation *Signals indicating delay in transmission on calls set up by means of synchronous systems with automatic error correction by repetition* , Rec. U.22.

[4] CCITT Recommendation *Operator recall on a telex call set up on a radiotelegraph circuit* , Rec. U.21.

Recommendation S.16

CONNECTION TO THE TELEX NETWORK OF AN AUTOMATIC TERMINAL

USING A V.24 [1] DCE/DTE INTERFACE

(Former Recommendation V.11, Mar del Plata, 1968;

amended at Geneva, 1980 and Malaga-Torremolinos, 1984)

1 General

1.1 This Recommendation describes a method of originating and answering calls on the 50-baud telex network by means of an automatic terminal that uses interchange circuits defined in Recommendation V.24 [1] for the interface between the data terminal equipment (DTE) and the data circuit terminating equipment (DCE). In addition this Recommendation covers manual calling with automatic switching to data processing or other off-line equipment and reply by teleprinter with automatic switching to a DTE.

1.2 A distinction is drawn between the two types of automatic calling in national telex networks — dial selection (using dial pulses in accordance with Recommendation U.2 [2]) and keyboard selection using 50-baud teleprinter signals [International Telegraph Alphabet No. 2 (ITA2)].

2 DCE/DTE interface

2.1 The interchange circuits used for the interface between the DCE and the DTE are defined in Recommendation V.24 [1] and comply with the technical specifications in either Recommendation V.28 [3] or Recommendation V.10 [4]. Thus the correspondance between the voltages and the significant states is as shown in Table 1/S.16.

H.T. [T1.16]
TABLE 1/S.16
Correspondence between significant states

Circuit condition	Logic level	Voltage level		Signal	Condition
		Rec. V.28	Rec. V.10		
ON	0	≥" | 3 V	≥" | 0.3 V	Start	A
OFF	1	| (em3 V	| (em0.3 V	Stop	Z

Table 1/S.16 [T1.16], p.

2.2 The circuits used for automatic reply (see Figures 1 and 2/S.16), are CT 102, 103, 104, 107, 108/2, 125 and 132.

2.3 The circuits used for automatic calling with dial selection (see Figure 1/S.16) are those listed in § 2.2 supplemented by CT 202, 206, 207, 208, 209, 210, 211 and 213. The 200-series circuits are not connected directly to the DCE but to an automatic calling equipment (ACE) built into the DCE, which explains the presence of CT 202 to 213. These circuits may be used by a single DTE connected to a single DCE/ACE.

2.4 The circuits used for automatic calling with keyboard selection (see Figure 2/S.16) are those listed in § 2.2 supplemented by CT 202, which is connected directly from the DTE to the DCE.

2.5 Where a DTE has access through a DCE to several telex lines of the public network, the DCE shall select for each call attempt one telex line and one only (which need not be the same one as for the preceding attempt) and in no case is the DCE allowed to present the same call simultaneously on more than one telex line. The calling and answering procedure and signalling between DTE and DCE are identical, after connection to a telex line, with those that are used when a DCE is connected to one telex line only, which are described in the diagrams below.

2.6 If several DTE are connected to the telex network through the same DCE, each DTE shall make its call attempts to the network using the procedure described in this Recommendation. On the other hand, when it is in the answering position for a call coming from the telex network, the DCE is responsible for handling the calls intended for the DTE concerned using the procedure described in Recommendation F.71 [5] on the interconnection of the telex network with private teleprinter networks. As soon as the DCE has

selected the DTE concerned, the answering signal to the call at the DTE/DCE interface and the signalling on the telex line will be identical to those used in the case of a single DTE as described in the diagrams below.

2.7 In the timing diagrams below (see Annexes A to E), the ON condition in the interchange circuits is denoted by a solid line and the OFF condition by the absence of a line. For CT 103 and 104, * means that the DCE connects them to line and o / means that the DCE disconnects them from the line.

FIGURE 1/S.16, p.

FIGURE 2/S.16 and Notes, p.

3 Signalling

3.1 These interfaces may be used with the three following types of telex signalling:

— type A (keyboard selection);

— type B (keyboard selection);

— type B (dial selection).

3.2 The signalling between the DCE and the national telex exchange is not standardized by the CCITT. The signalling protocol shown in the timing diagrams (Annexes A to E below) are only examples to indicate the interdependence between the signalling on the subscriber lines and the status of the interchange circuits.

3.3 Automatic calling with type B signalling and dial selection is described in Annex A. Automatic calling with either type A or B signalling and keyboard selection is described in Annex B. The other annexes are common to all types of signalling.

3.4 The **SSSS** sequence (four times combination No. 19 in ITA2), if required, is transmitted either after the exchange of answer-back codes and through-connection, if network-controlled, or, otherwise, after reception of the call-connected signal. The purpose of the **SSSS** sequence is to indicate that the exchange of ‘‘data’’ is about to start and that no further ‘‘telex’’ signals that might disturb the exchange of data should be transmitted or interpreted. It enables the equipment that is required for the exchange of data, which may then commence after a 500 ms delay, as specified in

Recommendation S.15. This sequence may be omitted where an exchange of messages in ITA2 is to take place, providing disabling of the answer-back function is not considered necessary.

3.5 In the event of reply by teleprinter, the last character of the **SSSS** sequence initiates automatic switching to the DTE.

3.6 A special data signal may be sent by the DTE to cause the distant terminal to return to the telex mode of operation.

3.7 The DTE must comply with Recommendation U.40 [6] concerning ineffective attempts. It must be able to interpret at least the following service signals: OCC, ABS, NA, NP, NC, NCH, DER.

4 Modes of operation — timing diagrams

4.1 The various modes of operation and equipment configurations are illustrated in the annexes below as follows:

Annex	*Subject*	*Signalling*
A	Automatic call by DTE (dial selection)	Type B (dial selection)
B	Automatic call by DTE (keyboard selection)	Types A and B (keyboard)
C	Teleprinter + DTE (manual call with manual or automatic switching to DTE)	All types
D	Answering by DTE	All types
E	Teleprinter answering (with automatic switching to DTE)	All types

4.2 The following abbreviations and signs are used in Annexes A to E:

A/B telex answer-back code

DCE data circuit terminating equipment

DTE data terminal equipment

ms millisecond

SSSS transfer sequence (see § 3.4 above)

s second

WRU ‘‘Who are you?’’ sequence (combination No. 4 in figure case)

* CT 103 and 104 connected to line

o / CT 103 and 104 disconnected from line

———— a broken line indicates that the circuit may be either ON or OFF

ANNEX A

(to Recommendation S.16)

Automatic call by DTE

(dial selection)

Table Annex A, p.

ANNEX B
(to Recommendation S.16)

Automatic call by DTE

(keyboard selection)

Table Figure Annex B, p.

Automatic call by DTE *(cont'd)*

(keyboard selection)

Table Figure Annex B (cont.) and Notes, p.

ANNEX C
(to Recommendation S.16)

Teleprinter + DTE

(Manual call with manual or automatic switching to DTE)

Table Annex C p.204

ANNEX D
(to Recommendation S.16)

Answering by DTE

Table Annex D, p.

ANNEX E

(to Recommendation S.16)

Teleprinter answering

(with automatic switching to DTE)

Table Annex E p.206

References

[1] CCITT Recommendation *List of definitions for interchange circuits between data terminal equipment and data circuit terminating equipment* , Rec. V.24.

[2] CCITT Recommendation *Standardization of dials and dial pulse generators for the international telex service* , Rec. U.2.

[3] CCITT Recommendation *Electrical characteristics for unbalanced double-current interchange circuits* , Rec. V.28.

[4] CCITT Recommendation *Electrical characteristics for unbalanced double-current interchange circuits for general use with integrated circuit equipment in the field of data communications* , Rec. V.10.

[5] CCITT Recommendation *Interconnection of private teleprinter networks with the telex network* , Rec. F.71.

[6] CCITT Recommendation *Reactions by automatic terminals connected to the telex network in the event of ineffective call attempts or signalling incidents* , Rec. U.40.

Recommendation S.17

ANSWER-BACK UNIT SIMULATORS

(former Recommendation V.13, Mar del Plata, 1968)

1 The answer-back code must be released by a device capable of recognizing the *Who are you?* signal in International Telegraph Alphabet No. 2 (five-unit code). Hence, this device must keep in a store unit the *figures* situation indicated by combination No. 30 received before combination No. 4 of this alphabet.

2 In view of the procedure adopted for the use of the sequence of four No. 19 combinations as the signal for passage from the telex position to the data position in terminal equipment, the introduction of this sequence (four times combination No. 19) in the 20 signals of the simulator answer-back code is to be avoided, since it is incompatible with the procedure already adopted.

Note — It should be noted that, for the same reason of procedure, this four times combination No. 19 sequence should not be introduced in the answer-back code signals of a teleprinter associated with a manual or automatic call-transfer device.

3 The composition of the signals of the answer-back unit simulator can obviously be used for identification of the station obtained by the station that requests the call. If the identification is negative, it is up to this calling station to interrupt the unwanted connection.

Note — On the other hand, it was agreed that identification in the opposite direction could not be achieved in a simple way by the answer-back unit simulator, since the answer-back code to be checked in this direction is that of the opposite station, which is normally the one that has requested the connection.

4 In a telex installation intended for data transmission and equipped with an answer-back unit simulator instead of a teleprinter, the device for changeover from telex to data working — by the passage of the sequence of four combinations No. 19 — must be automatic.

5 The characteristics of the answer-back unit simulator should conform with Recommendation S.6.

Recommendation S.18

CONVERSION BETWEEN INTERNATIONAL TELEGRAPH ALPHABET No. 2 AND INTERNATIONAL ALPHABET No. 5

(Geneva, 1980)

The CCITT,

considering

(a) that the Recommendation cited in [1] defines International Telegraph Alphabet No. 2 (ITA2), which is used, for example, in the international telex service;

(b) that International Alphabet No. 5 (IA5), defined in Recommendation T.50 [2], has been established jointly by the CCITT and the International Organization for Standardization (ISO) for use in data transmission (for example);

(c) that rules for converting from ITA2 to IA5 and vice versa are desirable to facilitate interworking, for example between terminals in the international telex service and terminals in data networks;

(d) that a suitable set of rules has been drawn up in collaboration with ISO;

(e) that for specific user applications some variations in the tables below may be developed and applied by bilateral agreement;

(f) that this Recommendation does not define whether the alphabetic characters of ITA2 are represented as capital or small letters;

unanimously recommends

that the following rules for conversion should apply.

1 Conversion from ITA2 to IA5

1.1 The conversion of characters shall be as specified in Table 1/S.18.

1.2 Annex A, together with Table A-1/S.18, provides information on alternative conversions that are in general use in some countries.

2 Conversion from IA5 to ITA2

2.1 The conversion of characters shall be as specified in Table 2/S.18.

2.2 The control characters of positions 0/1, 0/2, 0/3, 0/4, 0/6, 1/0, 1/5, 1/6 and 1/7 are generally not converted because they are removed from the character string by the link control equipment.

2.3 Characters for which there are no direct equivalents shall be represented by the single character question mark (**?**), unless prior agreement has been made between the interchange parties.

2.4 The greater number of code combinations available in IA5 means that not every character can be translated unambiguously into a single ITA2 character. Use of a single character, rather than a multi-character representation, will minimize formatting problems.

2.5 Annex A together with Table A-2/S.18 provide information on some alternative conversions that are in use in some countries.

Blanc

H.T. [T1.18]
TABLE 1/S.18
Montage:
Reprendre les originaux du Livre Rouge
(sans corr.)

BLANC
H.T. [T2.18]
TABLE A-1/S.18
Montage:
Reprendre les originaux du Livre Rouge
(sans corr.)

BLANC
H.T. [T3.18]
TABLE A-2/S.18
Montage:
Reprendre les originaux du Livre Rouge
(sans corr.)

BLANC
H.T. [T3.18]
TABLE A-2/S.18
Montage:
Reprendre les originaux du Livre Rouge
(sans corr.)

BLANC
Table A-1/S.18 [T2.18], p.

Blanc

H.T. [T3.18]
TABLE A-2/S.18
Montage:
Reprendre les originaux du Livre Rouge
(sans corr.)

BLANC
Table A-2/S.18 [T3.18], p.

References

[1] CCITT Recommendation *Operational provisions for the international public telegram service* , Rec. F.1, § C.

[2] CCITT Recommendation *International Alphabet No. 5* , Rec. T.50.

Recommendation S.19

CALLING AND ANSWERING IN THE TELEX NETWORK

WITH AUTOMATIC TERMINAL EQUIPMENT

(Geneva, 1980)

1 General

1.1 This Recommendation describes a method of originating and answering calls on the 50-baud telex network by means of an automatic terminal using a simple telegraph-type interface for the exchange of data or messages.

1.2 The equipment that processes these data or messages at the terminal is referred to as the data terminal equipment (DTE). It should be able to carry out automatically all the operations required to set up and clear down calls as well as the sending and receiving of information at 50 bauds on the telex network.

1.3 The data circuit terminating equipment (DCE) constitutes the frontier between the DTE and the telex network and offers the possibility of remote maintenance. The DCE effects all signal conversions between the DTE and the telex subscriber line. The DCE may be either a separate unit or a built-in component of the DTE.

2 DCE/DTE interface

2.1 The interchange circuits used for the interface (if any) between the DCE and the DTE are defined in Recommendation V.24 [1] and comply with the technical specifications in either Recommendation V.28 [2] or Recommendation V.10 [3]. Thus the correspondence between the voltages and the significant states is as shown in Table 1/S.16.

2.2 The DCE/DTE interface consists of three circuits: CT 103 and 104 for the transmission and reception of both data and control signals and CT 102 for the signal ground or common return. Figure 1/S.19 illustrates the interface configuration.

FIGURE 1/S.19, p.

2.3 In addition to its use for sending data or messages once a call has been established, CT 103 carries all the control signals produced by the DTE and needed by the telex network to set up and clear down connections. Similarly CT 104, in addition to its use for receiving data or messages once a call has been established, carries all the control signals produced by the DCE and needed by the network to set up and clear down connections.

2.4 During a call that has been set up and in the setting-up phase, as well as in all intervals between signals, the DTE maintains CT 103 and the DCE maintains CT 104 on Z polarity.

3 Signalling

3.1 This interface may be used with any of the telex signalling variants in use in national networks.

3.2 The signalling between the DCE and the national telex exchange is not standardized by the CCITT. The signalling protocol shown in the timing diagram (Figure 3/S.19) is only an example. However, since it is based on Type A signalling, for Type B signalling the call establishment phase should be read as shown in Figure 2/S.19.

FIGURE 2/S.19, p.

3.3 Figure 3/S.19 shows CT 103 (forward path) and CT 104 (backward path) for both the calling and called DTEs. Consequently it covers both calling and answering with an automatic terminal, but the procedures described are applicable to a calling or called DTE in communication with a DTE operated in accordance with one of the procedures described in Recommendation S.16 or manually. The particular case shown is that of a successful call with clearing initiated by the calling DTE.

3.4 The **SSSS** sequence (four times combination No. 19 in International Telegraph Alphabet No. 2) normally precedes and announces the exchange of data, which may commence after a delay of 500 ms, as specified in Recommendation S.15. This sequence may be omitted where an exchange of message in ITA2 is to take place, providing disabling of the answer-back function is not considered necessary.

3.5 The DTE must comply with Recommendation U.40 [4] concerning reactions to ineffective call attempts. It must be able to interpret at least the following service signals: OCC, ABS, NA, NP, NC, NCH, DER.

3.6 If a call collision is detected, the DTE must abandon its call attempt to permit acceptance of the incoming call.

FIGURE 3/S.19, p.

References

[1] CCITT Recommendation *List of definitions for interchange circuits between data terminal equipment and data circuit terminating equipment* , Rec. V.24.

[2] CCITT Recommendation *Electrical characteristics for unbalanced double-current interchange circuits* , Rec. V.28.

[3] CCITT Recommendation *Electrical characteristics for unbalanced double-current interchange circuits for general use with integrated circuit equipment in the field of data communications* , Rec. V.10.

[4] CCITT Recommendation *Reactions by automatic terminals connected to the telex network in the event of ineffective call attempts or signalling incidents* , Rec. U.40.