INTERNATIONAL TELECOMMUNICATION UNION

CCITT

THE INTERNATIONAL
TELEGRAPH AND TELEPHONE
CONSULTATIVE COMMITTEE

YELLOW BOOK

VOLUME VII – FASCICLE VII.2

TELEGRAPH AND TELEMATIC SERVICES TERMINAL EQUIPMENT

RECOMMENDATIONS OF THE S AND T SERIES

VII^TH PLENARY ASSEMBLY
GENEVA, 10–21 NOVEMBER 1980

Geneva 1981

INTERNATIONAL TELECOMMUNICATION UNION

CCITT

THE INTERNATIONAL
TELEGRAPH AND TELEPHONE
CONSULTATIVE COMMITTEE

YELLOW BOOK

VOLUME VII - FASCICLE VII.2

TELEGRAPH AND TELEMATIC SERVICES TERMINAL EQUIPMENT

RECOMMENDATIONS OF THE S AND T SERIES

VII^TH PLENARY ASSEMBLY
GENEVA, 10–21 NOVEMBER 1980

Geneva 1981

ISBN 92-61-01141-1

CONTENTS OF THE CCITT BOOK
APPLICABLE AFTER THE SEVENTH PLENARY ASSEMBLY (1980)

YELLOW BOOK

[1] "Telematic services" is used provisionally.

Volume V – Telephone transmission quality. Series P Recommendations (Study Group XII).

Volume VI

FASCICLE VI.1 – General Recommendations on telephone switching and signalling. Interface with the maritime service. Recommendations Q.1 - Q.118 *bis* (Study Group XI).

FASCICLE VI.2 – Specifications of signalling systems Nos. 4 and 5. Recommendations Q.120 - Q.180 (Study Group XI).

FASCICLE VI.3 – Specifications of signalling system No. 6. Recommendations Q.251 - Q.300 (Study Group XI).

FASCICLE VI.4 – Specifications of signalling systems R1 and R2. Recommendations Q.310 - Q.490 (Study Group XI).

FASCICLE VI.5 – Digital transit exchanges for national and international applications. Interworking of signalling systems. Recommendations Q.501 - Q.685 (Study Group XI).

FASCICLE VI.6 – Specifications of signalling system No. 7. Recommendations Q.701 - Q.741 (Study Group XI).

FASCICLE VI.7 – Functional Specification and Description Language (SDL). Man-machine language (MML). Recommendations Z.101 - Z.104 and Z.311 - Z.341 (Study Group XI).

FASCICLE VI.8 – CCITT high level language (CHILL). Recommendation Z.200 (Study Group XI).

Volume VII

FASCICLE VII.1 – Telegraph transmission and switching. Series R, U Recommendations (Study Group IX).

FASCICLE VII.2 – Telegraph and "telematic services"[1] terminal equipment. Series S, T Recommendations (Study Group VIII).

Volume VIII

FASCICLE VIII.1 – Data communication over the telephone network. Series V Recommendations (Study Group XVII).

FASCICLE VIII.2 – Data communication networks; services and facilities, terminal equipment and interfaces. Recommendations X.1 - X.29 (Study Group VII).

FASCICLE VIII.3 – Data communication networks; transmission, signalling and switching, network aspects, maintenance, administrative arrangements. Recommendations X.40 - X.180 (Study Group VII).

Volume IX – Protection against interference. Series K Recommendations (Study Group V). Protection of cable sheaths and poles. Series L Recommendations (Study Group VI).

Volume X

FASCICLE X.1 – Terms and definitions.

FASCICLE X.2 – Index of the Yellow Book.

---

[1] "Telematic services" is used provisionally.

CONTENTS OF FASCICLE VII.2 OF THE YELLOW BOOK

Part I – Series S Recommendations

Alphabetical telegraph and telematic
(except facsimile)
services terminal equipment

SECTION 1 – *Start-stop terminals*

SECTION 2 – *Teletex terminals*

SECTION 3 – *Videotex terminals*

Part II – Series T Recommendations

Terminal equipment and transmission for facsimile services

REMARKS

1 The Questions entrusted to each Study Group for the Study Period 1981-1984 can be found in Contribution No. 1 to that Study Group.

2 The status of annexes and appendices attached to the Series S and T Recommendations should be interpreted as follows:

- an *annex* to a Recommendation forms an integral part of the Recommendation;
- an *appendix* to a Recommendation does not form part of the Recommendation and only provides some complementary explanation or information.

CCITT NOTE

In this fascicle, the expression "Administration" is used for shortness to indicate both a telecommunication Administration and a recognized private operating agency.

COLLABORATION WITH OTHER INTERNATIONAL ORGANIZATIONS ON CCITT-DEFINED TELEMATIC [1] SERVICES

Recommendation A.21 published in Volume I is reproduced below for the convenience of the reader.

Recommendation A.21

COLLABORATION WITH OTHER INTERNATIONAL ORGANIZATIONS ON CCITT-DEFINED TELEMATIC SERVICES [1]

(Geneva, 1980)

The CCITT,

considering

(a) that, according to Article 1 of the agreement between the United Nations and the International Telecommunication Union, the United Nations recognizes the International Telecommunication Union as the specialized agency responsible for taking such action as may be appropriate under its basic instrument for the accomplishment of the purposes set forth therein;

(b) that Article 4 of the *International Telecommunication Convention* Malaga-Torremolinos, 1973 states that the purposes of the Union are:

"a) to maintain and extend international cooperation for the improvement and rational use of telecommunication of all kinds;

b) to promote the development of technical facilities and their most efficient operation with a view to improving the efficiency of telecommunication services, increasing their usefulness and making them, as far as possible, generally available to the public;

c) to harmonize the actions of nations in the attainment of those ends";

(c) that Article 40 of the *Convention* states that "in furtherance of complete international coordination on matters affecting telecommunication, the Union shall cooperate with international organizations having related interests and activities";

(d) that this cooperation has to recognize the advisory capacity of organizations participating in the work of CCITT;

(e) that, in the study of terminals for new CCITT-defined telematic services (e.g. for Teletex, Telefax, Datafax, Bureaufax, Videotex services), ISO in particular is invited to give advice to CCITT based on their work on data systems and data communications;

[1] "Telematic services" is used provisionally and includes such services as Videotex, Teletex, facsimile, etc.

(f) that this cooperation has to be organized in a manner that will avoid duplication of work and of decisions that would be contrary to the principles set out above;

recognizes the following principles

(1) It is the responsibility of the CCITT alone to make the decisions regarding the operational, technical (including factors needed to ensure international interworking) and tariff principles of the CCITT-defined services.

(2) While the CCITT will define many of the relevant factors for the CCITT-defined telematic services, other international organizations will be invited to give specialist advice to CCITT on subjects that are of mutual interest, such as:

- character sets and coding;
- end-to-end control procedures including error protection;
- interfaces between terminals and circuit terminating equipment;
- terminal transmitter distortion and receiver margin;
- paper sizes and text formatting.

(3) Standardization, if required, of hardware and software implementation of terminals, such as printing systems, paper feed, character type fonts, paper characteristics, etc., are outside the scope of CCITT.

PART I

Series S Recommendations

ALPHABETICAL TELEGRAPH AND TELEMATIC (EXCEPT FACSIMILE) SERVICES TERMINAL EQUIPMENT

PAGE INTENTIONALLY LEFT BLANK

PAGE LAISSEE EN BLANC INTENTIONNELLEMENT

SECTION 1

START-STOP TERMINALS

Recommendation S.3

TRANSMISSION CHARACTERISTICS OF THE LOCAL END WITH ITS TERMINATION (ITA No. 2)

(based on former Recommendations S.3, S.3 bis *and S.3* ter, *Geneva, 1976 and 1980)*

The CCITT,

considering

(a) that this Recommendation defines the characteristics, from the transmission point of view, of the local end with its termination when start-stop equipment uses International Telegraph Alphabet No. 2 (see Recommendation S.4 and the Recommendation cited in [1]);

(b) that this Recommendation applies – except where otherwise specified (for example, the case of regenerative repeaters, which is covered by Recommendation R.60 [2]) – to start-stop apparatus in the wide sense of the terms as defined in [3]: i.e. it includes reperforators, service signals sent by switching equipment, the signals from answer-back units, automatic transmitters, etc.;

(c) that some equipment (for 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* (see [4]).

(d) 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 they apply to such local ends with their terminations only if the influence of the line in the local end produces negligible distortion.

unanimously declares the view:

1 General characteristics

1.1 The nominal modulation rate should be 50, 75 or 100 bauds.

1.2 The difference between the real mean modulation rate of signals when in service and the nominal modulation rate should not exceed:

a) ± 0.1% for new-generation electronic equipment first placed in service after 1980; or

b) ± 0.75% for other equipment.

1.3 For 50-baud working, the nominal duration of the transmitting cycle should be at least 7.4 units (preferably 7.5), the stop element lasting for at least 1.4 units (preferably 1.5).

Note – Administrations are recommended to withdraw from the international service equipment not meeting this Recommendation. If this cannot be done immediately then, in view of the special difficulties that are encountered in the regeneration of automatically transmitted 7-unit start-stop signals, it is recommended that urgent attention should be given to the replacement of 7-unit automatic transmitters by 7.5- (or 7.4 minimum) unit automatic transmitters.

1.4 For 75-baud working, the nominal duration of the transmitting cycle should be at least 7.4 units (preferably 7.5) the stop element lasting for at least 1.4 units (preferably 1.5). Administrations should not authorize the use of terminal machines with a cycle of less than that value.

1.5 For 100-baud working, the nominal duration of the transmitting cycle should be at least 7.5 units, the stop element lasting for at least 1.5 units.

1.6 To accommodate the shortest signal that may be emitted by, for example, a regenerative repeater (see Recommendation R.60 [2]), the receiver must be able to translate correctly in service the signals coming from a source that appears to have a nominal transmit cycle equal to or greater than:

– 7 units at 50 or 75 bauds; or

– 7.2 units at 100 bauds.

2 Transmitter characteristics

2.1 The degree of gross start-stop distortion of transmitted signals, measured at the output of the local end with its termination, must not exceed:

a) 5% for new-generation electronic equipment first placed in service after 1980; or

b) 10% for other equipment.

The appropriate value applies to all working conditions.

2.2 It is recommended that the measurement should be made with a start-stop distortion measuring set for two consecutive periods, each of about 15 seconds (corresponding to about 300, 450 or 600 transitions at 50, 75 or 100 bauds respectively). Early distortion should be observed during one period and late distortion during the other.

3 Receiver characteristics

3.1 For signals corresponding to a nominal transmit cycle equal to or greater than 7 units at 50 or 75 bauds or 7.2 units at 100 bauds, the effective net margin should not be less than:

a) 40% for new-generation electronic 50- or 75-baud equipment first-placed in service after 1980; or

b) 35% for other 50- or 75-baud equipment; or

c) 30% for 100-baud equipment (this value requires further study).

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

– 7.5-unit cycle for the signals transmitted by the measuring equipment;

– use of some of the standardized texts specified in Recommendation R.52 [5];

– first test with an identical distortion rate on all the transitions of the signal train, obtained by lengthening the start element;

– a second test with the same rate of identical distortion on all the transitions of the signal train, but obtained in this case by shortening the start element;

– reading the margin when less than one error per sentence of Recommendation R.52 [5] is obtained. (The margin is the lesser of the 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 that would have been obtained by the recommended method.

References

[1] CCITT Recommendation *Operational provisions for the international public telegram service*, Vol. II, Fascicle II.4, Rec. F.1, § C.

[2] CCITT Recommendation *Conditions to be fulfilled by regenerative repeaters for start-stop signals of International Telegraph Alphabet No. 2*, Vol. VII, Fascicle VII.1, Rec. R.60.

[3] CCITT Definition: *Start-stop apparatus*, Vol. X, Fascicle X.1 (Terms and Definitions).

[4] CCITT Definition: *Answer-back code*, Vol. X, Fascicle X.1 (Terms and Defenitions).

[5] CCITT Recommendation *Standardization of an international text for the measurement of the margin of start-stop equipment*, Vol. VII, Fascicle VII.1, Rec. R.52.

Recommendation S.4

USE OF INTERNATIONAL TELEGRAPH ALPHABET No. 2

(former CCIT Recommendations C.7, C.8 and C.12;
modified at New Delhi, 1960, Geneva, 1964, 1972, 1976 and 1980)

1 Secondaries of letters F, G, H – combinations Nos. 6,7 and 8

Since, in accordance with the provision of the Recommendation cited in [1], some Administrations and recognized private operating agencies assign the secondaries of letters **F**, **G** and **H** for internal use whereas others do not, it is desirable to avoid varying interpretations of these combinations that might result if they were used freely in international services.

The CCITT

unanimously declares the view

(1) that the use of secondaries of **F**, **G** and **H** should be prohibited in international services, except by direct agreement between Administrations;

(2) that, in all services, the secondaries of **F**, **G** and **H** should be shown in some special manner on the keyboard;

(3) that services in which these secondaries are not used should place on the secondary position on the printing blocks of the letters **F**, **G** and **H** an arbitrary sign, such as, for instance, a square, the appearance of such sign on the paper to indicate an abnormal impression.

2 Control symbols

The CCITT

unanimously declares the view

that Administrations who wish to indicate the reception or transmission of certain combinations effect this using the symbols shown in Table 1/S.4.

Note – The < symbol differs from that specified for CR in IA No. 5 in ISO Standard 2047 (←) [2]. The alignment of these graphic symbols is under study.

3 Sequences of combinations used for special purposes

As quoted in Recommendations F.1 [3], F.30 [4], R.79 [5], R.79 *bis* [6], S.11, S.15, U.21 [7] and U.22 [8], certain sequences of combinations from International Telegraph Alphabet No. 2 are devoted to special purposes (see Tables 2/S.4 and 3/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;

TABLE 1/S.4

Control characters

Function	Combination No.	Case	Symbol	Alphabetic representation
Who are you?	4	Figure	⌧ (see Note 1)	EQ
Bell	10	Figure	⍾	BL
Carriage-return	27	Either	<	CR
Line-feed	28	Either	≡	LF
Letter-shift	29	Either	↓	SL
Figure-shift	30	Either	↑	SF
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 either one or more positions on a printed or displayed line depending on the implementation.

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 [8];

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 Recommendations R.79 [5] or R.79 *bis* [6];

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 [9]);

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 [7]);

11) **HHHH** to prevent transmission of the delay signals described in Recommendation U.22 [8] made up from combination No. 32 as described in § 4 below.

TABLE 2/S.4

Combinations in International Telegraph Alphabet No. 2 referred to in Recommendation S.4

Combination number	Start	Element number					Stop	Indication	
		1	2	3	4	5		Letter case	Figure case
3	A	A	Z	Z	Z	A	Z	**C**	:
6	A	Z	A	Z	Z	A	Z	**F**	Note 1
8	A	A	A	Z	A	Z	Z	**H**	Note 1
11	A	Z	Z	Z	Z	A	Z	**K**	((left parenthesis)
12	A	A	Z	A	A	Z	Z	**L**	) (right parenthesis)
14	A	A	A	Z	Z	A	Z	**N**	, (comma)
19	A	Z	A	Z	A	A	Z	**S**	' (apostrophe)
24	A	Z	A	Z	Z	Z	Z	**X**	/ (fraction bar or division sign)
26	A	Z	A	A	A	Z	Z	**Z**	+

Note 1 – The figure case indication of this code combination is available for the internal service of each Administration or recognized private operating agency.

Note 2 – Symbols A and Z have the meanings defined in [10]. For punched tape working. A represents no perforation, Z represents a perforation.

4 Use of combination No. 32

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

4.2 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.

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

Note — §§ 3, 10) and 3, 11) as well as §§ 4.1 and 4.2 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 interconnection of start-stop circuits that operate at higher modulation rates, similar facilities might be desirable and could be provided by similar means.

TABLE 3/S.4

The use of various sequences of combinations for special purposes

Purpose of sequence	Sequence of combinations recommended	Method of operation		
		Message switching (including storage)	Through switching (without message storage)	Point-to-point operation
Start of message	26 3 26 3	Required in most systems	Could be useful in special cases	Not ordinarily required
Suppression of delay signals	8 8 8 8	Not required (delay signal not envisaged)	Required for some types of message (e.g. cypher) when routed over synchronous error-corrected radiotelegraph channels	Not required on public systems (delay signal not envisaged)
End of input	26 26 26 26	Could be useful in special cases	Could be useful in special cases	Not ordinarily required
End of message	14 14 14 14	Essential in most systems to separate individual message at relay centres and to control message switching	Required only when it is necessary positively to reconnect delay signal facility after use of suppression of delay signals facility	Not ordinarily required
Connection of reperforator (or equivalent device)	3 3 3 3	Not normally used (as storage is incorporated in the system); could be used for connection and disconnection of a supplementary storage device	Could be useful for special purposes; requires special equipment at point of reception	Could be useful for special purposes; requires special equipment at point of reception
Disconnection at distance of reperforator (or equivalent device)	6 6 6 6			
Connection of data equipment	19 19 19 19	Not normally used	Used for switching into data transmission equipment in association with telex networks	Could be useful for special purposes
Ready for test	11 11 11 11	Not normally used	Used for automatic maintenance of telex circuits	Could be useful for special purposes
Error signal	24 24 24 24 24	Not required	Used for automatic correction of operator errors	Could be useful for special purposes; requires special equipment at point of reception

References

[1] CCITT Recommendation *Operational provisions for the international public telegram service*, Vol. II, Fascicle II.4, Rec. F.1, § C.8.

[2] *Information processing – Graphical representations for the control characters of the 7-bit coded character set*, ISO Standard 2047-1975.

[3] CCITT Recommendation *Operational provisions for the international public telegram service*, Vol. II, Fascicle II.4, Rec. F.1.

[4] CCITT Recommendation *Use of various sequences of combinations for special purposes*, Vol. II, Fascicle II.4, Rec. F.30.

[5] CCITT Recommendation *Automatic tests of transmission quality on telegraph circuits between switching centres where no regeneration is involved*, Vol. VII, Fascicle VII.1, Rec. R.79.

[6] CCITT Recommendation *Automatic tests of transmission quality of telegraph circuits between switching centres where regeneration is involved*, Vol. VII, Fascicle VII.1, Rec. R.79 *bis*.

[7] CCITT Recommendation *Operator recall on a telex call set up on a radiotelegraph circuit*, Vol. VII, Fascicle VII.1, Rec. U.21.

[8] CCITT Recommendation *Signals indicating delay in transmission on calls set up by means of synchronous systems with automatic error correction by repetition*, Vol. VII, Fascicle VII.1, Rec. U.22.

[9] CCITT Recommendation *Operational provisions for the international public telegram service*, Vol. II, Fascicle II.4, Rec. F.1, § C.165.

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

Recommendation S.5

STANDARDIZATION OF PAGE-PRINTING START-STOP EQUIPMENT AND COOPERATION BETWEEN PAGE-PRINTING AND TAPE-PRINTING START-STOP EQUIPMENT (ITA No. 2)

(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 $\lessdot$ for the carriage-return signal;

b) the symbol $\equiv$ 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*, Vol. II, Fascicle II.4, Rec. F.60.

CHARACTERISTICS OF ANSWER-BACK UNITS (ITA No. 2)

(based on former Recommendations S.6 [1], *S.6 bis* [2] *and S.6 ter* [3] *Geneva, 1976 and 1980)*

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 (ITA No. 2);

(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 is 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 ITA No. 2;

(2) that operation of the code transmitter should be effected by the sequence of signals figure-shift **D** (combinations Nos. 30 and 4) in ITA No. 2;

(3) that, for services [1)] other than gentex, the answer-back 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 [1)], the answer-back 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;

1) As regards the information to be conveyed by answer-back 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.

(6) that, for services other than telex and gentex, when the answer-back code includes less than 16 significant characters, to distribute them by inserting as many letter-shifts as are necessary 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 the answer-back signals should comply with the transmission characteristics specified in Recommendation S.3;

(8) 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 answer-back 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;

(9) 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**);

(10) 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 ITA No. 2.

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 *bis*, 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 *ter*, ITU, Geneva, 1973.

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

[5] CCITT Recommendation *Composition of answer-back codes for the international gentex service*, Vol. II, Fascicle II.4, Rec. F.21.

[6] CCITT Recommendation *Operational provisions for the international telex service*, Vol. II, Fascicle II.4, Rec. F.60, § 3.4.2.

[7] CCITT Recommendation *Maritime answer-back codes*, Vol. II, Fascicle II.4, Rec. F.130.

[8] CCITT Recommendation *Operational provisions for the international telex service*, Vol. II, Fascicle II.4, 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, the motor of whose apparatus is still rotating, should transmit signals 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*, Vol. VII, Fascicle VII.1, 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 and Geneva, 1980)

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 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];

(2) 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*, Vol. VII, Fascicle VII.1, Rec. U.1.

[2] CCITT Recommendation *Operational provisions for the international telex service*, Vol. II, Fascicle II.4, 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

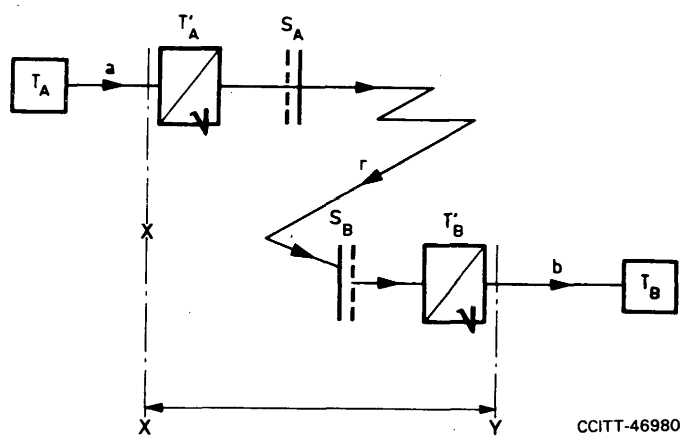
(2) that the start-stop signals provided by the retransmitting portion of the receiving termination of the synchronous system shall have the following characteristics:

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, $145\,^5/_6$ milliseconds with a tolerance of $\pm\ 1/10^6$.

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.



In this diagram:

T_A and T_B	are start-stop teleprinters.
T'_A and T'_B	are repeaters with or without storage.
a and b	represent the networks connecting teleprinters T_A and T_B to the repeaters T'_A and T'_B. These networks may comprise any number of channels in tandem, relays or regenerative repeaters.
S_A and S_B	are the distributors of the synchronous system, the complexity of which it is not necessary to state.
r	denotes a synchronous radiotelegraph channel.

It is agreed that, for the study of this question, the synchronous system includes all the equipment shown between lines X and Y on the diagram.

The input and output of the synchronous system are thus directly connected to the start-stop networks.

FIGURE 1/S.12
Synchronous system

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.

TABLE A-1/S.13

Code conversion table

Combination No. in International Telegraph Alphabet No. 2	Letter case	Figure case	Code in International Telegraph Alphabet No. 2 (see Note 1)	Code in International Telegraph Alphabet No. 3 (see Note 1)
1	**A**	–	ZZAAA	AAZZAZA
2	**B**	?	ZAAZZ	AAZZAAZ
3	**C**	:	AZZZA	ZAAZZAA
4	**D**	Note 2	ZAAZA	AAZZZAA
5	**E**	**3**	ZAAAA	AZZZAAA
6	**F**	Note 2	ZAZZA	AAZAAZZ
7	**G**	Note 2	AZAZZ	ZZAAAAZ
8	**H**	Note 2	AAZAZ	ZAZAAZA
9	**I**	**8**	AZZAA	ZZZAAAA
10	**J**	Note 2	ZZAZA	AZAAAZZ
11	**K**	(	ZZZZA	AAAZAZZ
12	**L**	)	AZAAZ	ZZAAAZA
13	**M**	.	AAZZZ	ZAZAAAZ
14	**N**	,	AAZZA	ZAZAZAA
15	**O**	**9**	AAAZZ	ZAAAZZA
16	**P**	**0**	AZZAZ	ZAAZAZA
17	**Q**	**1**	ZZZAZ	AAAZZAZ
18	**R**	**4**	AZAZA	ZZAAZAA
19	**S**	'	ZAZAA	AZAZAZA
20	**T**	**5**	AAAAZ	ZAAAZAZ
21	**U**	**7**	ZZZAA	AZZAAZA
22	**V**	=	AZZZZ	ZAAZAAZ
23	**W**	**2**	ZZAAZ	AZAAZAZ
24	**X**	/	ZAZZZ	AAZAZZA
25	**Y**	**6**	ZAZAZ	AAZAZAZ
26	**Z**	+	ZAAAZ	AZZAAAZ
27	Carriage-return		AAAZA	ZAAAAZZ
28	Line-feed		AZAAA	ZAZZAAA
29	Letter-shift		ZZZZZ	AAAZZZA
30	Figure-shift		ZZAZZ	AZAAZZA
31	Space		AAZAA	ZZAZAAA
32	Not normally used		AAAAA	AAAAZZZ
–	Signal repetition		–	AZZAZAA
–	Signal α		(permanent A polarity)	AZAZAAZ
–	Signal β		(permanent Z polarity)	AZAZZAA

Note 1 – Symbols A and Z have the meanings defined in [6].

Note 2 – See Recommendation S.4.

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].

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*

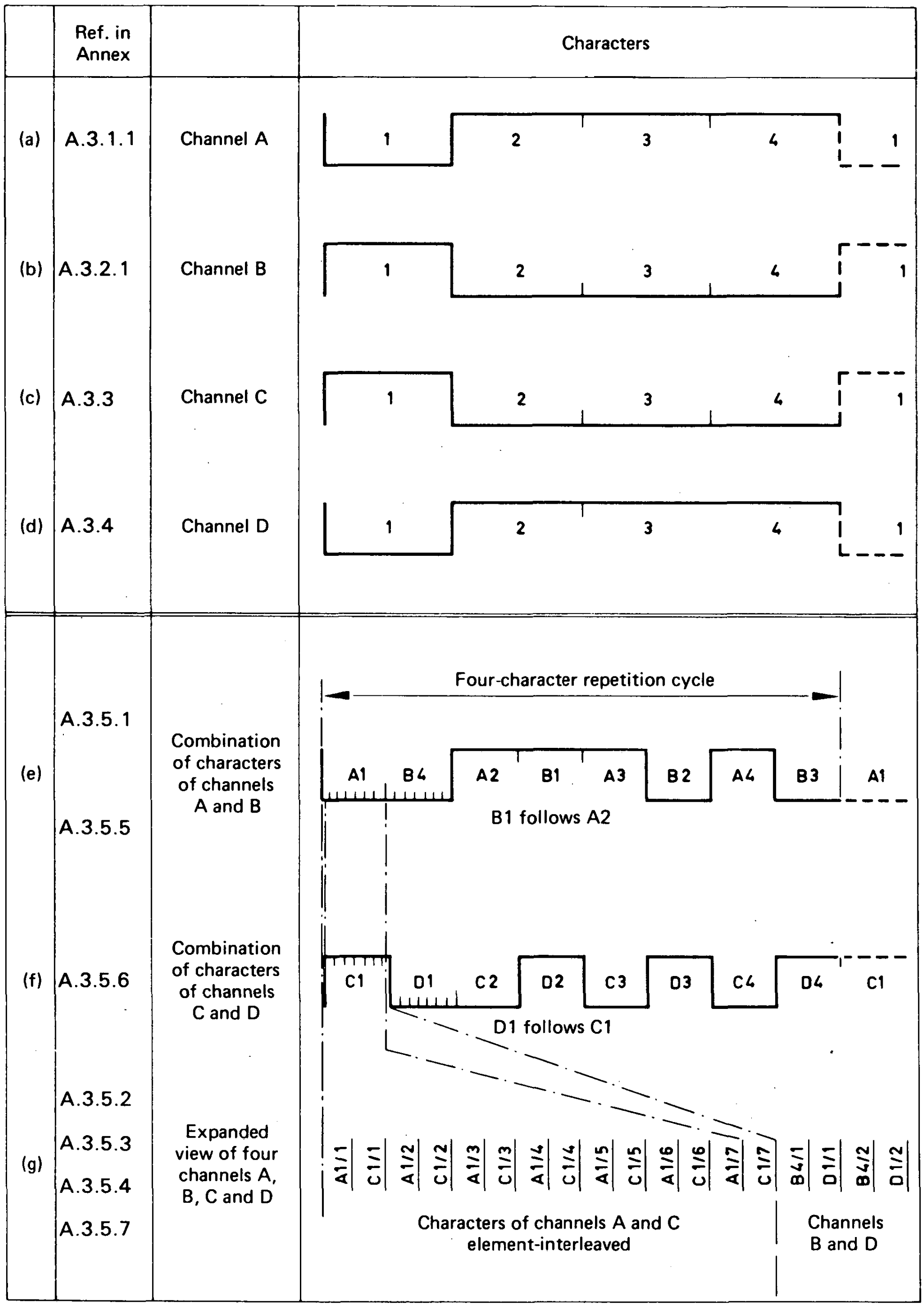
As a result of the characteristics specified in §§ A.2, A.3 and A.4 above, the transmission of characters will be as shown in Figures A-1/S.13, A-2/S.13 and A-3/S.13.

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;

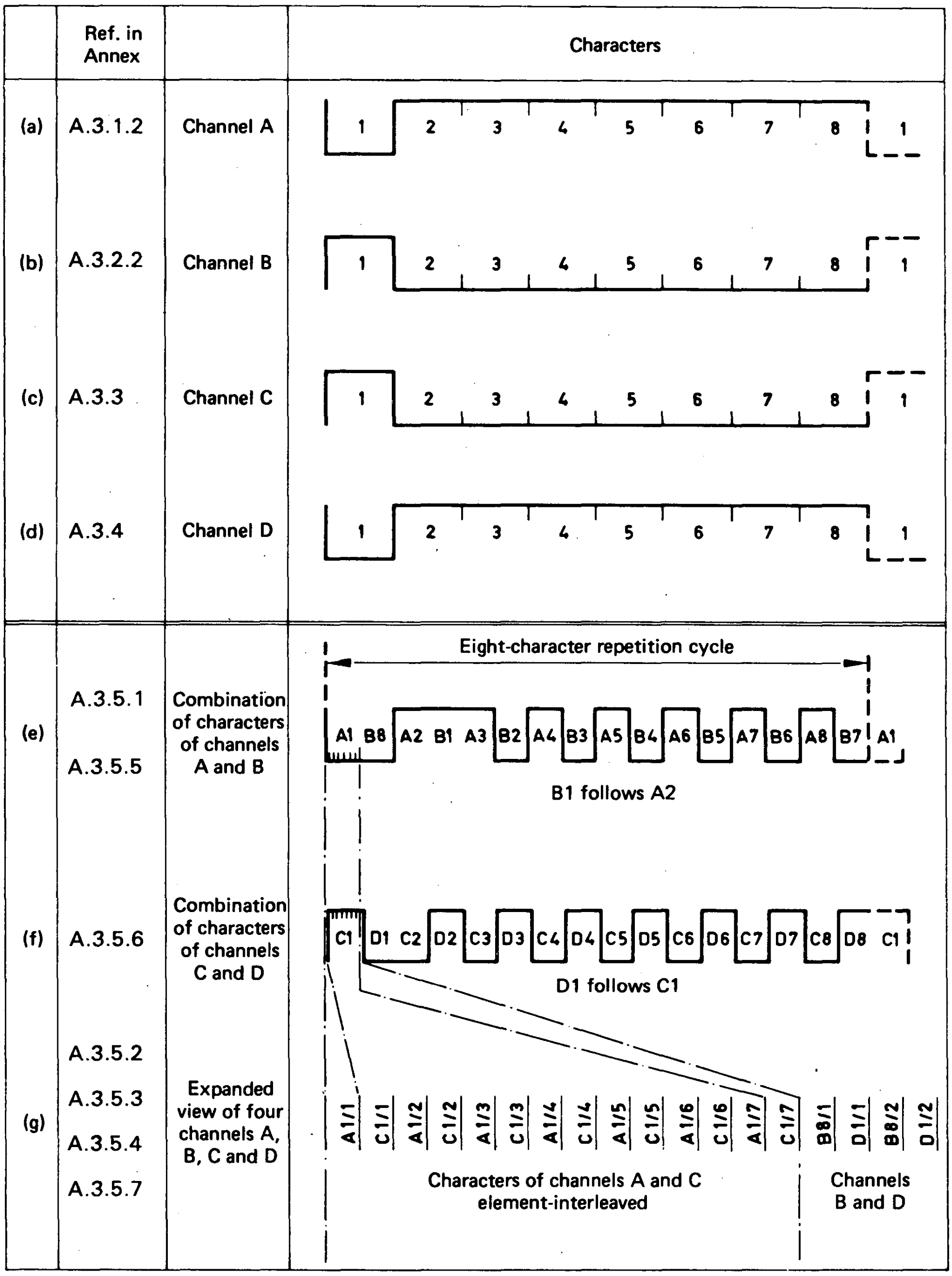
b) after equal counts of A and Z elements have been made over at least two consecutive system cycles whilst continuous cycling due to the receipt of errors is occurring on all main channels.



CCITT-46990

FIGURE A-1/S.13

Channel arrangement for a four-character repetition cycle



CCITT-47000

FIGURE A-2/S.13

Channel arrangement for an eight-character repetition cycle

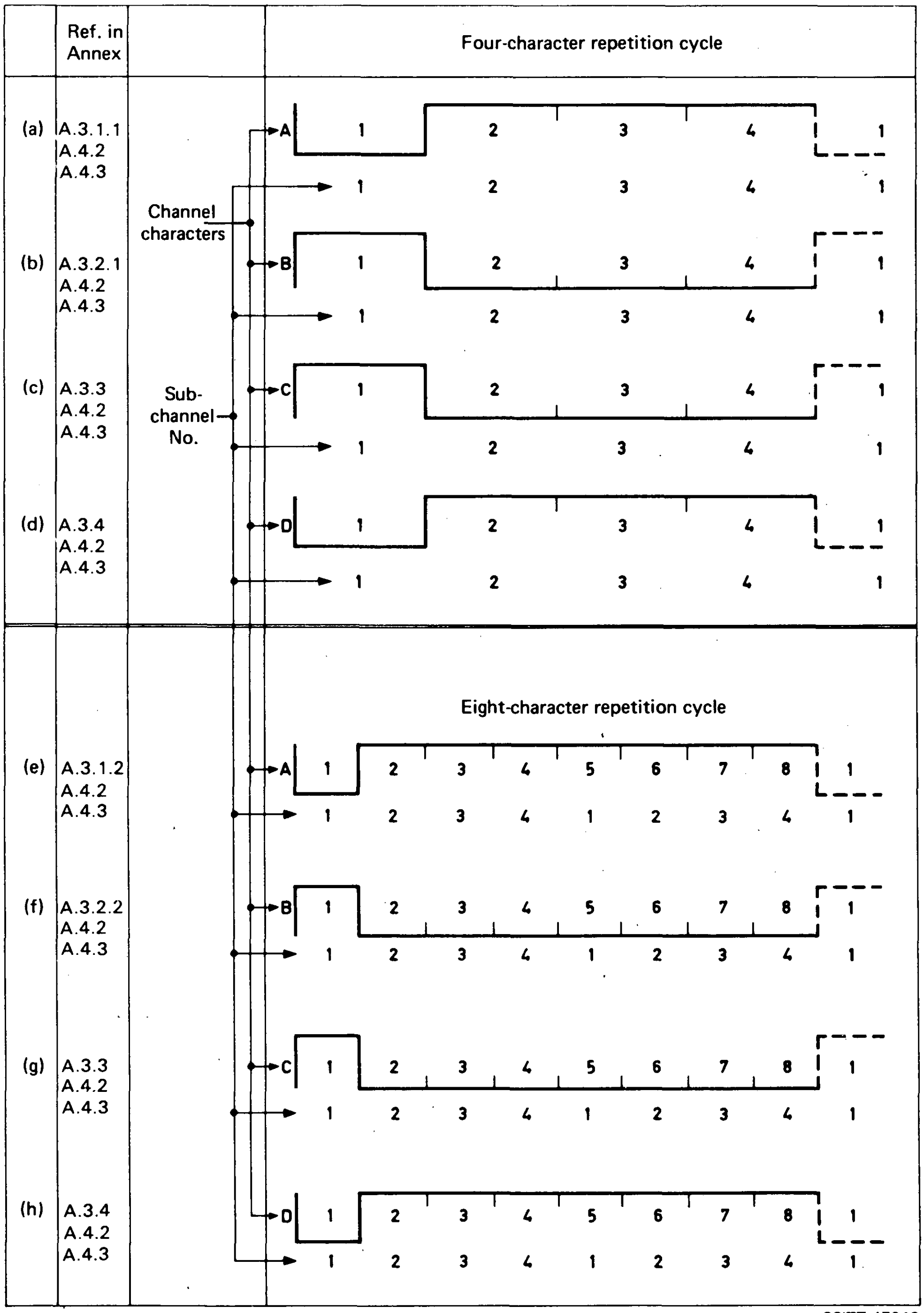


FIGURE A-3/S.13
Subchannelling arrangements for a four- and eight-character repetition cycle

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 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.

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.

References

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

[2] CCITT Recommendation *Telex and gentex signalling on radio channels (synchronous 7-unit systems affording error correction by automatic repetition)*, Vol. VII, Fascicle VII.1, Rec. U.20.

[3] CCITT Recommendation *Operator recall on a telex call set up on radiotelegraph circuit*, Vol. VII, Fascicle VII.1, 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*, Vol. VII, Fascicle VII.1, Rec. U.22.

[5] CCITT Recommendation *Operational provisions for the international public telegram service*, Vol. II, Fascicle II.4, Rec. F.1, § C.8.

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

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 (ITA No. 2). Users should be left free to decide how combinations should be allocated to the various components of the alphabet (of course ITA No. 2 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 ITA No. 2

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 (ITA No. 3).

In all cases item e) 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*, Vol. II, Fascicle II.4, Rec. F.60.

[2] CCITT Recommendation *Signalling conditions to be applied in the international telex service*, Vol. VII, Fascicle VII.1, 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*, Vol. VII, Fascicle VII.1, Rec. U.22.

[4] CCITT Recommendation *Operator recall on a telex call set up on a radiotelegraph circuit*, Vol. VII, Fascicle VII.1, 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)

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 (ITA No. 2)].

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.

TABLE 1/S.16
Correspondence between significant states

Circuit condition	Logic level	Voltage level		Signal	Condition
		Rec. V.28	Rec. V.10		
ON	0	$\geq +3$ V	$\geq +0.3$ V	Start	A
OFF	1	≤ -3 V	≤ -0.3 V	Stop	Z

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 201, 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 201 and 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 ø means that the DCE disconnects them from the line.

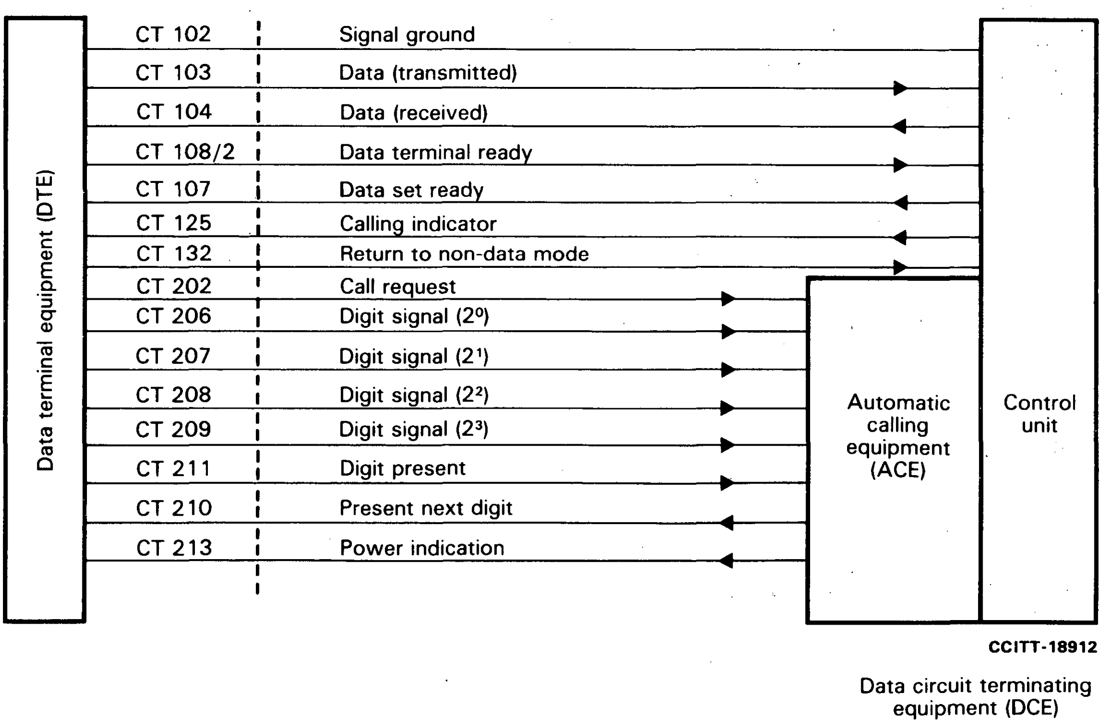


FIGURE 1/S.16
Interface for automatic calling (dial selection)

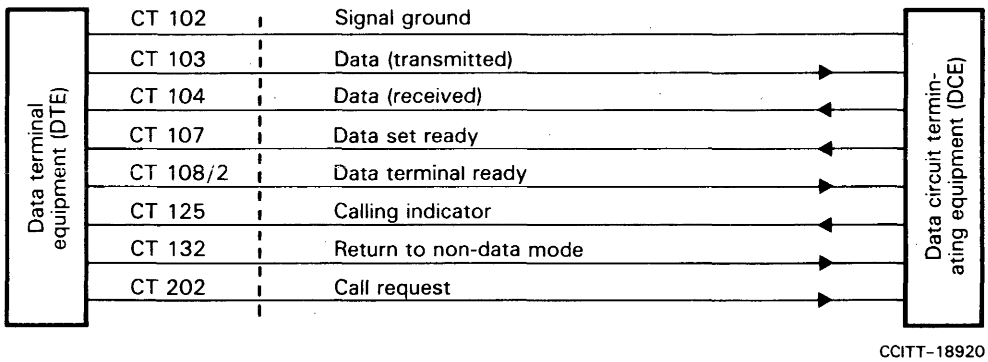


FIGURE 2/S.16
Interface for automatic calling (keyboard selection)

Notes to Figures 1/S.16 and 2/S.16

a) CT 106 and 109, which are unnecessary for telegraph operation, have been suppressed. CT 107 indicates that the DCE is ready to receive the selection information.

b) With keyboard selection, the selection signals (start-stop ITA No. 2) are of the same type as the "data" signals. They are therefore transmitted serially by the DTE on CT 103.

c) CT 108/2, which is mainly used to indicate that the DTE is ready to receive a call, also serves, when OFF, to initiate clearing of a call.

d) CT 203 is not essential since the proceed-to-select signal is indicated by CT 107 and, in the event of call collision in automatic calling, the simultaneous ON condition of CT 125 and 202 informs the DTE that it must abandon its call attempt to permit acceptance of the incoming call.

e) CT 202 may also be suppressed by assigning the calling function to CT 108/2. The latter, which should then be designated CT 108/1, would fulfil the functions of CT 108/2 and 202.

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 ITA No. 2), 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 ITA No. 2 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:

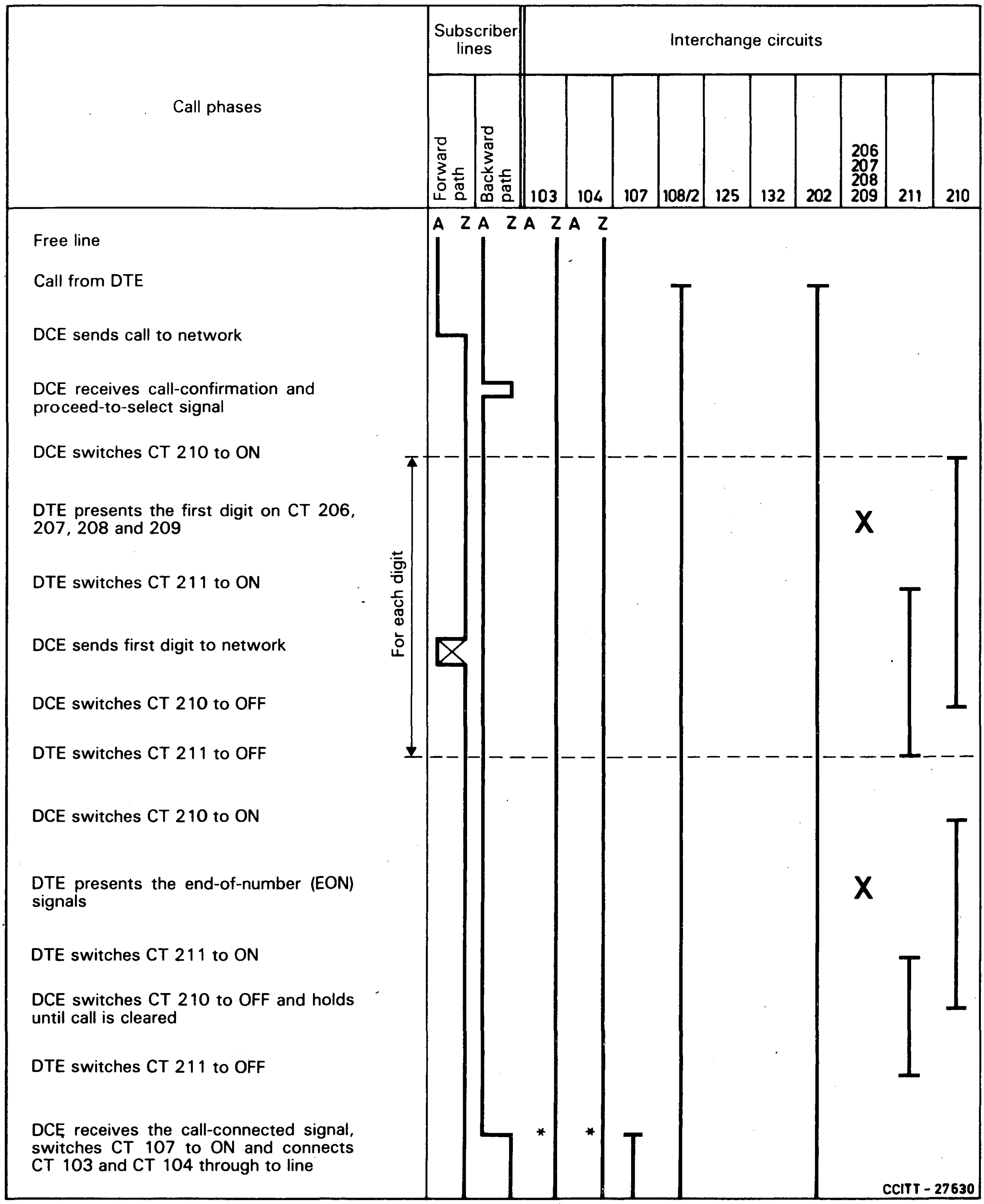
A/B	telex answer-back code
DCE	data circuit terminating equipment
DTE	data terminal equipment
ms	millisecond
SSSS	transfer sequence (see § 3.4 above)
s	second
WRU	"Who are you?" sequence (combination No. 4 in figure case)
*	CT 103 and 104 connected to line
ø	CT 103 and 104 disconnected from line
– – – –	a broken line indicates that the circuit may be either ON or OFF

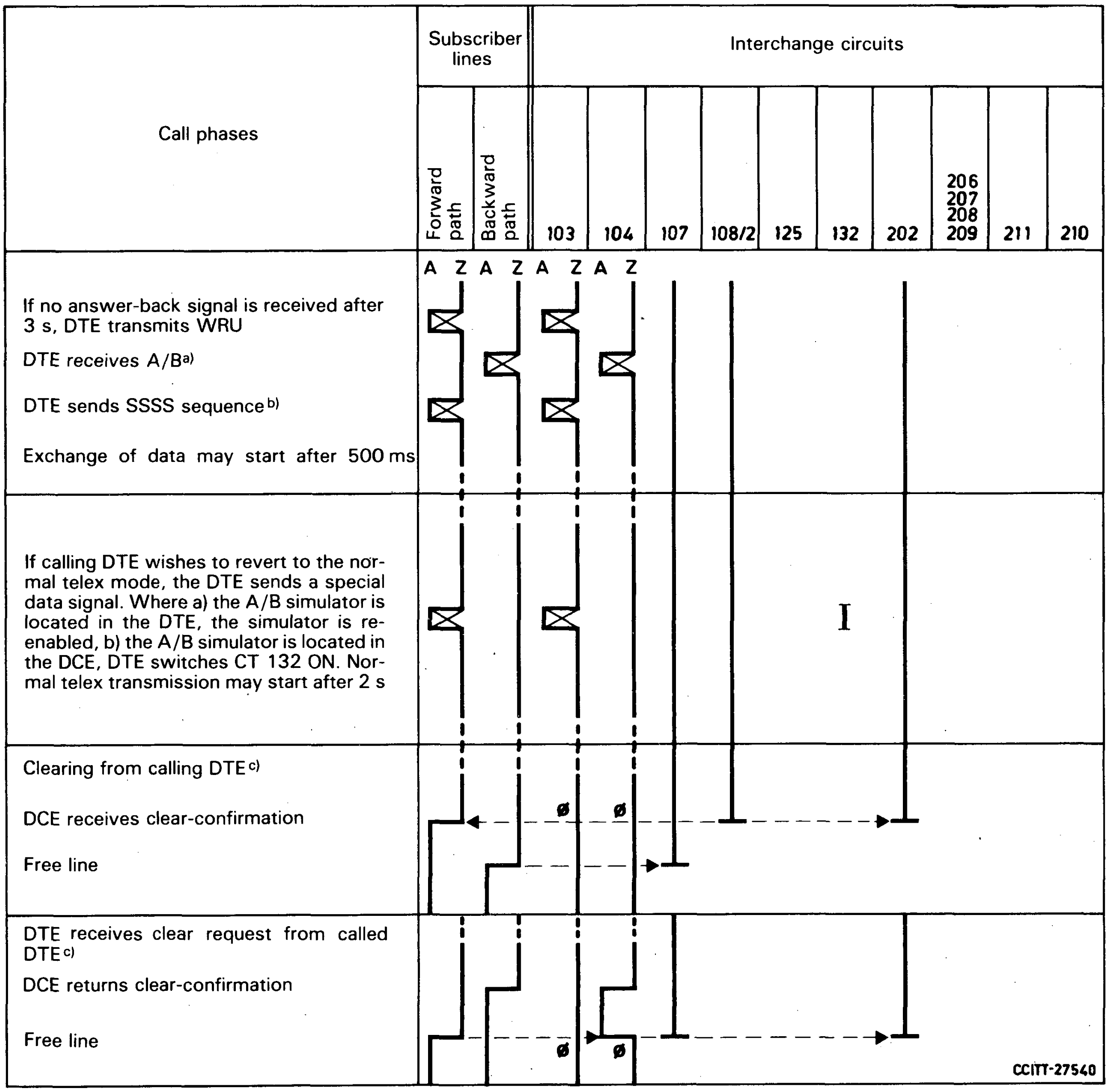
ANNEX A

(to Recommendation S.16)

Automatic call by DTE

(dial selection)





[a] If an A/B simulator is provided in the DCE, then this must not respond to the WRU.

[b] This SSSS sequence is recognized by:

a) the DTE, if the A/B simulator is located in the DTE;

b) the DCE, if the A/B simulator is located in the DCE.

In either case the A/B simulator is disabled.

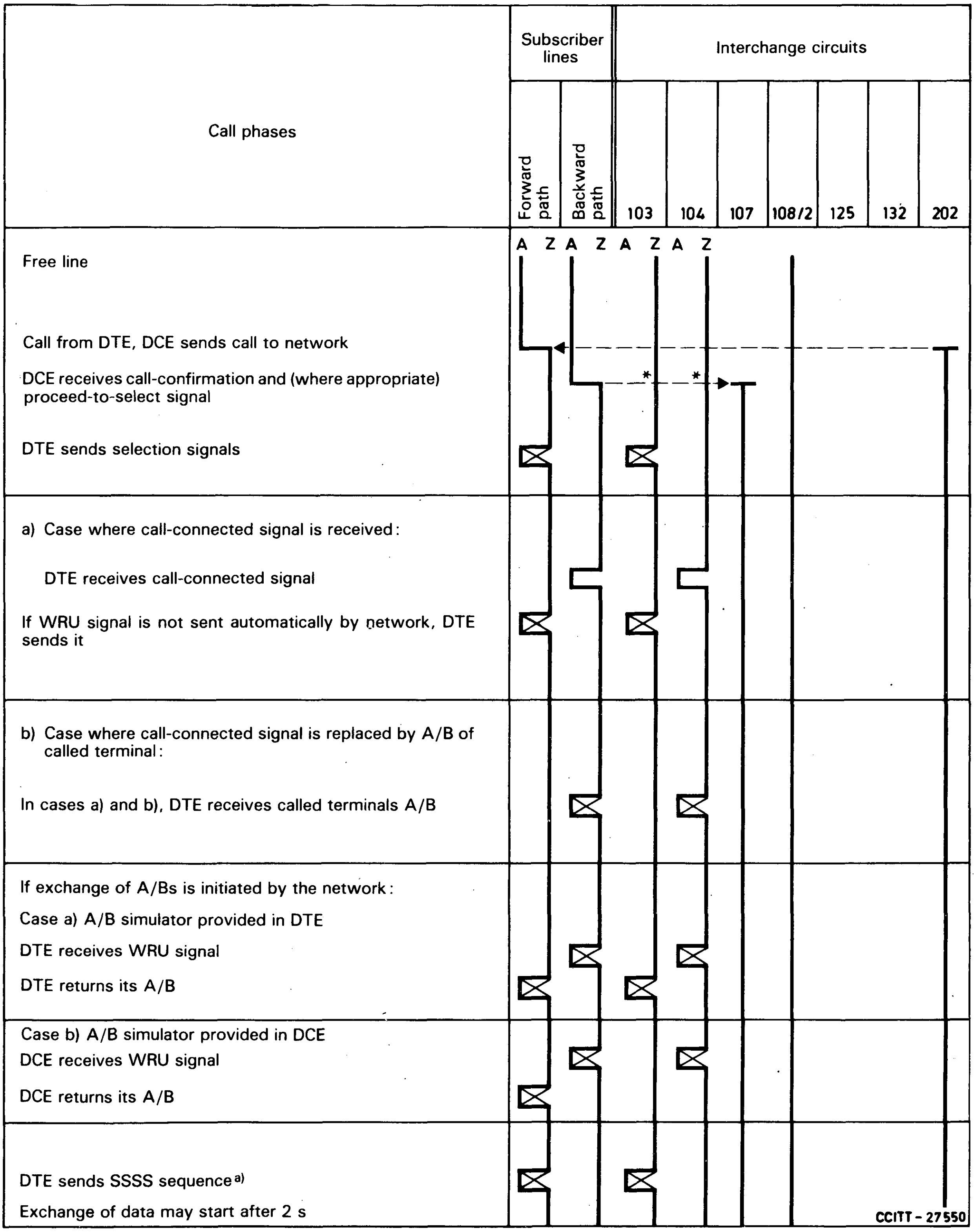
[c] If the A/B simulator is located in the DCE and is disabled, it is re-enabled.

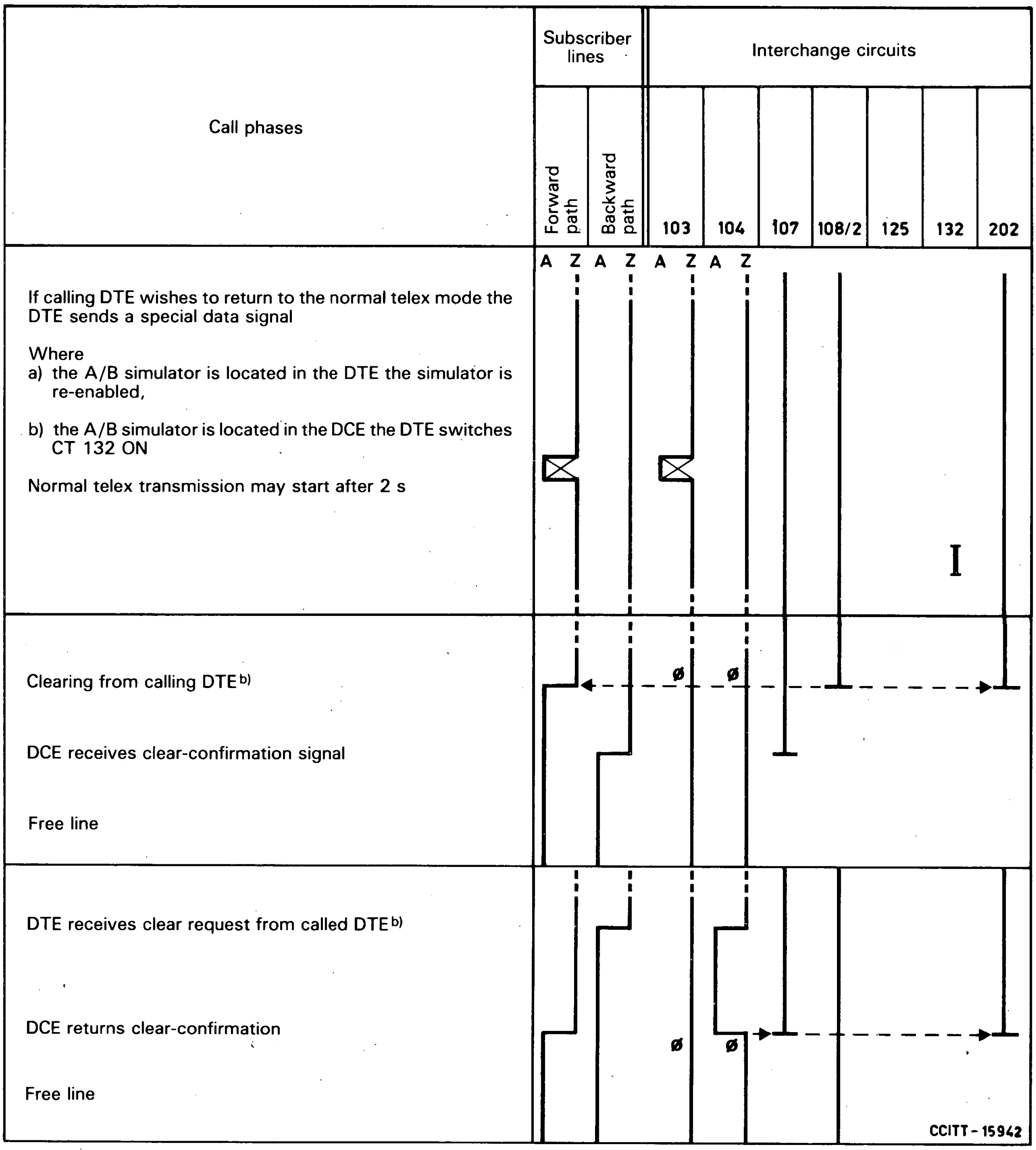
ANNEX B

(to Recommendation S.16)

Automatic call by DTE

(keyboard selection)





a) This SSSS sequence is recognized by:
a) the DTE, if the A/B simulator is located in the DTE;
b) the DCE, if the A/B simulator is located in the DCE.
In either case the A/B simulator is disabled.

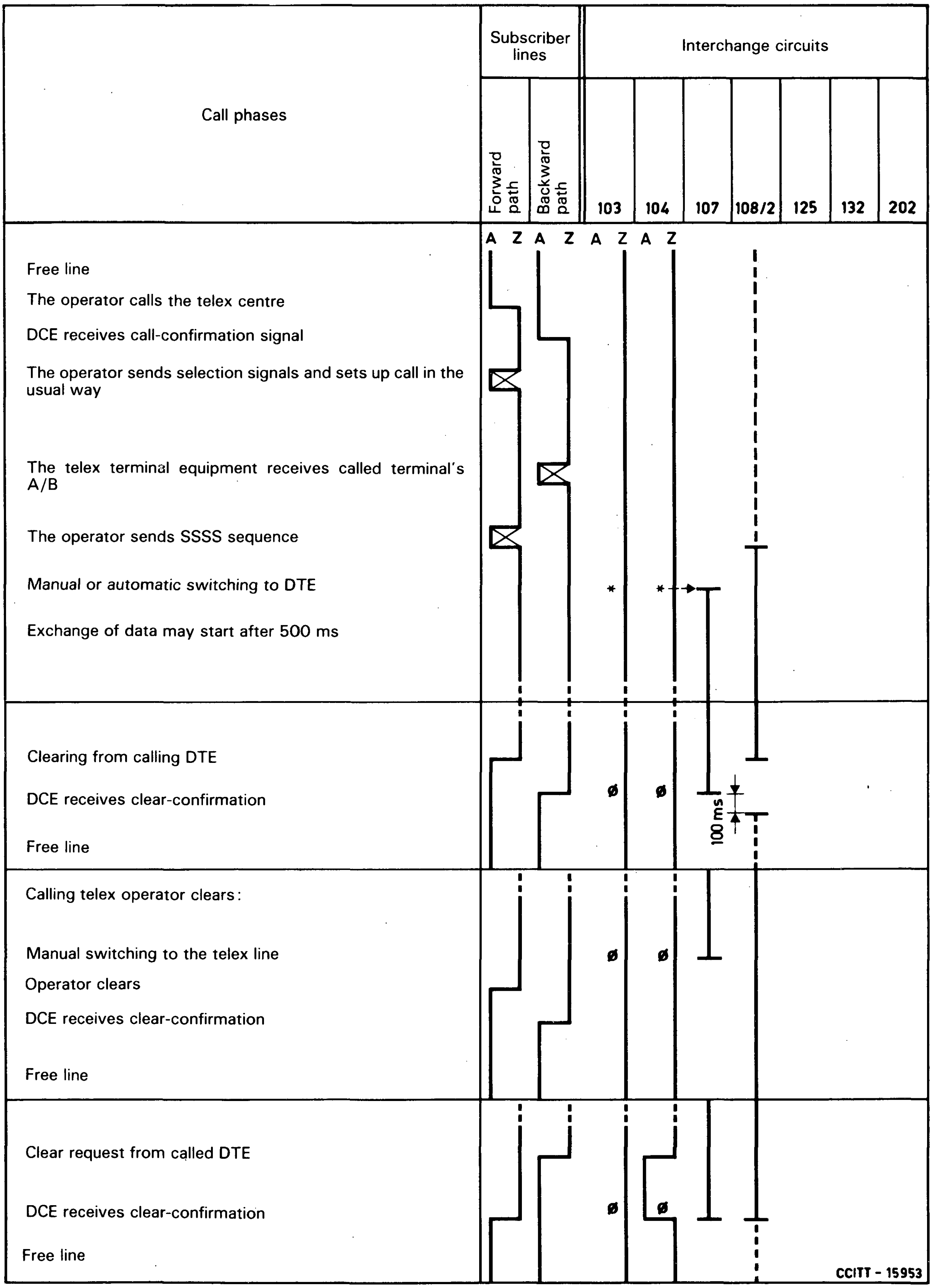
b) If the A/B simulator is located in the DCE and is disabled, it is re-enabled.

ANNEX C

(to Recommendation S.16)

Teleprinter + DTE

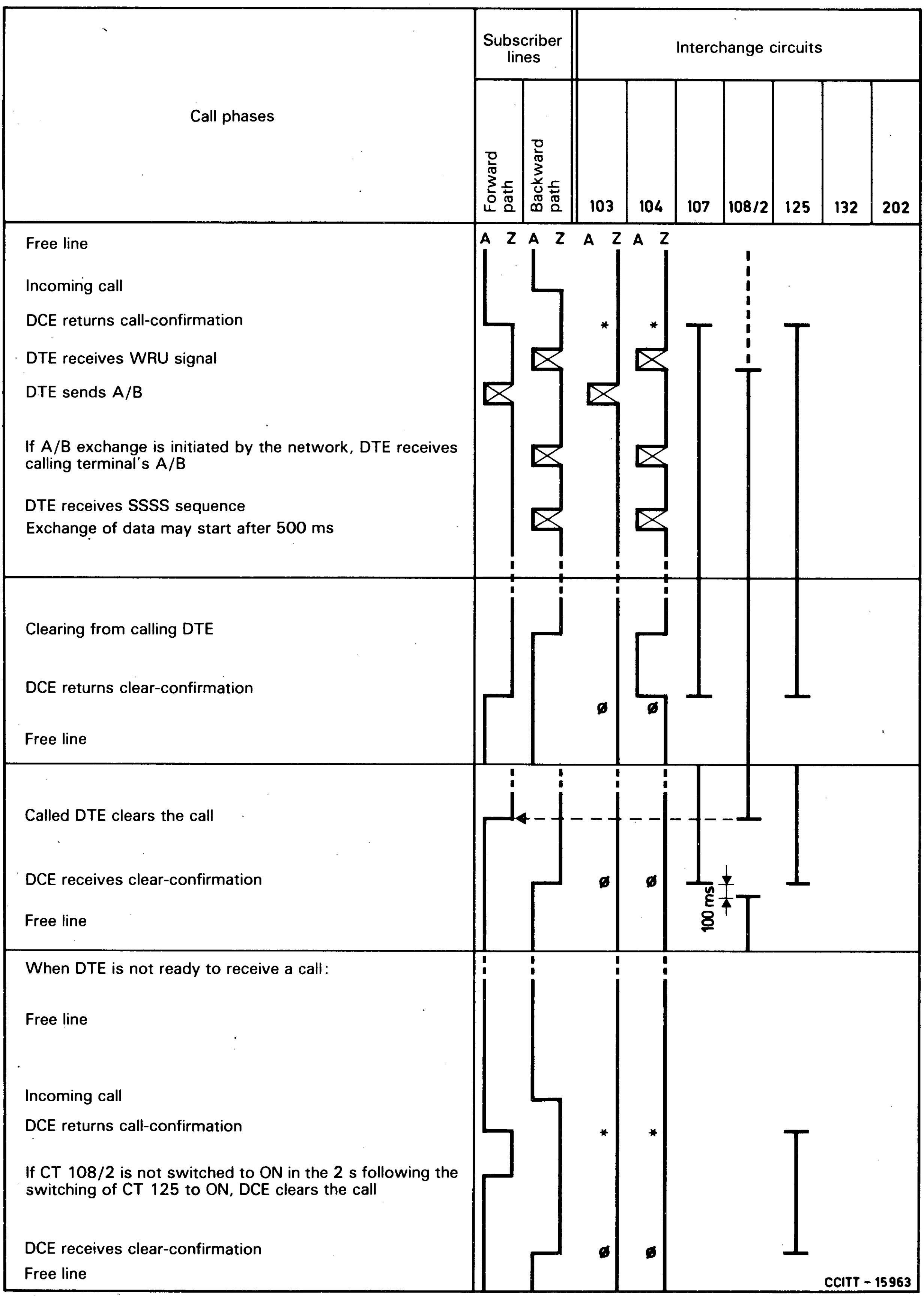
(Manual call with manual or automatic switching to DTE)



ANNEX D

(to Recommendation S.16)

Answering by DTE

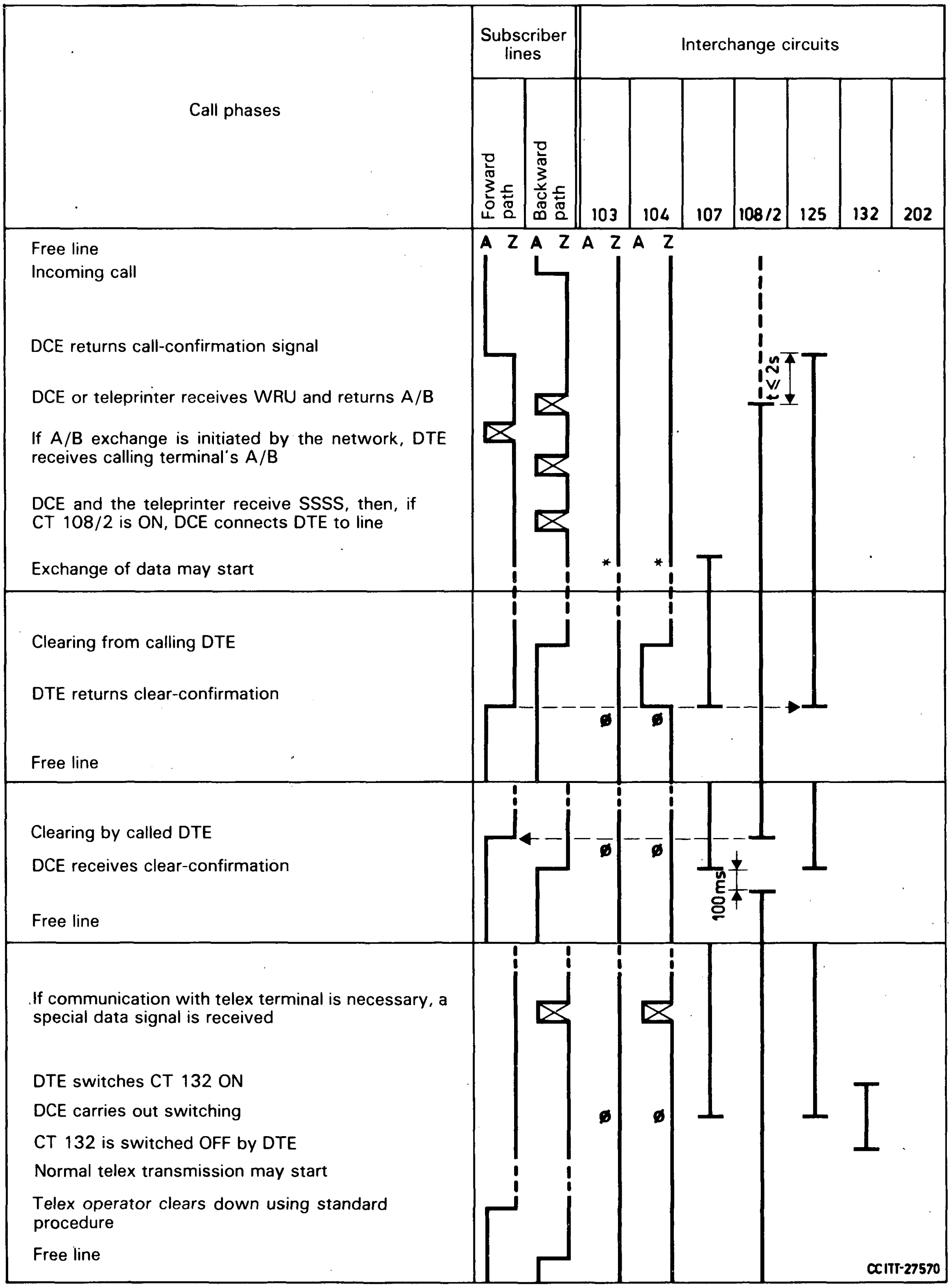


ANNEX E

(to Recommendation S.16)

Teleprinter answering

(with automatic switching to DTE)



References

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

[2] CCITT Recommendation *Standardization of dials and dial pulse generators for the international telex service*, Vol. VII, Fascicle VII.1, Rec. U.2.

[3] CCITT Recommendation *Electrical characteristics for unbalanced double-current interchange circuits*, Vol. VIII, Fascicle VIII.1, 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*, Vol. VIII, Fascicle VIII.1, Rec. V.10.

[5] CCITT Recommendation *Interconnection of private teleprinter networks with the telex network*, Vol. II, Fascicle II.4, 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*, Vol. VII, Fascicle VII.1, 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.

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 (ITA No. 2), which is used, for example, in the international telex service;

(b) that International Alphabet No. 5 (IA No. 5), defined in Recommendation V.3 [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 ITA No. 2 to IA No. 5 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 ITA No. 2 are represented as capital or small letters;

unanimously recommends

that the following rules for conversion should apply.

1 Conversion from ITA No. 2 to IA No. 5

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 IA No. 5 to ITA No. 2

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 IA No. 5 means that not every character can be translated unambiguously into a single ITA No. 2 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.

TABLE 1/S.18

Conversion from ITA No. 2 to IA No. 5

ITA No. 2 combination number	ITA No. 2 letter case	IA No. 5 Character (See Note 3)	IA No. 5 Coding	IA No. 5 Character (See Note 3)	IA No. 5 Coding	ITA No. 2 figure case	IA No. 5 Character	IA No. 5 Coding
1	**A**	**A**	4/1	**a**	6/1	–	–	2/13
2	**B**	**B**	4/2	**b**	6/2	?	?	3/15
3	**C**	**C**	4/3	**c**	6/3	:	:	3/10
4	**D**	**D**	4/4	**d**	6/4	WRU	ENQ (See Note 1)	0/5
5	**E**	**E**	4/5	**e**	6/5	**3**	**3**	3/3
6	**F**	**F**	4/6	**f**	6/6	National use		
7	**G**	**G**	4/7	**g**	6/7	National use	(See Note 4)	
8	**H**	**H**	4/8	**h**	6/8	National use		
9	**I**	**I**	4/9	**i**	6/9	**8**	**8**	3/8
10	**J**	**J**	4/0	**j**	6/10	BELL	BEL	0/7
11	**K**	**K**	4/11	**k**	6/11	(	(	2/8
12	**L**	**L**	4/12	**l**	6/12	)	)	2/9
13	**M**	**M**	4/13	**m**	6/13	.	.	2/14
14	**N**	**N**	4/14	**n**	6/14	,	,	2/12
15	**O**	**O**	4/15	**o**	6/15	**9**	**9**	3/9
16	**P**	**P**	5/0	**p**	7/0	**0**	**0**	3/0
17	**Q**	**Q**	5/1	**q**	7/1	**1**	**1**	3/1
18	**R**	**R**	5/2	**r**	7/2	**4**	**4**	3/4
19	**S**	**S**	5/3	**s**	7/3	'	'	2/7
20	**T**	**T**	5/4	**t**	7/4	**5**	**5**	3/5
21	**U**	**U**	5/5	**u**	7/5	**7**	**7**	3/7
22	**V**	**V**	5/6	**v**	7/6	=	=	3/13
23	**W**	**W**	5/7	**w**	7/7	**2**	**2**	3/2
24	**X**	**X**	5/8	**x**	7/8	/	/	2/15
25	**Y**	**Y**	5/9	**y**	7/9	**6**	**6**	3/6
26	**Z**	**Z**	5/10	**z**	7/10	+	+	2/11

ITA No. 2 combination number	ITA No. 2 character (either case)	IA No. 5 character	IA No. 5 coding
27	Carriage-return	FE_5	0/13
28	Line-feed	FE_2	0/10
29	Letter-shift	(See Note 2)	
30	Figure-shift	(See Note 2)	
31	Space	SP	2/0
32	Not normally used	(See Note 4)	0/0

Note 1 – This character is used only to operate the answer-back unit of the corresponding instrument in the international public services.

Note 2 – These characters have no corresponding function in IA No. 5. Conversion equipment operates the appropriate shift and discards the characters.

Note 3 – Small or capital letters may be used, however intermixing of small and capital letters is not allowed.

Note 4 – These characters have no international allocation.

TABLE 2/S.18

Conversion from IA No. 5 to ITA No. 2

	0	1	2	3	4	5	6	7
0	NUL / ?	DLE / ?	SP / SP	0 / 0	@ / ?	P / P	` / ?	p / P
1	SOH / ?	DC$_1$ / ?	! / ?	1 / 1	A / A	Q / Q	a / A	q / Q
2	STX / ?	DC$_2$ / ?	" / ?	2 / 2	B / B	R / R	b / B	r / R
3	ETX / ?	DC$_3$ / ?	# / ?	3 / 3	C / C	S / S	c / C	s / S
4	EOT / ?	DC$_4$ / ?	¤ / ?	4 / 4	D / D	T / T	d / D	t / T
5	ENQ / WRU	NAK / ?	% / ?	5 / 5	E / E	U / U	e / E	u / U
6	ACK / ?	SYN / ?	& / ?	6 / 6	F / F	V / V	f / F	v / V
7	BEL / BEL	ETB / ?	' / '	7 / 7	G / G	W / W	g / G	w / W
8	FE$_0$ / ?	CAN / ?	(/ (	8 / 8	H / H	X / X	h / H	x / X
9	FE$_1$ / ?	EM / ?	) /)	9 / 9	I / I	Y / Y	i / I	y / Y
10	FE$_2$ / LF	SUB / ?	* / ?	: / :	J / J	Z / Z	j / J	z / Z
11	FE$_3$ / ?	ESC / ?	+ / +	; / ?	K / K	[/ ?	k / K	{ / ?
12	FE$_4$ / ?	IS$_4$ / ?	, / ,	< / ?	L / L	\ / ?	l / L	| / ?
13	FE$_5$ / CR	IS$_3$ / ?	— / —	= / =	M / M	] / ?	m / M	} / ?
14	SO / ?	IS$_2$ / ?	. / .	> / ?	N / N	^ / ?	n / N	— / ?
15	Si / ?	IS$_1$ / ?	/ / /	? / ?	O / O	— / ?	o / O	DEL / removed

IA No. 5 / ITA No. 2

CCITT-43810

Note – Characters allocated to letter case or figure case are specified in Table 1/S.18. The current converted character must be preceded by the appropriate shift character if a change of case is required, i.e. if the last shift that occurred differs from the required one.

ANNEX A

(to Recommendation S.18)

Alternative conversions between IA No. 5 and ITA No. 2

A.1 Recommendation S.18 permits alternative conversions for characters that have no direct equivalents, provided these conversions are agreed between interchange parties. Other alternatives may be used.

A.2 Tables A-1/S.18 and A-2/S.18 list conversions that are in use in some countries.

A.3 In some nationally adapted applications of ITA No. 2 and IA No. 5, special conversion rules are required because national characters have been allocated in different orders in the coded character sets concerned.

A.4 NUL is equivalent to *all space* (combination No. 32 or NU) in ITA2.

TABLE A-1/S.18

Examples of alternative conversions from ITA No. 2 to IA No. 5

ITA No. 2				IA No. 5		
Alternative	Case	Combination No.	Character	Character	Code	Remarks
a)	Figure Figure Figure	6 7 8	National use	SUB SUB SUB	1/10 1/10 1/10	
b)	Figure Figure Figure	6 7 8	National use		5/11 5/12 5/13	See § A.3
c)	Figure Figure Figure	6 7 8	National use		7/11 7/12 7/13	See § A.3
d)	Either Either	29 30	Letter shift Figure shift	IS_2 IS_1	1/14 1/15	
e)	Either Either	29 30	Letter shift Figure shift	DEL DEL	7/15 7/15	
f)	As e) but with additional agreement that only shift characters following the first one are converted to 7/15. The first one is treated according to Table 1/S.18.					
g)	Either	32	NU	NUL	0/0	See § A.4

TABLE A-2/S.18

Examples of alternative conversions from IA No. 5 to ITA No. 2

IA No. 5		ITA No. 2		Remarks
Code	Character	Characters	Combinations	
0/0	NUL	NU	32	See § A.4
0/1 0/2 0/3 0/4 0/6 1/1 1/5 1/6 1/7	SOH STX ETX EOT ACK DLE NAK SYN ETB	)?)	12 (right parenthesis) 2 (question mark) 12 (right parenthesis) in figure case	Alternative conversions where characters not removed from the character string by the link control equipment or by convention
0/8 0/9 0/11 0/12 0/14 0/15 1/1 1/2 1/3 1/4 1/8 1/9 1/10 1/11 1/12 1/13	FE_0 FE_1 FE_3 FE_4 SO SI DC_1 DC_2 DC_3 DC_4 CAN EM SUB ESC IS_4 IS_3	)?)	12 (right parenthesis) 2 (question mark) 12 (right parenthesis) in figure case	
1/14 1/15	IS_2 IS_1	Letter-shift Figure-shift	29 30	See also Table A-1/S.18. Combinations 29 and 30 may be used with either case

2/1
2/2
2/3
2/4
2/5
2/6
2/10
3/11
3/12
3/14
4/0
5/14
5/15
6/0
7/11
7/12
7/13
7/14
	!
	"
	#
	¤
	%
	&
	*
	;
	<
	>
	@
	^
	_
	`
	{
	|
	}
	‾
		(?)	11 (left parenthesis)
			2 (question mark)
			12 (right parenthesis)
			in figure case	

5/11 5/12 5/13	[\\ ]	National use options	6 7 in figure case 8	See § A.3

7/11
7/12
7/13
	{
	|
	}
		National use options	6
			7 in figure case
			8
				See § A.3

7/15	DEL	Letter-shift	29	

Note – Use of *new line* requires additional agreement between the interchange parties.

References

[1] CCITT Recommendation *Operational provisions for the international public telegram service*, Vol. II, Fascicle II.4, Rec. F.1, § C.

[2] CCITT Recommendation *International Alphabet No. 5*, Vol. VIII, Fascicle VIII.1, Rec. V.3.

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.

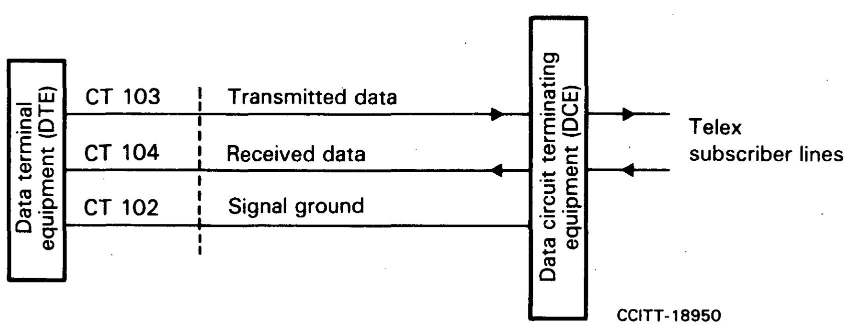


FIGURE 1/S.19
Interface configuration

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.

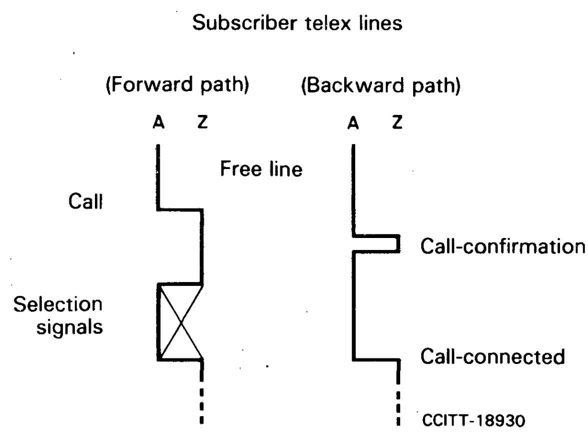


FIGURE 2/S.19
Type B call establishment

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.

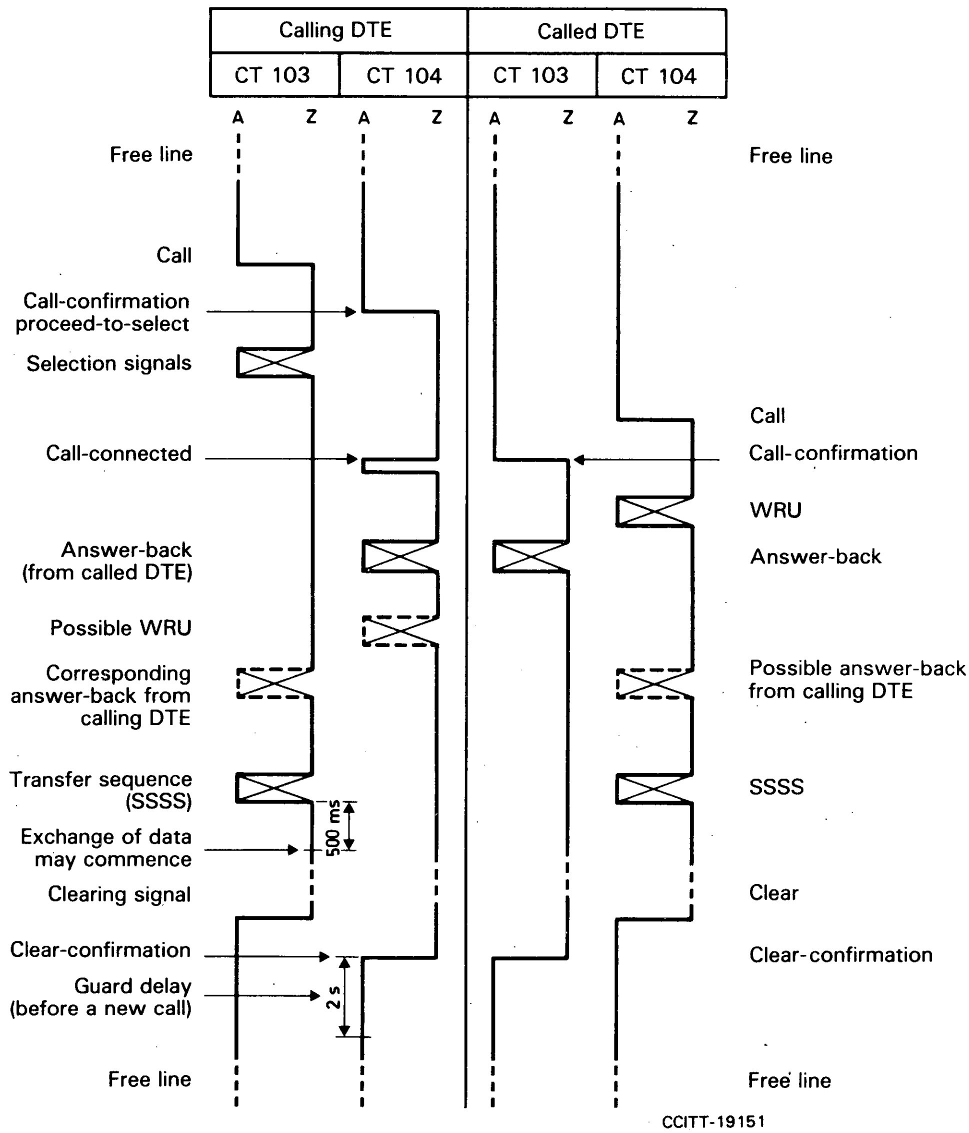


FIGURE 3/S.19
Timing diagram

References

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

[2] CCITT Recommendation *Electrical characteristics for unbalanced double-current interchange circuits*, Vol. VIII, Fascicle VIII.1, 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*, Vol. VIII, Fascicle VIII.1, 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*, Vol. VII, Fascicle VII.1, Rec. U.40.

AUTOMATIC CLEARING PROCEDURE FOR A TELEX TERMINAL

(Geneva, 1980)

The CCITT,

considering

(a) that new equipment should be capable of automatic performance of functions that would normally require an operator;

(b) that those operator functions that involve repetitive work or idle waiting on the part of an operator should be considered most immediately for automation of a terminal;

(c) that one of the most straightforward operator functions that could benefit from automatic assistance is the clearing of a call;

(d) that conditions for automatic establishments of calls are laid down in Recommendation U.40 [1] whereas this Recommendation assumes that an operator is present to initiate the calling condition;

unanimously recommends

that the following procedure should be adopted for new equipment to assist operators by automatically providing a clearing down procedure following automatic transmission of a message.

1 The activation of this automatic procedure should be under the control of the operator, so that either manual control, or automatic control, can be selected according to the requirements of a particular call.

2 It is assumed that connection to the desired subscriber has already been established, and that the correctness of this connection has been confirmed by examination of the answer-back sequence received from the called subscriber.

3 It is also assumed that the message to be transmitted is ready for release to line via the automatic transmitter.

4 The subsequent procedure may be described as a series of steps as follows:

a) Operate the special control that initiates the following automatic transmission and clearing procedure.

b) (Optional, according to national requirements). The equipment transmits a WRU signal in order to obtain a sample of the answer-back sequence of the called subscriber. This sequence is stored for subsequent checking.

   Note – If step b) is not implemented it may be desirable to modify the subsequent procedure. For example, step h) may also be eliminated, with corresponding changes to step g) and step k). Also, if this check procedure is not considered to be necessary, it may be desirable to reduce the period of alarm in step m) to less than 30 seconds before the terminal automatically clears the call.

c) Automatic transmission is started.

d) At any time during the automatic transmission the detection of incoming signals, or transmission failure, will cause an alarm to be raised, as at step l). Automatic transmission will also be stopped. If the incoming signals are not sustained, but consist of only an isolated pulse or a single spurious character, the automatic transmission may be resumed after a maximum delay of one second. The alarm may continue until clearance of the call.

   Note – Transmission failure may be detected as, for example, failure of paper tape feed or loss of transmitted signals.

e) The end of automatic transmission is detected locally by the tape-out contacts of the tape reader, or by the recognition of the transmission of an end of message pattern or by other means arranged within the terminal.

f) The terminal then automatically transmits the combinations No. 30 (figure-shift) and No. 4 (WRU) and awaits reception of the called subscriber's answer-back.

g) If the called subscriber's answer-back is received in less than six seconds the terminal immediately follows it by step h), otherwise it proceeds to step k).

h) If the received answer-back code is the same as the stored answer-back (step b) the terminal makes step i), otherwise it proceeds to step l).

i) The terminal transmits its own answer-back signal.

j) A clearing signal is initiated, and maintained until a clear confirm signal is recognized. This is followed by assumption of the free line condition.

k) If the called subscriber's answer-back is not received within six seconds, or if it differs in more than one character from that stored in step b), then step f), the transmission of figure-shift and WRU is repeated once more. If this results in the reception of a called subscriber's answer-back that is identical with that stored in step b), then the terminal proceeds to step i), otherwise to step l).

l) An alarm is operated to attract an operator's attention. This alarm may be the same as that used for combination No. 10 (Bell) or it may be a separate alarm provided for the purpose.

m) If the operator does not cancel the alarm and restore manual control of the terminal functions within 30 seconds, the terminal moves to step i), sending its own answer-back and automatically clearing the call.

Note – In the case of a connection's being established over a circuit involving storage, e.g. involving error correction facilities, the six-seconds period of waiting for an answer-back may be inadequate. The manual control of the procedure by the operator, following the alarm, is considered necessary in this case.

Reference

[1] CCITT Recommendation *Reactions by automatic terminals connected to the telex network in the event of ineffective call attempts or signalling incidents*, Vol. VII, Fascicle VII.1, Rec. U.40.

Recommendation S.21

USE OF DISPLAY SCREENS IN TELEX MACHINES

(Geneva, 1980)

The CCITT,

considering

(a) that any terminal machine connected to the telex network should meet the basic operational and technical requirements laid down in Recommendations F.60 [1], S.3, S.4, S.6, S.8 and S.9;

(b) that a visual display screen facilitates message preparation and automatic calling in the telex service;

(c) that it is important that the operator should not be interrupted in his work of preparing messages by an incoming call, except that the operator may need to be alerted if combination No. 10 in figure case in International Telegraph Alphabet No. 2 is received on the incoming line;

(d) that customer confidence in correct delivery of a telexed message requires that all signals sent or received by a telex terminal should be recorded in a permanent form;

unanimously declares the following views

1 Transmission of the answer-back should be in accordance with Recommendations S.6 and S.9.

2 It is essential that any telex terminal include a printer that records at least all the signals sent or received on the line. Such signals do not necessarily need to be presented on the display screen.

3 It should be possible to transmit a message prepared on the screen automatically to line and simultaneously to the local printer.

4 When a call is received, the operator should be able to prepare or to continue preparing a message by means of the keyboard, the display screen and, possibly, storage equipment. All characters received from or transmitted to line should be printed.

5 The format and content of the message appearing on the screen should be identical to those that will subsequently appear on the page copy of the calling and called subscriber's printers.

6 All the lines on the screen, except in a possible reserved area, should be available to display a message. This message may be

a) a message being prepared;

b) a message already stored in a memory;

c) a message incoming from the line.

Note 1 – In cases a) and b) the screen should constitute a *window* that the operator can move line by line over the message or the stored part of the message. It is highly desirable that the movement of the *window* over the message should stop automatically when there are no more stored characters, the last recorded line being visible at the top of the screen.

Note 2 – In case c) it is desirable that:

– the message received, apart from being printed, can be stored in the memory at the end of the call;

– that the operator can converse with his correspondent, all the characters transmitted or received being visible on the screen.

7 A reserved area of the screen, where the operator cannot write anything, may be set aside in order to warn the operator:

a) that the memory is almost exhausted; or

b) that the visible portion of the message does not include the beginning of the message.

8 The display screen and its memory should employ a line length of 69 printing characters.

Note – This number of characters may not be strictly equivalent to the number sent to line, because the code used in the memory may not be the one used in telex calls.

9 It is very important that it should be possible to erase the message only at the command of the operator and not automatically at the end of transmission, so that the operator can send the same message to other addressees.

Reference

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

USE OF "CONVERSATION IMPOSSIBLE" RESPONSE TO J/BELL SIGNALS FROM A TELEX TERMINAL

(Geneva, 1980)

The CCITT,

considering

(a) that conventional telex terminals incorporate a facility that allows an operator at one end of an established connection to attract the attention of an operator at the other end, this being achieved by transmitting J/BELL (combination No. 10 in International Telegraph Alphabet No. 2) in figure case;

(b) that technological developments and changing customer requirements have led to the introduction of the page-printing, receive-only, telex terminal, which, because of the absence of a keyboard, makes any conversational mode of operation impossible;

(c) that this limitation is not indicated to a calling station at the time the connection is established and may well result in wasted circuit time through attempts to establish contact with the called station via the J/BELL facility;

(d) that automatic calling and/or answering terminals employing data terminal equipment (DTE) and data circuit terminating equipment (DCE), in accordance with Recommendation S.16, are unlikely to have a conversational mode of operation;

(e) that technological developments and changing operational requirements may lead to the retention of messages in storage until a suitable opportunity to print-out arises;

unanimously declares the following views

1 Where a telex terminal is incapable of a conversational mode of operation, either through the absence of a keyboard or for local operational reasons, then it is highly desirable, at least in new equipment, that such a terminal be able to automatically return an appropriate service signal sequence on receipt of one or more ITA No. 2 combination No. 10 characters (i.e. BELL signals) when preceded by ITA No. 2 combination No. 30 (i.e. figure-shift).

2 The recommended sequence of signals to be returned in such circumstances should incorporate the code expression.

CI Conversation impossible

in conformity with the Recommendation cited in [1].

3 The complete sequence incorporating the code expression **CI** should have a format that corresponds with the Recommendation cited in [2], concerning service signals for ineffective calls, except that it should not be followed by the clearing signal.

4 As operators often key several repetitions of J/BELL (in figure-case) when attempting to contact a distant operator, a delay of 0.5-1.0 seconds should precede the transmission of the sequence, the delay to be measured from the stop element of the last J/BELL combination detected, there being no further characters received in that period.

References

[1] CCITT Recommendation *Operational provisions for the international telex service*, Vol. II, Fascicle II.4, Rec. F.60, § 4.1.

[2] CCITT Recommendation *Signalling conditions to be applied in the international telex service*, Vol. VII, Fascicle VII.1, Rec. U.1, § 10.1.2.

STANDARDIZATION OF BASIC MODEL PAGE-PRINTING MACHINE USING INTERNATIONAL ALPHABET No. 5

(Geneva, 1972; amended at Geneva, 1976)

The CCITT,

considering

(a) that the basic model page-printing machine is defined as having certain basic features for receiving (including printing) and/or transmitting;

(b) Recommendations V.3 [1], V.4 [2] and X.4 [3];

unanimously declares the view

1 The sets of graphics to be used should be either:

- a set of 95 characters consisting of columns 2 to 7 in the code table of International Alphabet No. 5 excluding the character DEL; or
- a smaller set of 64 characters consisting of columns 2 to 5 of the code table of International Alphabet No. 5.

If the machine is designed only for the smaller set of characters, the logic of the machine must be such that it prints the appropriate capital letters even when it receives a code combination for small letters.

Note – The interpretation, by 64-character machines, of other than alphabetic characters in columns 6 and 7 of the code table is at the discretion of Administrations for the time being.

2 The number of characters that the line of text of the basic model page-printing machine may contain should be fixed at 80.

3 To ensure the new-line function on direct printing machines:

- the transmitter must send at least n characters;
- the receiver must operate correctly on receipt of n characters.

For speeds up to and including 20 characters per second, $n = 4$. At 27.3 (corresponding to 300 bauds) and 30 characters per second, $n = 6$. The n characters consist of:

- one format effector CR (position 0/13 in International Alphabet No. 5);
- one format effector LF (position 0/10 in International Alphabet No. 5);
- the appropriate remaining number of non-printing and non-carriage moving characters (but the CR character is allowed);

4 The time elapsing between the application of power to the motor of a machine and the machine's running up to speed and being ready to receive or send characters should not exceed 600 ms. Where the machine is used in a switched network, this elapsed time shall start from the instant when an incoming call is received at the interface.

Note – Manufacturers should endeavour to minimize this time.

References

[1] CCITT Recommendation *International Alphabet No. 5*, Vol. VIII, Fascicle VIII.1, Rec. V.3.

[2] CCITT Recommendation *General structure of signals of International Alphabet No. 5 code for data transmission over public telephone networks*, Vol. VIII, Fascicle VIII.1, Rec. V.4.

[3] CCITT Recommendation *General structure of signals of International Alphabet No. 5 code for data transmission over public data networks*, Vol. VIII, Fascicle VIII.2, Rec. X.4.

TRANSMISSION CHARACTERISTICS FOR START-STOP DATA TERMINAL EQUIPMENT USING INTERNATIONAL ALPHABET No. 5

(Geneva, 1972; amended at Geneva, 1976)

The CCITT,

considering

(a) that taking into account Recommendations V.3 [1] and X.4 [2], this Recommendation applies to the characteristics, from the transmission point of view, at the interchange point between data circuit-terminating equipment and start-stop data terminal equipment using International Alphabet No. 5. Except where otherwise specified, *data terminal equipment* in this Recommendation should be understood to mean *start-stop apparatus* in the wide sense of the term, as defined in [3] i.e. it includes reperforators, service signals sent by switching equipment, signals from answer-back units, automatic transmitters, etc.;

(b) that, bearing in mind the definition of User Class of Service 1 in Recommendation X.1 [4], where it is specified that a signalling rate of 300 bit/s, a structure of 11 units per character and start-stop operation shall be used for address selection, call progress signals and data transfer;

(c) that the characteristics laid down below are those that should be evident in service conditions at the interchange point between data terminal equipment and data circuit-terminating equipment;

unanimously declares the view:

1 Equipment characteristics

1.1 The nominal modulation rate should be:

a) 300 bauds; or

b) 200 bauds.

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

1.3 The nominal duration of the transmitting cycle should be at least 11 units, the stop element lasting for at least 2 units.

1.4 The receiver must be able to translate correctly in service the signals coming from a source that appears to have a nominal transmit cycle equal to or greater than 10 units.

2 Transmitter characteristics

2.1 The degree of gross start-stop distortion of transmitted signals, measured at the interchange point between data terminal equipment and data circuit-terminating equipment, must not exceed 5%. This value applies to all working conditions of the equipment under consideration encountered during normal service, whether the signals are transmitted separately or whether they succeed one another at the maximum rate compatible with the modulation rate.

2.2 It is recommended that the measurement should be made with a start-stop distortion measuring set for two consecutive periods, each of about 15 seconds (corresponding to about 1200 transitions at 200 bauds or 1800 transitions at 300 bauds). Early distortion should be observed during one period and late distortion during the other.

3 Receiver characteristics

3.1 The effective net margin measured at the interchange point between data terminal equipment and data circuit-terminating equipment should not be less than 40% for signals corresponding to a nominal transmit cycle equal to or greater than 10 units.

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

- 11-unit cycle for the signals transmitted by the measuring apparatus;
- use of one of the signal trains specified in Recommendation S.33;
- first test with an identical distortion rate on all transitions of the signal train, obtained by lengthening the start element;
- a second test with the same rate of identical distortion on all the transitions of the signal train, but obtained in this case by shortening the start element;
- reading the margin when one error per test sentence is obtained (the margin is the lesser of the two values of the degree of distortion obtained from the two measurements);
- the length of the start element or of any data element must in no case be less than 50% of the theoretical unit element.

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 Alphabet No. 5*, Vol. VIII, Fascicle VIII.1, Rec. V.3.

[2] CCITT Recommendation *General structure of signals of International Alphabet No. 5 code for data transmission over public data networks*, Vol. VIII, Fascicle VIII.2, Rec. X.4.

[3] CCITT Definitions: *Start-stop apparatus*, Vol. X, Fascicle X.1 (Terms and Definitions).

[4] CCITT Recommendation *International user classes of service in public data networks*, Vol. VIII, Fascicle VIII.2, Rec. X.1.

Recommendation S.32

ANSWER-BACK UNITS FOR 200- AND 300-BAUD START-STOP MACHINES IN ACCORDANCE WITH RECOMMENDATION S.30

(Geneva, 1972; amended at Geneva, 1976)

The CCITT,

considering

(a) that start-stop machines are capable of receiving communications without the aid of an operator;

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

unanimously declares the view

that if the use of an automatic answer-back unit is requested, it would be advisable:

1) to effect the operation of the code transmitter by the control character ENQ, position 0/5 in the code table of International Alphabet No. 5 (Recommendation V.3 [1]);

2) to compose the code-emission by a series of 20 signals, as follows:

   1 CR (position 0/13 in the code table),

   1 LF (position 0/10 in the code table),

   2 non-printing, non-carriage moving signals (but which may include CR),

   16 signals chosen for the subscriber comprising the identification of the machine;

3) when the code signal does not comprise 16 characters, to distribute them by inserting at the beginning as many fill signals (such as DEL or NUL) as are necessary to make up the total of 16 signals;

4) that the answer-back signals follow Recommendations X.4 [2] and S.31;

5) that the delay between the reception of the beginning of the start unit of control character ENQ and the beginning of the start unit of the first signal of the answer-back sent by the machine should lie between one and four character periods.

References

[1] CCITT Recommendation *International Alphabet No. 5*, Vol. VIII, Fascicle VIII.1, Rec. V.3.

[2] CCITT Recommendation *General structure of signals of International Alphabet No. 5 code for data transmission over public data networks*, Vol. VIII, Fascicle VIII.2, Rec. X.4.

Recommendation S.33

STANDARDIZATION OF AN INTERNATIONAL TEXT FOR THE MEASUREMENT OF THE MARGIN OF START-STOP MACHINES USING INTERNATIONAL ALPHABET No. 5

(Geneva, 1972)

The CCITT

unanimously declares the view

(1) that it is not necessary to standardize a single international text for the measurement of the margin of a teleprinter;

(2) that nevertheless it would be of interest to recommend to the operating Administrations the use of one or other of the following texts (based on the international reference version of International Alphabet No. 5):

a) in case of application of the 95-character set (columns 2 to 7 in the code table):

VoyeZ Le BricK GeanT QuE J'ExaminE PreS Du WharF 123 456 7890 + − × : = ¤ % ( )

ThE QuicK BrowN FoX JumpS OveR ThE LazY DoG 123 456 7890 + − × : = ¤ % ( )

b) in case of application of the 64-character set (columns 2 to 5 in the code table):

VOYEZ LE BRICK GEANT QUE J'EXAMINE PRES DU WHARF 123 456 7890 + − × : = ¤ % ( )

THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG 123 456 7890 + − × : = ¤ % ( )

PAGE INTENTIONALLY LEFT BLANK

PAGE LAISSEE EN BLANC INTENTIONNELLEMENT

SECTION 2

TELETEX TERMINALS

Recommendation S.60

TERMINAL EQUIPMENT FOR USE IN THE TELETEX SERVICE

(Geneva, 1980)

1 Scope of Recommendations concerning the Teletex service

1.1 This Recommendation defines the requirements for terminal equipment used in the international Teletex service.

1.2 The rules to be followed in the Teletex service are defined in Recommendation F.200 [1].

1.3 The character repertoire and the coded character sets for the Teletex service are defined in Recommendation S.61.

1.4 All Teletex terminals have to communicate with unique procedures that are described as follows:

a) the interface to the transport network is defined in this Recommendation;

Note – The link level (HDLC) for circuit-switched data networks and public switched telephone networks is under study.

b) the transport end-to-end control procedure is defined in Recommendation S.70;

c) the Teletex control procedures are defined in Recommendation S.62.

2 Introduction

2.1 With the aid of a Teletex terminal it is possible to produce character-coded texts and to transmit their true contents and form to a receiving terminal.

2.2 A Teletex terminal, operating in the local mode, can also be used like a typewriter to prepare ordinary office documents. By means of the Teletex communication facilities, the text thus prepared can be transmitted to other Teletex terminals or received from them.

2.3 In this Recommendation *text* refers to character-coded text only.

2.4 Terminals can have various degrees of complexity. Within this Recommendation the emphasis is on requirements for correct interworking of different terminals.

2.5 Details are given on dimensions and positioning of text. Various dimensions refer to the presentation of text on paper. In this respect, paper formats of both 210 × 297 mm (ISO A4) and 216 × 280 mm are taken into account.

2.6 Terminals fulfilling the requirements denoted as *basic requirements* can participate in the Teletex service on a defined level of compatibility.

3 General characteristics of the terminal equipment

3.1 *Basic characteristics*

3.1.1 The Teletex terminal allows text to be communicated from any subscriber to any other subscriber.

3.1.2 All terminals participating in the international Teletex service have to be compatible with one another at the basic level defined in this Recommendation. Additional optional functions may be invoked.

3.1.3 In order to support a high grade of service, a user data rate of 2.4 kbit/s on the subscriber line is recommended wherever possible. Detailed arrangements on a national level are left to the Administrations concerned, as it is recognized that national implementation of the Teletex service on various types of network may involve national operation at different data throughput rates.

3.1.4 When operated in the local mode, e.g. when the Teletex terminal is used in the same way as an office typewriter, the operation in the local mode should not be interrupted by incoming traffic. However, under *receive store full* conditions, the production of a permanent copy of the incoming messages must have priority over the local mode.

3.1.5 In the sending mode, the Teletex terminal must be capable of sending a selection of characters that belong to the basic repertoire of graphic characters.

3.1.6 In the receiving mode, the Teletex terminal must be capable of receiving into store all characters from the basic repertoire of graphic characters.

3.1.7 The presentation device of the terminal must have the ability to represent as legibly as possible all graphic characters of the basic international Teletex character repertoire.

3.1.8 The terminal must have the ability to respond to the control functions of the basic international Teletex repertoire.

3.1.9 The use of graphic character repertoires other than the Teletex basic repertoire of graphic characters is subject to ascertaining the mutual capability of the terminals and has to be initiated by the appropriate procedural steps.

3.1.10 The page is the basis for text formatting and text transmission.

3.1.11 The terminal must be able to handle paper formats in both the vertical and horizontal orientation (see § 4.2 below).

3.1.12 A printable area of the page is defined within which free positioning of the text is possible during local text preparation (see § 4.2 below).

3.1.13 After transmission, the content, layout and format of a Teletex message must be identical at the transmitting and the receiving terminals, when using the defined basic mode of Teletex operation.

3.1.14 The Teletex terminal must be provided with storage for transmitting and receiving functions. See § 5.2 for further details.

3.1.15 The Teletex terminal must provide means for *fully automatic operation* (see definitions in Recommendation F.200 [1]).

3.1.16 For the purpose of automatic operation, an internationally agreed unique terminal identification must be provided (see § 5.1 for further details).

3.1.17 The basic Teletex terminal should provide the capability of interworking with telex. Necessary constraints on the Teletex terminal are defined in § 8.

3.1.18 Teletex terminals shall incorporate all functions defined as basic for the Teletex service in § 3.2 below. In addition, optional functions can be incorporated. In this Recommendation, the optional functions are divided into CCITT-standardized options (§ 3.3) and nationally and/or privately specified options (§ 3.4).

3.2 *Basic functions*

3.2.1 A terminal shall be capable of handling:

a) the basic end-to-end control procedures as defined in Recommendation S.62;

b) the Teletex basic graphic character repertoire;

c) the Teletex basic control function repertoire;

d) text in the basic vertical and horizontal page formats;

e) subscripts and superscripts.

3.2.2 Basic text formatting functions for printers (or other presentation devices as applicable) are as follows:

a) vertical and horizontal page orientation;

b) printable area common to A4 and 216 × 280 mm paper formats;

c) character spacing of 2.54 mm (10 characters per 25.4 mm);

d) line feed parameter values of 0.5, 1, 1.5 and 2 spacings of 4.233 mm (six spacings of 4.233 mm equals 25.4 mm);

e) free positioning of text within the printable area using the Teletex basic repertoire of graphic characters and control functions;

f) partial line up and partial line down functions (for presenting superscript and subscript).

3.2.3 The following Teletex service requirements must be met:

a) terminal identification;

b) storage for receiving and transmitting functions;

c) provisions for a permanent copy (not necessarily on paper) of all text received;

d) provisions for interworking with the telex service.

Note – The use of the terminal identification (transmission, reception) is a matter for the communication procedure (see Recommendation S.62).

3.3 *CCITT-standardized optional functions*

3.3.1 The possibility of using optional functions can be negotiated between terminals during a handshaking procedure in the end-to-end control procedure (see Recommendation S.62).

3.3.2 As the service develops, additions and changes to the CCITT-standardized optional functions listed below may be needed.

3.3.3 For the optional functions of the communication control procedures, see Recommendation S.62.

3.3.4 Optional text formatting functions for printers (or other presentation devices as applicable) are:

a) utilization of A4 printable area (see Annex B);

b) character spacing of 2.12 mm (12 characters per 25.4 mm) and 1.69 mm (15 characters per 25.4 mm) – see Annex B;

c) line feed parameter values of one spacing of 3.175 mm and 0.5, 1, 1.5 and 2 spacings of 5 mm (see Annex B);

d) reverse line feed.

3.3.5 Alternative character repertoires may be invoked by designation of CCITT-registered national and/or application-oriented character repertoires.

Note – The definition and designation of CCITT-registered national and/or application-oriented character repertoires is a matter for study in the future.

3.3.6 Facsimile mode of operation requires further study. Possible applications are:

a) communication of facsimile coded text on a per page basis;

b) communication of mixed character-coded and facsimile-coded information within the same page.

3.4 *Optional functions for national standardization or private use*

3.4.1 The CCITT standardization includes the necessary rules and means for indication of or escape into functions specified nationally or for private use (see standardized options in Recommendation F.200 [1]).

3.5 *Default conditions*

3.5.1 In the absence of specific indication, the receiving terminal shall assume the following conditions:

a) communication (as specified in Recommendation S.62):

- one way (calling terminal is transmitting text);
- normal document;

b) character repertoire – basic international Teletex character repertoire;

c) text presentation:

- vertical basic page format;
- character spacing of 2.54 mm;
- line-feed spacing of 4.23 mm (single spacing);
- default rendition.

4 Text handling

4.1 *Character repertoire*

4.1.1 The terminal, participating in the international Teletex service, can exchange text with all other Teletex terminals. To enable this communication, the international Teletex basic graphic character and control function repertoires, as defined in Recommendation S.61, shall be used.

4.1.2 On an optional basis a terminal can use other national and/or application-oriented character repertoires registered by CCITT. The rules for the code extension technique will be included later in Recommendation S.61.

4.2 *Paper sizes and printable areas*

4.2.1 If the Teletex terminal is capable of printing text on paper, it has to act like a normal office typewriter. Therefore the following applies.

4.2.2 There are countries that use ISO A4 paper size (210 × 297) or North-American paper size (216 × 280 mm) of which the common area is 210 × 280 mm.

4.2.3 Printable areas are defined for both the vertical and horizontal orientation of the paper, and are expressed by the number of line positions and character positions shown in Table 1/S.60.

4.2.4 The printable areas include an allowance for printing with an offset of 2.12 mm above the first base line and 2.12 mm below the last base line for superscripts and subscripts respectively.

4.2.5 For the definitions of the printable areas in Table 1/S.60 certain assumptions about technical and operational problems have been taken. Further details about these assumptions are given in Annex A.

TABLE 1/S.60

Basic printable areas

Paper orientation		Vertical	Horizontal
Maximum number of lines per page	Line spacing (mm) 4.23 6.35 8.47	 56 37 28	 39 26 19
Maximum number of characters per line	Character spacing (mm) 2.54	 77	 105

4.2.6 It is not the intention of this Recommendation to define precisely the location and the size of the printable areas on paper sheets. However, the design of printing equipment shall always provide for the maximum number of lines and the maximum number of characters per line as shown in Table 1/S.60.

Note – The optional use of preprinted forms needs further study.

4.2.7 Optional printable areas are found in Annex B.

4.3 *Page format*

4.3.1 The size of the communicated text area, vertically or horizontally oriented, is one line spacing less than the defined maximum printable area, to allow for presentation of the call identification line.

4.3.2 For each text area a home position is defined. See Recommendations S.61 and F.200 [1].

Note – The home positions for different character spacings are shown in Figure B-1/S.60.

5 Communications

5.1 *Terminal identification*

5.1.1 Each Teletex terminal is equipped with a unique identification. Details of the identification are given in Recommendation F.200 [1].

5.2 *Storage*

5.2.1 The terminals have to be equipped with a memory for reception, transmission and undisturbed local operation.

5.2.2 The storage ability of a terminal to receive incoming traffic may be established by control procedures prior to message transmission.

5.2.3 If the transmission has to be terminated as a result of insufficient storage at the receiving end, indication of this condition will be given to both the transmitting and receiving parties.

5.2.4 The storage capacity shall be sufficient to meet the quality of service criteria laid down in Recommendation F.200 [1].

5.2.5 Terminal design and/or operating procedures shall be such as to minimize the possibility of loss of messages due to power failure or memory failure (for example by the use of nonvolatile memory or by forced print-out as appropriate).

5.3 *Call identification*

5.3.1 The Teletex procedures include the exchange of reference information prior to sending any document. Details of the call identification line are covered in Recommendation F.200 [1].

6 Network-dependent requirements

6.1 Teletex transport can be provided by a circuit-switched data network (CSDN), a packet-switched data network (PSDN) or a public switched telephone network (PSTN). In all three types of network the Teletex terminal will provide automatic answering, transmission, reception and clearing.

6.2 *Circuit-switched data network*

a) functional and procedural aspect on the interface: Recommendation X.21 [2];

b) with external DCE – mechanical and electrical characteristics of the interface: Recommendation X.21 [2];

c) date and time may be provided by the network at the originator side;

d) bit rate: 2.4 kbit/s;

e) link procedure: HDLC (details for further study, e.g. duplex/half duplex).

6.3 *Public switched telephone network*

For study (interface, automatic dialling, HDLC, etc.)

6.4 *Packet-switched data network*

a) functional and procedural aspects on the interface: Recommendation X.25 [3], levels 1, 2, 3;

b) duplex transmission;

c) bit rates: 2400, 4800, 9600, 48 000 bit/s;

d) number of logical channels at a time: one, or more than one.

7 Indicators

7.1 Indicators should inform about situations in which negative effects on the grade of service can be expected.

7.2 The following indicators are required:

a) terminal unable or soon unable to receive (e.g. receiving memory nearly full);

b) operator assistance required (e.g. for change of printing element);

c) message received in store.

8 Interworking between Teletex terminals and telex terminals

8.1 The restriction of the graphic character set to that of International Telegraph Alphabet No. 2 (ITA No. 2) should be performed in the Teletex terminal.

8.2 During the interworking, the Teletex terminal is allowed to send only those characters of ITA No. 2 that form a subset of the basic Teletex character repertoire, as specified in Table C-1/S.60 (coded in accordance with Recommendation S.61).

8.3 The line length is restricted to 69 characters.

8.4 The Teletex terminal, when interworking with telex, operates at the Teletex terminal's normal data signalling rate.

8.5 The control procedure between the Teletex terminal and the conversion facility shall be as described in Recommendation S.62.

Note – A conversion facility has to provide the conversion of coding, code frame, procedure, formatting, data signalling rate and other service characteristics.

ANNEX A

(to Recommendation S.60)

Explanations of the printable areas

A.1 The content of this annex does not form part of the requirements laid down by this Recommendation; instead it gives explanations of how the printable areas in Table 1/S.60 were defined.

A.2 The maximum printable area is defined to be the paper area available to the printing mechanism onto which graphic information can be technically impressed.

A.3 The following parameters were considered:

a) the use of a common paper area of 210 × 280 mm;

b) the worst case conditions for tolerances of paper size and of paper insertion as in Figure A-1/S.60;

c) the need to have the paper sheet held secure in the paper feed mechanism during the whole printout;

d) the use of line spacings of 4.23, 6.35 and 8.47 mm and a character spacing of 2.54 mm. The values for line spacings are rounded off to two decimal places (six spacings of 4.23 mm equal 25.4 mm);

e) the location of characters and base lines on a paper sheet as shown in Figure A-2/S.60;

f) the allowance to print exponents and indices with an offset of not more than 2.12 mm above and below the first and last base lines respectively.

A.4 The parameters in § A.3 lead to the values for the position of the first and last printable characters as in Table A-1/S.60 and Figure A-2/S.60, and are given as examples only.

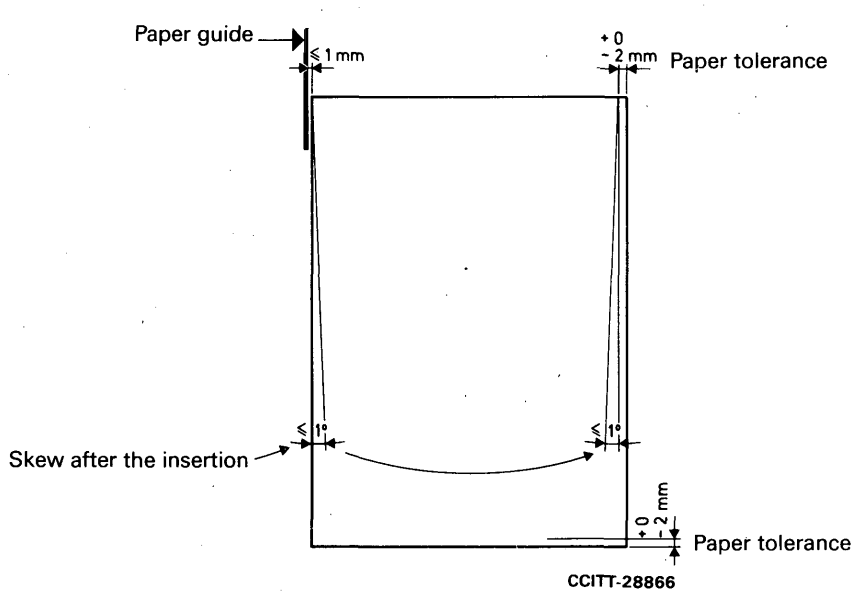
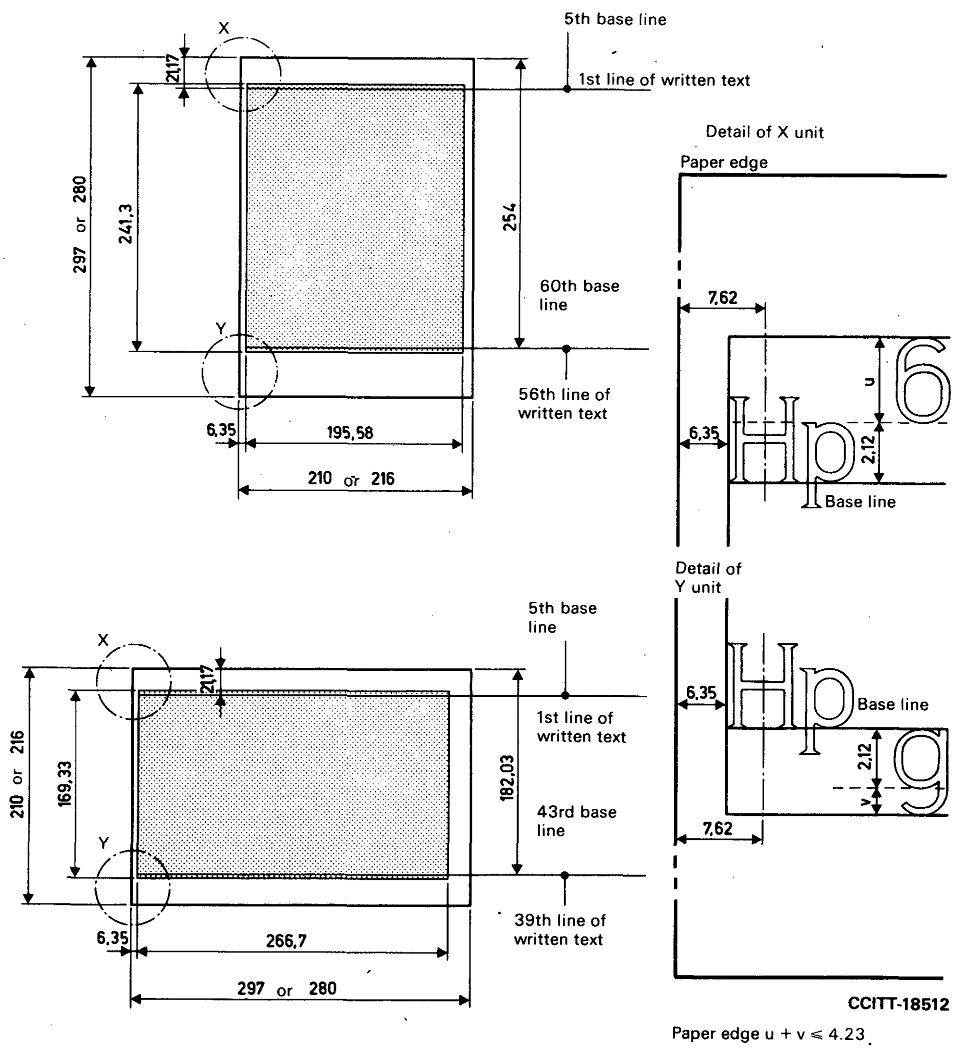


FIGURE A-1/S.60

TABLE A-1/S.60

	Base line position		Character position
	Orientation		for 2.54 mm character spacing
First printable positions	Vertical	Horizontal	
	5	5	3
Last printable positions	60	-	79
	-	43	107



Note 1 – Dotted area indicates the maximum printable area.
Note 2 – All values are nominal, given in mm and rounded to two decimal places.
Note 3 – The line spacing is defined as 6 lines per 25.4 mm and the character spacing as 10 characters per 25.4 mm.

FIGURE A-2/S.60

ANNEX B

(to Recommendation S.60)

Standardized options for printable areas

This annex contains standardized optional values for different sizes of maximum printable areas.

B.1 *Options for presentation within the basic maximum printable areas*

B.1.1 Table B-1/S.60 contains the values for the usage of different optional character and line spacings.

B.1.2 In Figure B-1/S.60, the location of the home position for different character spacings is defined.

TABLE B-1/S.60

Options for presentation within the basic maximum printable area

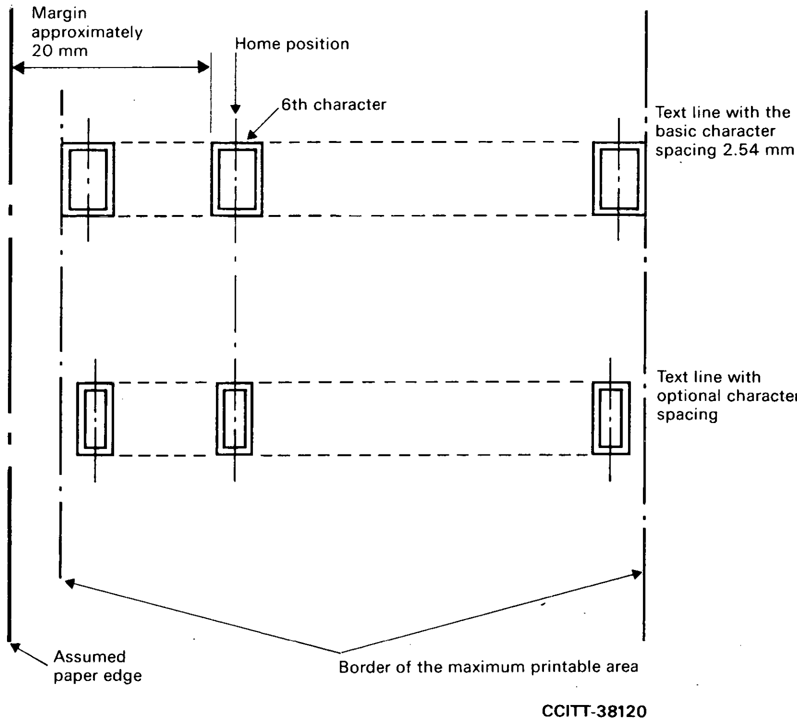
(see § 4)

Paper orientation		Vertical	Horizontal
Maximum number of lines per page	Line spacing (mm) 3.175 5	The maximum number of lines per page is under evaluation	
Maximum number of characters per line[a)]	Character spacing (mm) 2.12 1.69	92 (6 + 86)[a)] 115 (7 + 108)[a)]	125 (6 + 119)[a)] 156 (7 + 149)[a)]

[a)] The figures in parentheses indicate:
1) the number of characters to the left of the home position (see Figure B-1/S.60); and
2) the number of characters to the right side including the home position character.

B.2 *Options for presentation within ISO A4 paper size*

B.2.1 With the same assumptions as used for the basic printable areas and described in this Recommendation (§ 4 and Annex A), the appropriate maximum printable areas for the ISO A4 paper sheet (210 × 297 mm) and the values for different optional presentation attributes are found in Table B-2/S.60.



Note 1 – The home position is defined as the 6th character position within the maximum printable area using the character spacing 2.54 mm.

The Figure shows the home position aligned with the centre of the character field. It is permissible to use the left side of the character or character field as the home position.

Note 2 – This home position shall be used for all other optional character spacings (see Table B-2/S.60).

FIGURE B-1/S.60

Definition of the home position

TABLE B-2/S.60

Optional printable areas and associated values for ISO A4 paper size

Paper orientation		Vertical	Horizontal
Maximum number of lines per page	Line spacing (mm) 4.23 6.35 8.47	 60 40 30	 39 26 19
Maximum number of characters per line [a)b)]	Character spacing 2.54 2.12 1.69	 77 (5 + 72) 92 (6 + 86) 115 (7 + 108)	 110 (5 + 105) 132 (6 + 126) 165 (7 + 158)

[a)] See footnote [a)] to Table B-1/S.60.

[b)] The home position is defined in Figure B-1/S.60.

ANNEX C

(to Recommendation S.60)

Conversion table between the Teletex repertoire and the telex repertoire for Teletex/telex interworking

TABLE C-1/S.60

ITA No. 2 Combination No.	Telex repertoire	Teletex repertoire	Identifier (Recommendation S.61)
Letter case			
1	**A**	**a** or **A**	LA01 or LA02
2	**B**	**b** or **B**	LB01 or LB02
3	**C**	c or **C**	LC01 or LC02
.	.	.	.
.	.	.	.
.	.	.	.
24	**X**	x or **X**	LX01 or LX02
25	**Y**	y or **Y**	LY01 or LY02
26	**Z**	z or **Z**	LZ01 or LZ02
Figure case			
1	–	–	SP10
2	?	?	SP15
3	:	:	SP13
4	WRU	Note 1	
5	**3**	**3**	ND03
6	Nat. use	Note 2	
7	Nat. use	Note 2	
8	Nat. use	Note 2	
9	**8**	**8**	ND08
10	BELL	Note 1	
11	(	(	SP06
12	)	)	SP07
13	.	.	SP11
14	,	,	SP08
15	**9**	**9**	ND09
16	**0**	**0**	ND10
17	**1**	**1**	ND01
18	**4**	**4**	ND04
19	'	'	SP05
20	**5**	**5**	ND05
21	**7**	**7**	ND07
22	=	=	SA04
23	**2**	**2**	ND02
24	/	/	SP12
25	**6**	**6**	ND06
26	+	+	SA01
Either case			
27	CR	CR	CF15
28	LF	LF	CF12
29	letter-shift	Note 3	
30	figure-shift	Note 3	
31	SP	SP	SP01
32	NU	Note 1	

Note 1 – Not defined in the Teletex repertoire. It will not be transmitted from the conversion facility to the Teletex terminal.

Note 2 – The use of these characters is not defined in international Teletex/telex interworking.

Note 3 – This character is only used for communication between conversion and telex terminal and is not transmitted to the Teletex terminal.

ANNEX D

(to Recommendation S.60)

Definitions

D.1 **printable area**

A printable area is defined to be the paper area available to the printing mechanism onto which graphic information can be technically impressed.

D.2 **page**

A page is the basic element of office correspondence in the Teletex service. This term defines the information that can be presented on one A4 (or North American standard) sheet of paper. This information may be stored, displayed or printed.

D.3 **text**

Text is information for human comprehension that is intended for presentation in a two-dimensional form, e.g. printed on paper or displayed on a screen. Text consists of symbols, phrases or sentences in natural or artificial languages, pictures, diagrams and tables.

References

[1] CCITT Recommendation *Telex service*, Vol. II, Fascicle II.4, Rec. F.200.

[2] CCITT Recommendation *Interface between data terminal equipment (DTE) and data circuit terminating equipment (DCE) for synchronous operation on public data networks*, Vol. VIII, Fascicle VIII.2, Rec. X.21.

[3] CCITT Recommendation *Interface between data terminal equipment (DTE) and data circuit terminating equipment (DCE) for terminals operating in the packet mode on public data networks*, Vol. VIII, Fascicle VIII.2, Rec. X.25.

Recommendation S.61

CHARACTER REPERTOIRE AND CODED CHARACTER SETS FOR THE INTERNATIONAL TELETEX SERVICE

(Geneva, 1980)

CONTENTS

1 Introduction

1.1 This Recommendation contains detailed definitions of the repertoires of graphic characters and control functions to be used in the basic international Teletex service, and their coded representations for communication. Additionally, the means are described whereby supplementary character repertoires and their coded representations may optionally be used.

1.2 In the Teletex service, control functions may be communicated as coded characters within the text or by means of the control procedures. This Recommendation defines the repertoire and coding of the former category.

1.3 The character repertoires and coded character sets for Teletex are not intended to replace International Alphabet No. 5 (IA No. 5) or International Telegraph Alphabet No. 2 (ITA No. 2). This Recommendation, based on Recommendation V.3 [1], provides an extended alphabet for use in the international text communication service *Teletex*. Where characters of IA No. 5 are not required for Teletex, their code table positions have been left unused; thereby, compatibility with IA No. 5 is assured. The resulting subset of IA No. 5 has been extended by the definition of additional coded character sets.

1.4 The development of the coded character set defined in this Recommendation is based on the use of an 8-bit structure for the basic Teletex service.

1.5 This Recommendation should be read in conjunction with the following Recommendations:

S.60 – Terminal equipment for use in the Teletex service;

S.62 – Control procedures for the Teletex service;

F.200 [2] – Teletex service.

1.6 The following Recommendations and ISO standards are also relevant:

V.3 [1] International Alphabet No. 5;

ISO 646 [3] 7-bit coded character set for information processing interchange (equivalent to Recommendation V.3 [1]);

ISO 2022 [4] Code extension techniques for use with the ISO 7-bit coded character set;

ISO 6429 [5] Additional control functions for character-imaging devices;

ISO 6937 [6] Coded character set for text communication.

1.7 This Recommendation contains ordered lists of graphic characters and control functions forming the Teletex basic repertoire, together with the coded character sets necessary for their communication. For this purpose, the elements of the coded character sets are used either individually or in defined combinations.

1.8 The optional use of additional character repertoires is provided for, but the composition of such repertoires is not defined. Similarly, the code extension techniques for the representation of the additional repertoires are described in general, but no specific allocations of code tables are made.

2 Definitions

2.1 format effectors

F: caractères de mise en page

S: determinantes de formato

Control functions that influence the positioning of text, within the text area, on a presentation device. The following concepts are used in defining format effectors.

2.1.1 active position

F: position active

S: posición activa

The character position where the next character would appear if it were presented;

2.1.2 **text area**

F: zone de texte

S: zona de texto

The part of a printed page that is actually used for the presentation of text. The active position moves within the text area only. For Teletex, the text area is the *maximum printable area* (see Recommendation S.60);

2.1.3 **home position**

F: position initiale

S: posición inicial

The reference position on any line to which the active position moves after a terminal receives a *Carriage return.* The starting position for printing is then established from this reference position by the sending terminal, using *Space* or *Backspace* characters as required.

2.2 **presentation control functions**

F: fonctions de commande pour la présentation

S: funciones de control de la presentación

Control functions that influence in a uniform way the presentation attributes of the text (e.g. line spacing or page format) on a presentation device.

2.3 **graphic code extension**

F: extension de code graphique

S: ampliación del código gráfico

The method of encoding graphic characters in excess of those that may be represented by the 8-bit code combinations of the basic code table. Alternative sets of 94 graphic characters may be *designated* by means of escape sequences and *invoked* by means of shift functions. Depending on the designating escape sequence, the alternative sets of characters are represented by bit combinations of the left-hand half (positions 2/1 to 7/14 inclusive) or the right-hand half (positions 10/1 to 15/14 inclusive) of the 8-bit code table.

In the basic Teletex service, escape sequences and shift functions are not used. The primary set of graphic characters defined in § 4.1.3.3 is implicitly designated and invoked into positions 2/1 to 7/14 of the 8-bit code table. The supplementary set of graphic characters defined in § 4.1.3.4 is implicitly designated and invoked into positions 10/1 to 15/14 of the 8-bit code table.

Note – As an enhancement to the basic Teletex service, national or application-oriented sets of graphic characters may be designated by means of appropriate escape sequences, thereby overlaying the primary and supplementary sets. Return to the primary and supplementary sets is accomplished by similar escape sequences.

The principles of graphic code extension to accommodate enhancements to the basic Teletex service are for further study (Question 20/VIII [7]). The form of these extension techniques should satisfy the needs for compatibility and ease of transcoding between the 7-bit and 8-bit environments (see Annex A).

2.4 **Teletex character repertoire**

F: répertoire des caractères télétex

S: repertorio teletex de caracteres

The total range of graphic characters and control functions that may be communicated between Teletex terminals.

2.5 **Teletex graphic character repertoire**

F: répertoire des caractères graphiques télétex

S: repertorio teletex de caracteres gráficos

The total range of graphic characters that may be communicated between and presented by Teletex terminals.

2.6 **Teletex basic graphic character repertoire**

F: répertoire des caractères graphiques télétex de base

S: repertorio teletex básico de caracteres gráficos

A comprehensive list of graphic characters whose communication is guaranteed by the Teletex service, and which are capable of being presented on all Teletex terminals.

2.7 **Teletex control function repertoire**

F: répertoire des fonctions de commande télétex

S: repertorio teletex de funciones de control

The total range of control functions communicated between Teletex terminals to enable the action of the receiving terminal to be controlled.

2.8 **Teletex basic control function repertoire**

F: répertoire des fonctions de commande télétex de base

S: repertorio teletex básico de funciones de control

A comprehensive list of control functions communicated between Teletex terminals whose effect on the receiving terminal is defined and guaranteed by the service.

2.9 **other Teletex character repertoires**

F: autres répertoires de caractères télétex

S: otros repertorios teletex de caracteres

National or application-oriented lists of graphic characters and control functions, in addition to the Teletex basic repertoires of graphic characters and control functions, that may be communicated between Teletex terminals by mutual agreement.

Note – Specific additional character repertoires may be the subject of CCITT Recommendations.

2.10 **character**

F: caractère

S: carácter

A member of a set of elements that is used for the organization control or representation of data. A character repertoire contains two types of elements: graphic characters and control functions.

2.11 **control function**

F: fonction de commande

S: función de control

An action that affects the recording, processing, transmission or interpretation of data. The coded representation of a control function consists of one or more bit combinations. A control function is not a graphic character, but may have a graphic representation in some circumstances (e.g. for record purposes). It must not, however, be transmitted with the specific intent of producing a graphic representation.

2.12 **control character**

F: caractère de commande

S: carácter de control

A control function, the coded representation of which consists of a single bit combination.

2.13 **graphic character**

F: caractère graphique

S: carácter gráfico

A character, other than a control function, that has a visual representation normally hand-written, printed or displayed. The term *graphic character* is used with a dual meaning:

a) Graphic characters that are elements of a set that can be designated. These are called *elementary graphic characters* in order to distinguish them from the *composite graphic characters*. Some of the elementary graphic characters are used in combinations to represent composite graphic characters.

b) Graphic characters that are members of a repertoire. Some of these are *composite graphic characters* represented by combinations of *elementary graphic characters.*

2.14 **presentation**

F: présentation

S: presentación

The printing or display of a stored character or characters to allow for human comprehension of the stored information.

2.15 **bit combination**

F: combinaison d'éléments binaires

S: combinación de bits

An ordered set of bits that represents a character.

2.16 **code, coded character set**

F: code, jeu de caractères codés

S: código, juego de caracteres codificados

A set of unambiguous rules that establish a character set and the one-to-one relationship between the characters of the set and their bit combinations.

2.17 **code table**

F: tableau de code

S: tabla de código

A table showing the character corresponding to each bit combination in a code. A code table is normally represented as a rectangular matrix of columns and rows.

2.18 **position**

F: position

S: posición

An item in a code table identified by its column and row coordinates.

2.19 **code extension**

F: extension de code

S: ampliación del código

Techniques for encoding characters that are not included in the character set of a given code.

2.20 **escape sequence**

F: séquence d'échappement

S: secuencia de escape

A bit string that is used for control purposes in code extension procedures and that consists of two or more bit combinations. The first of these combinations corresponds to the character *escape.*

2.21 **to designate**

F: désigner

S: designar

To identify a set of characters that are to be represented, in some cases immediately and in others on the occurrence of a further control function, in a prescribed manner.

2.22 **to invoke**

F: appeler

S: invocar

To cause a designated set of characters to be represented by the prescribed bit combinations whenever those bit combinations occur, until an appropriate code extension function occurs.

3 Teletex character repertoire

3.1 *General*

3.1.1 The Teletex character repertoire is composed as defined below and as illustrated in Figure 1/S.61.

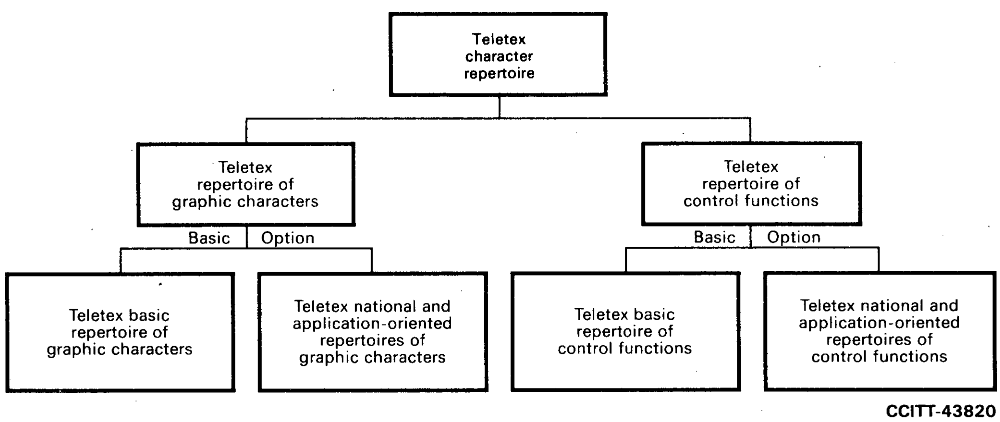


FIGURE 1/S.61
Teletex character repertoire

3.1.2 The Teletex character repertoire consists of the *Teletex repertoire of graphic characters* and the *Teletex repertoire of control functions.*

3.1.3 The Teletex repertoire of graphic characters consists of the *Teletex basic repertoire of graphic characters* and the *Teletex national and application-oriented repertoires of graphic characters.* The basic repertoire of graphic characters is defined in § 3.2.

3.1.4 The Teletex repertoire of control functions consists of the *Teletex basic repertoire of control functions* and the *Teletex national and application-oriented repertoires of control functions.* The basic repertoire of control functions is defined in § 3.3.

3.1.5 The Teletex basic repertoire of graphic characters, together with the Teletex basic repertoire of control functions, constitute the Teletex basic character repertoire.

3.1.6 Bit combinations or sequences of bit combinations that do not represent graphic characters or control functions of the Teletex basic character repertoire, are not defined in this Recommendation.

Note – With the Teletex sets of coded graphic characters and control functions it is, in principle, possible to produce combinations of diacritical marks and graphic characters other than those defined in the Teletex basic graphic character repertoire. However, the presentation of such composite symbols at the receiving terminal cannot be predicted and is therefore not defined in this Recommendation.

3.1.7 Sequences of graphic characters and control functions that would result in the presentation of two or more graphic characters in a single character position are not defined in this Recommendation.

Note – It is possible, in text preparation, to overlay graphic symbols by the use of the control functions BS, SP, CR and RLF. However, no character of the Teletex basic graphic character repertoire shall be transmitted over the communication medium by this means. As it is normal office practice to create graphic symbols by overlaying graphic characters, the user cannot be prevented from using the keyboard to image locally composite symbols and the Teletex service shall not exclude the possibility of the transmission of these overlaid graphic symbols. The presentation of such overlaid graphic symbols at the receiving terminal cannot be predicted and is, therefore, not defined in this Recommendation. An indication of the terminal capability to present overlaid graphic characters will be exchanged prior to message transmission.

3.1.8 The control functions of the Teletex basic repertoire enable a receiving terminal to produce a document that is identical in contents, layout and format, to that produced by the sending terminal.

3.1.9 The use of character repertoires other than the basic repertoire of graphic characters is subject to mutual agreement between terminals and shall be initiated by the appropriate procedural steps.

3.2 *Teletex basic repertoire of graphic characters*

3.2.1 *General*

3.2.1.1 The repertoire of graphic characters defined in this Recommendation consists of:

a) Latin alphabetic characters, listed in § 3.2.2, which comprise:

  i) the 52 small and capital letters of the basic Latin alphabet;

  ii) accented letters and umlauts, the graphical representations of which consist of combinations of basic Latin letters and diacritical marks;

  iii) alphabetic characters that are neither basic Latin letters nor combinations of basic Latin letters and diacritical marks;

b) nonalphabetic characters, listed in § 3.2.3, which comprise decimal digits, currency signs, punctuation marks (including *Space*), diacritical marks, arithmetic signs, miscellaneous symbols that have individual special meanings and nonspacing characters.

3.2.1.2 The lists in §§ 3.2.2 and 3.2.3 are composed as described below:

a) the first column contains the identifier of each character, assigned in accordance with the identification system explained in Annex C;

b) the second column presents the graphical representation of the character;

c) the third column specifies the name or the description of the character.

Note – The repertoire of graphic characters defined in this Recommendation contains a limited set of accented letters and umlauts. This set is summarized in Annex B.

3.2.2 *Latin alphabetic characters*

Identifier	Graphic	Name or description
LA01	a	small a
LA02	A	capital A
LA11	á	small a with acute accent
LA12	Á	capital A with acute accent
LA13	à	small a with grave accent
LA14	À	capital A with grave accent
LA15	â	small a with circumflex accent
LA16	Â	capital A with circumflex accent
LA17	ä	small a with diaeresis or umlaut mark
LA18	Ä	capital A with diaeresis or umlaut mark
LA19	ã	small a with tilde
LA20	Ã	capital A with tilde
LA23	ă	small a with breve
LA24	Ă	capital A with breve
LA27	å	small a with ring
LA28	Å	capital A with ring
LA31	ā	small a with macron
LA32	Ā	capital A with macron
LA43	ą	small a with ogonek
LA44	Ą	capital A with ogonek
LA51	æ	small æ diphthong
LA52	Æ	capital Æ diphthong
LB01	b	small b
LB02	B	capital B
LC01	c	small c
LC02	C	capital C
LC11	ć	small c with acute accent
LC12	Ć	capital C with acute accent
LC15	ĉ	small c with circumflex accent
LC16	Ĉ	capital C with circumflex accent
LC21	č	small c with caron
LC22	Č	capital C with caron
LC29	ċ	small c with dot
LC30	Ċ	capital C with dot
LC41	ç	small c with cedilla
LC42	Ç	capital C with cedilla
LD01	d	small d
LD02	D	capital D
LD21	ď or d'	small d with caron
LD22	Ď	capital D with caron
LD61	đ	small d with stroke
LD62	Đ	capital D with stroke, Icelandic eth
LD63	ð	small eth, Icelandic
LE01	e	small e
LE02	E	capital E
LE11	é	small e with acute accent
LE12	É	capital E with acute accent
LE13	è	small e with grave accent
LE14	È	capital E with grave accent
LE15	ê	small e with circumflex accent
LE16	Ê	capital E with circumflex accent
LE17	ë	small e with diaeresis or umlaut mark
LE18	Ë	capital E with diaeresis or umlaut mark
LE21	ě	small e with caron
LE22	Ě	capital E with caron
LE29	ė	small e with dot
LE30	Ė	capital E with dot
LE31	ē	small e with macron
LE32	Ē	capital E with macron
LE43	ę	small e with ogonek
LE44	Ę	capital E with ogonek
LF01	f	small f

Identifier	Graphic	Name or description
LF02	F	capital F
LG01	g	small g
LG02	G	capital G
LG11	ģ	small g with acute accent
LG15	ĝ	small g with circumflex accent
LG16	Ĝ	capital G with circumflex accent
LG23	ğ	small g with breve
LG24	Ğ	capital G with breve
LG29	ġ	small g with dot
LG30	Ġ	capital G with dot
LG42	Ģ	capital G with cedilla
LH01	h	small h
LH02	H	capital H
LH15	ĥ	small h with circumflex accent
LH16	Ĥ	capital H with circumflex accent
LH61	ħ	small h with stroke
LH62	Ħ	capital H with stroke
LI01	i	small i
LI02	I	capital I
LI11	í	small i with acute accent
LI12	Í	capital I with acute accent
LI13	ì	small i with grave accent
LI14	Ì	capital I with grave accent
LI15	î	small i with circumflex accent
LI16	Î	capital I with circumflex accent
LI17	ï	small i with diaeresis or umlaut mark
LI18	Ï	capital I with diaeresis or umlaut mark
LI19	ĩ	small i with tilde
LI20	Ĩ	capital I with tilde
LI30	İ	capital I with dot
LI31	ī	small i with macron
LI32	Ī	capital I with macron
LI43	į	small i with ogonek
LI44	Į	capital I with ogonek
LI51	ĳ	small ij ligature
LI52	Ĳ	capital IJ ligature
LI61	ı	small i without dot
LJ01	j	small j
LJ02	J	capital J
LJ15	ĵ	small j with circumflex accent
LJ16	Ĵ	capital J with circumflex accent
LK01	k	small k
LK02	K	capital K
LK41	ķ	small k with cedilla
LK42	Ķ	capital K with cedilla
LK61	ĸ	small k, Greenlandic
LL01	l	small l
LL02	L	capital L
LL11	ĺ	small l with acute accent
LL12	Ĺ	capital L with acute accent
LL21	ľ or l'	small l with caron
LL22	Ľ or L'	capital L with caron
LL41	ļ	small l with cedilla
LL42	Ļ	capital L with cedilla
LL61	ł	small l with stroke
LL62	Ł	capital L with stroke
LL63	l·	small l with middle dot
LL64	L·	capital L with middle dot
LM01	m	small m
LM02	M	capital M
LN01	n	small n
LN02	N	capital N
LN11	ń	small n with acute accent

Identifier	Graphic	Name or description
LN12	Ń	capital N with acute accent
LN19	ñ	small n with tilde
LN20	Ñ	capital N with tilde
LN21	ň	small n with caron
LN22	Ň	capital N with caron
LN41	ņ	small n with cedilla
LN42	Ņ	capital N with cedilla
LN61	ŋ	small eng, Lapp
LN62	Ŋ	capital eng, Lapp
LN63	ʼn	small n with apostrophe
LO01	o	small o
LO02	O	capital O
LO11	ó	small o with acute accent
LO12	Ó	capital O with acute accent
LO13	ò	small o with grave accent
LO14	Ò	capital O with grave accent
LO15	ô	small o with circumflex accent
LO16	Ô	capital O with circumflex accent
LO17	ö	small o with diaeresis or umlaut mark
LO18	Ö	capital O with diaeresis or umlaut mark
LO19	õ	small o with tilde
LO20	Õ	capital O with tilde
LO25	ő	small o with double acute accent
LO26	Ő	capital O with double acute accent
LO31	ō	small o with macron
LO32	Ō	capital O with macron
LO51	œ	small œ ligature
LO52	Œ	capital Œ ligature
LO61	ø	small o with slash
LO62	Ø	capital O with slash
LP01	p	small p
LP02	P	capital P
LQ01	q	small q
LQ02	Q	capital Q
LR01	r	small r
LR02	R	capital R
LR11	ŕ	small r with acute accent
LR12	Ŕ	capital R with acute accent
LR21	ř	small r with caron
LR22	Ř	capital R with caron
LR41	ŗ	small r with cedilla
LR42	Ŗ	capital R with cedilla
LS01	s	small s
LS02	S	capital S
LS11	ś	small s with acute accent
LS12	Ś	capital S with acute accent
LS15	ŝ	small s with circumflex accent
LS16	Ŝ	capital S with circumflex accent
LS21	š	small s with caron
LS22	Š	capital S with caron
LS41	ş	small s with cedilla
LS42	Ş	capital S with cedilla
LS61	ß	small sharp s, German
LT01	t	small t
LT02	T	capital T
LT21	ť or t'	small t with caron
LT22	Ť	capital T with caron
LT41	ţ	small t with cedilla
LT42	Ţ	capital T with cedilla
LT61	ŧ	small t with stroke
LT62	Ŧ	capital T with stroke
LT63	þ	small thorn, Icelandic

Identifier	Graphic	Name or description
LT64	Þ	capital thorn, Icelandic
LU01	u	small u
LU02	U	capital U
LU11	ú	small u with acute accent
LU12	Ú	capital U with acute accent
LU13	ù	small u with grave accent
LU14	Ù	capital U with grave accent
LU15	û	small u with circumflex accent
LU16	Û	capital U with circumflex accent
LU17	ü	small u with diaeresis or umlaut mark
LU18	Ü	capital U with diaeresis or umlaut mark
LU19	ũ	small u with tilde
LU20	Ũ	capital U with tilde
LU23	ŭ	small u with breve
LU24	Ŭ	capital U with breve
LU25	ű	small u with double acute accent
LU26	Ű	capital U with double acute accent
LU27	ů	small u with ring
LU28	Ů	capital U with ring
LU31	ū	small u with macron
LU32	Ū	capital U with macron
LU43	ų	small u with ogonek
LU44	Ų	capital U with ogonek
LV01	v	small v
LV02	V	capital V
LW01	w	small w
LW02	W	capital W
LW15	ŵ	small w with circumflex accent
LW16	Ŵ	capital W with circumflex accent
LX01	x	small x
LX02	X	capital X
LY01	y	small y
LY02	Y	capital Y
LY11	ý	small y with acute accent
LY12	Ý	capital Y with acute accent
LY15	ŷ	small y with circumflex accent
LY16	Ŷ	capital Y with circumflex accent
LY17	ÿ	small y with diaeresis or umlaut mark
LY18	Ÿ	capital Y with diaeresis or umlaut mark
LZ01	z	small z
LZ02	Z	capital Z
LZ11	ź	small z with acute accent
LZ12	Ź	capital Z with acute accent
LZ21	ž	small z with caron
LZ22	Ž	capital Z with caron
LZ29	ż	small z with dot
LZ30	Ż	capital Z with dot

3.2.3 *Nonalphabetic characters*

3.2.3.1 *Decimal digits*

Identifier	Graphic	Name or description
ND01	1	digit 1
ND02	2	digit 2
ND03	3	digit 3
ND04	4	digit 4
ND05	5	digit 5
ND06	6	digit 6
ND07	7	digit 7
ND08	8	digit 8
ND09	9	digit 9
ND10	0	digit 0

3.2.3.2 *Currency signs*

Identifier	Graphic	Name or description
SC01	¤	general currency sign
SC02	£	pound sign
SC03	$	dollar sign
SC04	¢	cent sign
SC05	¥	yen sign

3.2.3.3 *Punctuation marks*

Identifier	Graphic	Name or description
SP01		space (see also § 3.3.2)
SP02	!	exclamation mark
SP03	¡	inverted exclamation mark
SP04	"	quotation mark
SP05	'	apostrophe
SP06	(	left parenthesis
SP07	)	right parenthesis
SP08	,	comma
SP09	_	low line
SP10	-	hyphen or minus sign
SP11	.	full stop, period
SP12	/	solidus
SP13	:	colon
SP14	;	semicolon
SP15	?	question mark
SP16	¿	inverted question mark
SP17	«	angle quotation mark left
SP18	»	angle quotation mark right

Note – In Teletex (and Videotex), *Quotation mark*, *Apostrophe* and *Comma* are independent characters that cannot have the meaning of diacritical marks.

3.2.3.4 *Arithmetic signs*

Identifier	Graphic	Name or description
SA01	+	plus sign
SA02	±	plus/minus sign
SA03	<	less-than sign
SA04	=	equals sign
SA05	>	greater-than sign
SA06	÷	divide sign
SA07	×	multiply sign

Note – For *minus sign* see SP10.

3.2.3.5 *Subscripts and superscripts*

Identifier	Graphic	Name or description
NS02	²	superscript 2
NS03	³	superscript 3

3.2.3.6 *Fractions*

Identifier	Graphic	Name or description
NF01	½	fraction one half
NF04	¼	fraction one quarter
NF05	¾	fraction three quarters

3.2.3.7 *Miscellaneous symbols*

Identifier	Graphic	Name or description
SM01	#	number sign
SM02	%	percent sign
SM03	&	ampersand
SM04	*	asterisk
SM05	@	commercial at
SM06	[	left square bracket
SM08	]	right square bracket
SM13	|	vertical line
SM17	µ	micro sign
SM18	Ω	ohm sign
SM19	°	degree sign
SM20	º	ordinal indicator, masculine
SM21	ª	ordinal indicator, feminine
SM24	§	section sign
SM25	¶	paragraph sign, pilcrow
SM26	·	middle dot

3.2.3.8 *Diacritical marks as separate graphic characters*

Identifier	Graphic	Name or description
SD11	´	acute accent with space
SD13	`	grave accent with space
SD15	^	circumflex accent with space
SD17	¨	diaeresis or umlaut mark with space
SD19	˜	tilde with space
SD21	ˇ	caron with space
SD23	˘	breve with space
SD25	˝	double acute accent with space
SD27	˚	ring with space
SD29	˙	dot with space
SD31	¯	macron with space
SD41	¸	cedilla with space
SD43	˛	ogonek with space

Note – The diacritical marks are illustrated together with a rectangle representing the relative position of the graphic character with which they are normally associated.

3.2.3.9 *Nonspacing characters*

Identifier	Graphic	Name or description
SM27	_	non spacing underline

Note – Nonspacing underline can be combined with any character of the Teletex graphic character repertoire.

3.3 *Teletex basic repertoire of control functions*

3.3.1 *General*

3.3.1.1 The repertoire of control functions defined in this Recommendation consists of:

a) format effectors;

b) presentation control functions;

c) code extension control functions;

d) miscellaneous control functions.

3.3.1.2 In addition to the categories mentioned above, other control functions may be used in the Teletex service, in particular transmission control functions required by lower-level control procedures. These control functions, however, are not specified in this Recommendation since they are not used during the transmission of text in the basic Teletex service.

3.3.1.3 Format effectors, presentation control functions, code extension control functions and miscellaneous control functions are listed in §§ 3.3.2, 3.3.3, 3.3.4 and 3.3.5 respectively. These lists are composed as described below:

a) the first column contains the identifier of each control function, assigned in accordance with the identification system explained in Annex C;

b) the second column presents the abbreviated name of the control function;

c) the third column specifies the name and the definition of the control function.

3.3.2 *Format effectors*

Identifier	Abbreviation	Name and definition
SP01	SP	*Space* A format effector that advances the active position one character position on the same line. This character is also regarded as a nonprinting graphic.
CF10	BS	*Backspace* A format effector that moves the active position one character position backwards on the same line.
CF12	LF	*Line feed* A format effector that advances the active position to the corresponding character position of the next line. LF never causes a horizontal movement of the active position. To obtain the equivalent of *New line*, *Line feed* shall be used in combination with *Carriage return* (CR).
CF14	FF	*Form feed* A format effector that advances the active position to the corresponding character position on a predetermined line of the text area of the next form or page. FF never causes a horizontal movement of the active position. To obtain the equivalent of *New form*, *Form feed* shall be used in combination with *Carriage return* (CR). For the basic Teletex service, the predetermined line is the first line of the text area.
CF15	CR	*Carriage return* A format effector that moves the active position to the home position on the same line. *Note* – In some circumstances, CR may involve a forward movement of the active position, viz. when the active position has been moved in front of the home position.
CF16	PLD	*Partial line down* (Start of subscript/End of superscript) A format effector that moves the active position to the corresponding character position on an imaginary line with a partial vertical offset. This offset should be sufficient either to image following characters as subscripts until the first following occurrence of *Partial line up* (PLU) in the data stream or, if the immediately preceding character is imaged as a superscript to restore subsequent imaging of characters to the active line. Any interactions between PLD and vertical format effectors other than PLU are not defined by this Recommendation. Therefore, any occurrence of PLD to start subscript presentation shall be followed by PLU in the same line without another PLD's intervening. Any other use may produce a different printing format at the receiver than was intended by the sender. *Note* – It is intended that the imaging may be achieved by either: – special fonts with or without movement of the active position, or – movement of the active position not exceeding a half line space. The sender is responsible for avoiding overlapped printing. The interpretation and rendition is the responsibility of the receiving terminal.

CF17	PLU	*Partial line up* (Start of superscript/End of subscript)

A format effector that moves the active position to the corresponding character position on an imaginary line with a partial vertical offset. This offset should be sufficient either to image following characters as superscripts until the first following occurrence of *Partial line down* (PLD) in the data stream or, if the immediately preceding character is imaged as a subscript, to restore subsequent imaging of characters to the active line. Any interactions between PLU and vertical format effectors other than PLD are not defined by this Recommendation.

Therefore, any occurrence of PLU to start superscript presentation shall be followed by PLD in the same line without another PLU's intervening. Any other use may produce a different printing format at the receiver than was intended by the sender.

Note – It is intended that the imaging may be achieved by either:

– special fonts with or without movement of the active position, or
– movement of the active position not exceeding a half line space.

The sender is responsible for avoiding overlapped printing. The interpretation and rendition is the responsibility of the receiving terminal.

3.3.3 *Presentation control functions*

3.3.3.1 The presentation control functions defined in this Recommendation influence the following presentation attributes:

– page format (vertical or horizontal orientation);

– vertical spacing (line spacing);

– graphic rendition (underlining).

3.3.3.2 Presentation control functions are functions with parameters. Parameter values not defined in this Recommendation are reserved for future standardization by CCITT and/or ISO. In the basic Teletex service the horizontal spacing (character pitch) is fixed; however, in order to facilitate extensions to the basic service, a presentation control function involving this attribute has been included.

3.3.3.3 All presentation attributes shall be specified at the beginning of each page. Vertical spacing and graphic rendition may be changed within a page. Parameter default values are assumed at the beginning of each page.

3.3.3.4 *Presentation control function descriptions*

Identifier	Abbreviation	Name and definition
CP01	PFS	*Page format selection*

A presentation control function with a selective parameter that specifies the format of the pages to be introduced by a subsequent *Form feed* (FF) control function.

The meaning of the parameter value is:

0: vertical basic page format;
1: horizontal basic page format.

The default value of the parameter is 0. The text areas corresponding to these page formats are defined in Recommendation S.60.

CP03	SGR	*Select graphic rendition*

A presentation control function with a selective parameter which specifies a presentation attribute for subsequent text.

The meaning of the parameter value is:

0: default rendition;
4: underlined.

The default value of the parameter is 0.

CP04	SHS	*Select horizontal spacing*
		A presentation control function with a selective parameter, which specifies the character spacing for subsequent text. The value of this attribute may be changed at any point within a page to become effective after the next occurrence of both *Carriage return* and *Line feed.*
		The meaning of the parameter value is:
		0: 10 characters per 25.4 mm.
		The default value of the parameter is 0.
CP05	SVS	*Select vertical spacing*
		A presentation control function with a selective parameter that specifies the line spacing for subsequent text. The value of this attribute may be changed at any point within a page to become effective upon the next occurrence of *Line feed* or *Reverse line feed* (see Annex E).
		The meaning of the parameter value is:
		0: 6 lines per 25.4 mm; 1: 4 lines per 25.4 mm; 2: 3 lines per 25.4 mm; 3: 12 lines per 25.4 mm.
		The default value of the parameter is 0.
		The parameter value 3 is used to represent the *Half line down* and *Half line up* functions.

3.3.4 *Code extension control function*

Identifier	Abbreviation	Name and definition
CE03	ESC	*Escape*
		A code extension control function, which is used to provide coded representations for additional control functions.
CE06	CSI	*Control sequence introducer*
		A code extension control function, which is used to provide coded representations for additional control functions, in particular for control functions with parameters, such as presentation control functions.
		Note – Control functions for graphic code extension are for further study.

3.3.5 *Miscellaneous control functions*

Identifier	Abbreviation	Name and description
CM02	SUB	*Substitute character*
		A control function used as defined in Recommendation V.3 [1] to indicate an erroneous character. It is intended to permit printing an error indication or otherwise identify the location of a character received in error.
CM04	IGS	*Identify graphic subrepertoire*
		A control function with one numeric parameter, which is used to indicate to the receiving terminal that a particular subrepertoire of the total repertoire of graphic characters is to be used in the subsequent text. The identification of the graphic subrepertoire may be changed at any point in the text.

The parameter value identifies the subrepertoire according to the register of subrepertoires.

The subrepertoire that is assumed to be identified when this control function is omitted is the entire Teletex basic repertoire of graphic characters.

If any subrepertoire has been explicitly identified, it shall be restated prior to the first character of text on each subsequent page (i.e. prior to *Form feed*).

All subrepertoires shall contain the following graphic characters:

a) the 26 unaccented small letters (LA01, ... LZ01) and the 26 unaccented capital letters (LA02, ... LZ02);

b) the 10 decimal digits (ND01 ... ND10);

c) the nonalphabetic graphic characters:

Identifier	Graphic	Name or description
SP01		space
SP05	'	apostrophe
SP06	(	left parenthesis
SP07	)	right parenthesis
SP08	,	comma
SP10	-	hyphen or minus sign
SP11	.	full stop, period
SP12	/	solidus
SP13	:	colon
SP15	?	question mark
SA01	+	plus sign
SA04	=	equals sign

In addition, a subrepertoire may contain any other graphic characters selected from those listed in this Recommendation.

Note 1 – Each character in a subrepertoire retains its standard coded representation defined in this Recommendation.

Note 2 – The number of graphic characters in a subrepertoire is limited only by the size of the comprehensive repertoire. However, the composition of a subrepertoire may be related to the number of symbols in a changeable printing element. Note that several different symbols may be used in combination to present a single composite graphic character on an output device.

4 Coded representations

4.1 *Graphic character sets*

4.1.1 *Introduction*

4.1.1.1 The coded representations of the graphic characters defined in this Recommendation consist of the bit combination 2/0 for *Space*, and bit combinations of a *primary set* and a *supplementary set* of graphic characters.

4.1.1.2 The primary set and the supplementary set are defined in § 4.1.2. The use of the elements of the primary and supplementary sets to represent the graphic characters of the repertoire defined in § 3.2 is specified in § 4.1.3.

4.1.2 *Code table*

4.1.2.1 The primary set, specified in Figure 2/S.61 is a subset of the set of graphic characters of the International Reference Version of the 7-bit coded character set of Recommendation V.3 [1].

4.1.2.2 The supplementary set, also specified in Figure 2/S.61 contains three types of elements:

a) Diacritical marks, which are used in combination with the letters of the basic Latin alphabet in the primary set to constitute the coded representations of accented letters and umlauts. Each of these characters acts as a modifier indicating that the immediately following letter is to be transformed into an accented letter or an umlaut.

b) Alphabetic characters, which are used in addition to the basic Latin alphabet in the primary set and which are not composed of diacritical marks and basic letters.

c) Nonalphabetic characters, which are used in addition to those in the primary set.

4.1.2.3 Empty positions in the code table denote bit combinations that are reserved for future standardization. Shaded positions denote bit combinations which are not part of the sets specified by the table.

Note – In Recommendations V.3 [1] and S.100, and in ISO 6937 [6], bit combinations equivalent to empty positions in Figure 2/S.61 are used to represent graphic characters that are not, however, relevant to the basic Teletex service.

				b8	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
				b7	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1
				b6	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
				b5	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
b4	b3	b2	b1		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	0	0	0	0			SP	0	@	P		p				°			Ω	ĸ
0	0	0	1	1			!	1	A	Q	a	q			¡	±	`		Æ	æ
0	0	1	0	2			"	2	B	R	b	r			¢	²	´		Đ	đ
0	0	1	1	3				3	C	S	c	s			£	³	^		ª	ð
0	1	0	0	4				4	D	T	d	t			$	×	~		Ħ	ħ
0	1	0	1	5			%	5	E	U	e	u			¥	µ	¯			ı
0	1	1	0	6			&	6	F	V	f	v			#	¶	˘		Ĳ	ĳ
0	1	1	1	7			'	7	G	W	g	w			§	·	˙		Ŀ	ŀ
1	0	0	0	8			(	8	H	X	h	x			¤	÷	¨		Ł	ł
1	0	0	1	9			)	9	I	Y	i	y					②		Ø	ø
1	0	1	0	10			*	:	J	Z	j	z					˚		Œ	œ
1	0	1	1	11			+	;	K	[	k				«	»	¸		º	ß
1	1	0	0	12			,	<	L		l	|				¼	③ _		Þ	þ
1	1	0	1	13			-	=	M	]	m					½	˝		Ŧ	ŧ
1	1	1	0	14			.	>	N		n					¾	˛		Ŋ	ŋ
1	1	1	1	15			/	?	O	① _	o					¿	ˇ		ŉ	

CCITT-40400

Note 1 – When interworking with Videotex, this code shall have the meaning *delimiter*.

Note 2 – When a distinction needs to be made between diaeresis and umlaut mark, this code shall be used to represent umlaut mark.

Note 3 – Non spacing underline is not a diacritical mark and may be combined with any graphic character of the Teletex repertoire.

FIGURE 2/S.61

Code table for graphic characters showing *Space* in position 2/0, the primary set of graphic characters in positions 2/1 to 7/14, and the supplementary set of graphic characters in positions 10/1 to 15/14

4.1.3 *Formats of coded representations*

4.1.3.1 The formats of the coded representations of the graphic characters of the repertoire defined in this Recommendation are as follows:

a) Alphabetic and nonalphabetic characters of the primary set: Each of these characters is represented by a single bit combination in the range 2/1 to 7/14. The primary set contains the letters of the basic Latin alphabet.

b) Accented letters and umlauts: Each of these characters is represented by a sequence of two bit combinations. The first part of this sequence consists of a bit combination in the range 12/0 to 12/15 (excluding 12/12) representing a diacritical mark. The second part consists of a bit combination in the range 4/1 to 5/10 or 6/1 to 7/10 representing a basic Latin letter.

c) Alphabetic and nonalphabetic characters of the supplementary set: Each of these characters is represented by a single bit combination in the range 10/1 to 11/15 or 13/0 to 15/14.

d) Diacritical marks as separate graphic characters are represented by sequences of bit combinations, in the same way as accented letters and umlauts, with bit combination 2/0 (*Space*) instead of a basic Latin letter.

e) Nonspacing underline shall precede the character to which it applies. In particular, when it is used to underline an accented letter or umlaut, the nonspacing underline shall precede the diacritical mark.

4.1.3.2 *Space* is coded as 2/0.

4.1.3.3 The coded representation of the Teletex primary set of graphic characters is given in Table 1/S.61.

4.1.3.4 The coded representation of the Teletex supplementary set of graphic characters is given in Table 2/S.61.

TABLE 1/S.61

The Teletex primary set of graphic characters

Position	Graphic	Name or description	Position	Graphic	Name or description	Position	Graphic	Name or description
2/1	!	exclamation mark	4/0	@	commercial at	6/0		(not used)
2/2	“	quotation mark	4/1	A	capital A	6/1	a	small a
2/3		(not used)	4/2	B	capital B	6/2	b	small b
2/4		(not used)	4/3	C	capital C	6/3	c	small c
2/5	%	percent	4/4	D	capital D	6/4	d	small d
		sign	4/5	E	capital E	6/5	e	small e
2/6	&	ampersand	4/6	F	capital F	6/6	f	small f
2/7	’	apostrophe	4/7	G	capital G	6/7	g	small g
2/8	(	left parenthesis	4/8	H	capital H	6/8	h	small h
2/9	)	right parenthesis	4/9	I	capital I	6/9	i	small i
2/10	*	asterisk	4/10	J	capital J	6/10	j	small j
2/11	+	plus sign	4/11	K	capital K	6/11	k	small k
2/12	,	comma	4/12	L	capital L	6/12	l	small l
2/13	–	hyphen or minus sign	4/13	M	capital M	6/13	m	small m
2/14	.	full stop, period	4/14	N	capital N	6/14	n	small n
2/15	/	solidus	4/15	O	capital O	6/15	o	small o
3/0	0	digit 0	5/0	P	capital P	7/0	p	small p
3/1	1	digit 1	5/1	Q	capital Q	7/1	q	small q
3/2	2	digit 2	5/2	R	capital R	7/2	r	small r
3/3	3	digit 3	5/3	S	capital S	7/3	s	small s
3/4	4	digit 4	5/4	T	capital T	7/4	t	small t
3/5	5	digit 5	5/5	U	capital U	7/5	u	small u
3/6	6	digit 6	5/6	V	capital V	7/6	v	small v
3/7	7	digit 7	5/7	W	capital W	7/7	w	small w
3/8	8	digit 8	5/8	X	capital X	7/8	x	small x
3/9	9	digit 9	5/9	Y	capital Y	7/9	y	small y
3/10	:	colon	5/10	Z	capital Z	7/10	z	small z
3/11	;	semicolon	5/11	[	left square	7/11		(not used)
3/12	<	less-than sign			bracket	7/12	|	vertical line
3/13	=	equals sign	5/12		(not used)	7/13		(not used)
3/14	>	greater-than sign	5/13	]	right square bracket	7/14		(not used)
3/15	?	question mark	5/14		(not used)			
			5/15[a)]	–	low line			

[a)] When interworking with Videotex, this code shall have the meaning *delimiter*.

TABLE 2/S.61

The Teletex supplementary set of graphic characters

Position	Graphic	Name or description	Position	Graphic[a]	Name or description	Position	Graphic	Name or description
10/0			12/0		(not used)	14/0	Ω	ohm sign
10/1	¡	inverted exclamation mark	12/1	□̀	grave accent	14/1	Æ	capital Æ diphthong
10/2	¢	cent sign	12/2	□́	acute accent	14/2	Đ	capital D with stroke
10/3	£	pound sign	12/3	□̂	circumflex accent	14/3	ª	ordinal indicator, feminine
10/4	$	dollar sign	12/4	□̃	tilde	14/4	Ħ	capital H with stroke
10/5	¥	yen sign	12/5	□̄	macron	14/5		(not used)
10/6	#	number sign	12/6	□̆	breve	14/6	Ĳ	capital IJ ligature
10/7	§	section sign	12/7	□̇	dot	14/7	Ŀ	capital L with middle dot
10/8	¤	currency symbol	12/8	□̈	diaeresis or umlaut mark	14/8	Ł	capital L with stroke
10/9		(not used)	12/9[b]			14/9	Ø	capital O with slash
10/10		(not used)	12/10	□̊	ring	14/10	Œ	capital Œ ligature
10/11	«	angle quotation mark left	12/11	□̧	cedilla	14/11	º	ordinal indicator, masculine
10/12		(not used)	12/12	□̲	non-spacing underline	14/12	Þ	capital thorn, Icelandic
10/13		(not used)	12/13	□̋	double acute accent	14/13	Ŧ	capital T with stroke
10/14		(not used)	12/14	□̨	ogonek	14/14	Ŋ	capital eng, Lapp
10/15		(not used)	12/15	□̌	caron	14/15	ŉ	small n with apostrophe
11/0	°	degree sign	13/0		(not used)	15/0	ĸ	small k, Greenlandic
11/1	±	plus/minus sign	13/1		(not used)	15/1	æ	small æ diphthong
11/2	²	superscript 2	13/2		(not used)	15/2	đ	small d with stroke
11/3	³	superscript 3	13/3		(not used)	15/3	ð	small eth, Icelandic
11/4	×	multiply sign	13/4		(not used)	15/4	ħ	small h with stroke
11/5	µ	micro sign	13/5		(not used)	15/5	ı	small i without dot
11/6	¶	paragraph sign, pilcrow	13/6		(not used)	15/6	ĳ	small ij ligature
11/7	·	middle dot	13/7		(not used)	15/7	ŀ	small l with middle dot
11/8	÷	divide sign	13/8		(not used)	15/8	ł	small l with stroke
11/9		(not used)	13/9		(not used)	15/9	ø	small o with slash
11/10		(not used)	13/10		(not used)	15/10	œ	small œ ligature
11/11	»	angle quotation mark right	13/11		(not used)	15/11	ß	small sharp s, German
11/12	¼	fraction one quarter	13/12		(not used)	15/12	þ	small thorn, Icelandic
11/13	½	fraction one half	13/13		(not used)	15/13	ŧ	small t with stroke
11/14	¾	fraction three quarters	13/14		(not used)	15/14	ŋ	small eng, Lapp
11/15	¿	inverted question mark left	13/15		(not used)			

[a] Diacritical marks are illustrated together with a rectangle representing the relative position of the graphic character with which they are normally associated.

[b] When a distinction needs to be made between diaeresis and umlaut mark, this code shall be used to represent umlaut mark.

4.2 *Control function sets*

4.2.1 *Introduction*

4.2.1.1 The coded representations of the control functions defined in this Recommendation consist of bit combinations of a *primary set* and a *supplementary set* of control functions.

4.2.1.2 The primary set and the supplementary set are defined in § 4.2.2. The use of the elements of the primary and supplementary sets to represent the control functions of the repertoire defined in § 3.3 is specified in § 4.2.3.

4.2.2 *Code table*

4.2.2.1 The primary set, specified in Figure 3/S.61, has been derived from the set of control functions of the 7-bit coded character set of Recommendation V.3 [1].

4.2.2.2 The supplementary set is also specified in Figure 3/S.61.

4.2.2.3 Empty positions in the code table denote bit combinations that are reserved for future standardization. Shaded positions denote bit combinations that are not part of the sets specified by the table.

Note – In Recommendation V.3 [1] and in ISO 6429 [5], bit combinations equivalent to empty positions in Figure 3/S.61 are used to represent control functions, which are not, however, relevant to the transmission of text in the basic Teletex service.

4.2.3 *Formats of coded representations*

4.2.3.1 The formats of the coded representations of the control functions of the repertoire defined in this Recomendation are as follows:

a) Control functions that are elements of the primary set: Each of these control functions is represented by a single bit combination in the range 0/0 to 1/15.

b) Control functions that are elements of the supplementary set: Each of these control functions is represented by a single bit combination in the range 8/0 to 9/15.

c) Control functions with parameters: Each of these control functions is represented by a control sequence of the form

$$\text{CSI } P_1 \ldots P_n \; I_1 \ldots I_m \; F$$

as explained in Annex D. The first part of this sequence consists of the coded representation of the code extension control function *Control sequence introducer* (CSI) of the supplementary set; the second part (which may be omitted) consists of one or more bit combinations in the range 3/0 to 3/15 representing one or more parameters of the control function; the last part of the control sequence is composed of one or more bit combinations that identify the intended control function; this part consists of either a single *final* (F) bit combination in the range 4/0 to 7/14, or one or more *intermediate* (I) bit combinations in the range 2/0 to 2/15 followed by a *final* bit combination in the range 4/0 to 7/14.

4.2.3.2 The coded representations of the control functions of the repertoire defined in this Recommendation are specified by the lists in §§ 4.2.4.1 (format effectors), 4.2.4.2 (presentation control functions), 4.2.4.3 (code extension control functions) and 4.2.4.4 (miscellaneous control functions). These lists are composed as described below:

a) the first column contains the identifier of each control function;

b) the second column presents the abbreviated name of the control function;

c) the third column specifies the coded representation of the control function.

				b8	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
				b7	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1
				b6	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
				b5	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
b4	b3	b2	b1		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	0	0	0	0																
0	0	0	1	1																
0	0	1	0	2																
0	0	1	1	3																
0	1	0	0	4																
0	1	0	1	5																
0	1	1	0	6																
0	1	1	1	7																
1	0	0	0	8	BS															
1	0	0	1	9																
1	0	1	0	10	LF	SUB														
1	0	1	1	11		ESC							PLD	CSI						
1	1	0	0	12	FF								PLU							
1	1	0	1	13	CR															
1	1	1	0	14																
1	1	1	1	15																

CCITT-40410

FIGURE 3/S.61

Code table for control functions showing the primary set of control functions in positions 0/0 to 1/15, and the supplementary set of control functions in positions 8/0 to 9/15

4.2.4 *Coded representations*

4.2.4.1 *Format effectors*

Identifier	Abbreviation	Coded representation
CF10	BS	0/8
CF12	LF	0/10
CF14	FF	0/12
CF15	CR	0/13
CF16	PLD	8/11
CF17	PLU	8/12

4.2.4.2 *Presentation control functions*

Identifier	Abbreviation	Coded representation
CP01	PFS	CSI $P_1 \ldots P_n$ 2/0 4/10
CP03	SGR	CSI $P_1 \ldots P_n$ 6/13
CP04	SHS	CSI $P_1 \ldots P_n$ 2/0 4/11
CP05	SVS	CSI $P_1 \ldots P_n$ 2/0 4/12

4.2.4.3 *Code extension control functions*

Identifier	Abbreviation	Coded representation
CE03	ESC	1/11
CE06	CSI	9/11

4.2.4.4 *Miscellaneous control functions*

Identifier	Abbreviation	Coded representation
CM02	SUB	1/10
CM04	IGS	CSI $P_1 \ldots P_n$ 2/0 4/13

ANNEX A

(to Recommendation S.61)

Code extension procedures

A.1 The basic Teletex service makes use of an 8-bit coded character set, which is implicitly designated and invoked.

A.2 This 8-bit code contains the primary set of graphic characters in positions 2/1 to 7/14 and the supplementary set of graphic characters in positions 10/1 to 15/14. The characters constituting these basic sets are described in this Recommendation.

A.3 For enhancement of the basic Teletex service the following code extension facilities will be provided:

a) designation of up to four graphic character sets;

b) invocation of the designated sets, by means of locking and/or nonlocking shift functions, into positions 2/1 to 7/14 and 10/1 to 15/14 of the 8-bit code table.

Their implementation is for further study, bearing in mind the need for compatibility with the 7- and 8-bit code extension facilities defined in relevant international standards.

ANNEX B

(to Recommendation S.61)

Use of diacritical marks

B.1 The supplementary set contains 13 diacritical marks that are used in combination with the letters of the basic Latin alphabet in the primary set to constitute the coded representations of accented letters and umlauts. These diacritical marks, and their coded representations, are:

Acute accent	12/2
Grave accent	12/1
Circumflex accent	12/3
Diaeresis or umlaut mark	12/8
Tilde	12/4
Caron	12/15
Breve	12/6
Double acute accent	12/13
Ring	12/10
Dot	12/7
Macron	12/5
Cedilla	12/11
Ogonek	12/14

Note – When a distinction needs to be made between diaeresis and umlaut mark, the code 12/9 shall be used to represent the umlaut mark.

B.2 Figure B-1/S.61 specifies the combinations of diacritical marks and basic letters that are defined in this Recommendation.

Basic letter	Acute accent	Grave accent	Circumflex accent	Diaeresis or umlaut mark	Tilde	Caron	Breve	Double acute accent	Ring	Dot	Macron	Cedilla	Ogonek
a A	á Á	à À	â Â	ä Ä	ã Ã		ă Ă		å Å		ā Ā		ą Ą
b B													
c C	ć Ć		ĉ Ĉ			č Č				ċ Ċ		ç Ç	
d D						ď Ď							
e E	é É	è È	ê Ê	ë Ë		ě Ě				ė Ė	ē Ē		ę Ę
f F													
g G	ǵ		ĝ Ĝ				ğ Ğ			ġ Ġ		Ģ	
h H			ĥ Ĥ										
i I	í Í	ì Ì	î Î	ï Ï	ĩ Ĩ					İ	ī Ī		į Į
j J			ĵ Ĵ										
k K												ķ Ķ	
l L	ĺ Ĺ					ľ Ľ						ļ Ļ	
m M													
n N	ń Ń				ñ Ñ	ň Ň						ņ Ņ	
o O	ó Ó	ò Ò	ô Ô	ö Ö	õ Õ			ő Ő			ō Ō		
p P													
q Q													
r R	ŕ Ŕ					ř Ř						ŗ Ŗ	
s S	ś Ś		ŝ Ŝ			š Š						ş Ş	
t T						ť Ť						ţ Ţ	
u U	ú Ú	ù Ù	û Û	ü Ü	ũ Ũ		ŭ Ŭ	ű Ű	ů Ů		ū Ū		ų Ų
v V													
w W			ŵ Ŵ										
x X													
y Y	ý Ý		ŷ Ŷ	ÿ Ÿ									
z Z	ź Ź					ž Ž				ż Ż			

FIGURE B-1/S.61

Use of diacritical marks

ANNEX C

(to Recommendation S.61)

Identification system

C.1 For the purpose of this Recommendation, a system was developed that allows for the identification and description of each graphic character or control function. The system is shown in Figure C-1/S.61

C.2 Each identifier consists of two letters and two digits.

C.3 The first letter indicates the alphabet, the language, etc.

C.4 The second letter indicates the letter of an alphabet or, in the case of a nonalphabetic graphic character or a control function, the group of characters or control functions.

C.5 The first digit indicates whether the letter in the second position is an accented one, whether the diacritical mark is above or below the letter, etc. It has no special meaning in the case of the first letter being a C, N or S.

C.6 The second digit indicates whether the letter is a capital or a small one (even or odd). If the first letter is a C, N or S, this digit being even or odd has no significance.

C.7 The numbering is used in a consistent manner so that each diacritical mark is always given the same number.

C.8 The numbering principle is shown in Table C-1/S.61.

TABLE C-1/S.61

Numbering principle for alphabetic characters

Item	Small	Capital
No diacritical mark	01	02
Acute accent	11	12
Grave accent	13	14
Circumflex accent	15	16
Diaeresis or umlaut mark	17	18
Tilde	19	20
Caron	21	22
Breve	23	24
Double acute accent	25	26
Ring	27	28
Dot	29	30
Macron	31	32
Cedilla	41	42
Ogonek	43	44
Diphthong or ligature	51	52
Special form	61, 63, etc.	62, 64, etc.

L A 0 1

- For alphabetic characters:
  odd digit = small letter;
  even digit = capital letter.
- If C, N or S in first position:
  no special meaning.

- For alphabetic characters:
  zero = letter without diacritical mark;
  one, two or three = letter with diacritical mark above it;
  four = letter with diacritical mark below it;
  five = diphthong or ligature;
  six = special form.
- If C, N or S in first position:
  no special meaning.

- For alphabetic characters:
  A to Z = the respective letter of the Latin alphabet, or the Latin equivalent in the case of a non-Latin letter;
- If C in first position:
  E = code extension control function;
  F = format effector;
  P = presentation control function;
  M = other control function.
- If N in first position:
  D = decimal digit;
  F = fraction;
  S = subscript or superscript.
- If S in first position:
  A = arithmetic sign;
  C = currency sign;
  D = diacritical mark;
  P = punctuation mark;
  M = other symbol.

- L = Latin alphabetic character;
- C = control function;
- N = nonalphabetic graphic character;
- S = special graphic character.

FIGURE C-1/S.61

Identification system

ANNEX D

(to Recommendation S.61)

Format of control sequences

The following explanation of the format of control sequences consists of noncontiguous extracts from ISO/TC97/SC2 N 915, the text of ISO 6429 [5]. For ease of cross-reference to that document, the original numbering scheme has been retained in preference to allocating a new set of consistent paragraph numbers. To ensure accurate interpretation of detailed meanings, reference should be made to 97/2N915.

"4.1.2 *Control functions represented by control sequences*

A control sequence consists of the coded representation of *Control sequence introducer* (CSI) followed by one or more bit combinations, which identify the control function and, if applicable, represent the parameters of the control function. The control function CSI itself is an element of the C1 set.

The format of a control sequence is:

$$\mathrm{CSI}\ P_1 \ldots P_n\ I_1 \ldots I_m\ F$$

where:

- CSI is represented by ESC 5/11 in a 7-bit code and by 9/11 in an 8-bit code (see § 4.2).
- $P_1 \ldots P_n$ are bit combinations of column 3 representing the parameter values; these bit combinations shall be omitted if the control function has no parameter, and may be omitted if the default parameter value is to apply.
- $I_1 \ldots I_m$ are bit combinations of column 2 which, together with the final bit combination F, identify the control function; these bit combinations shall be omitted if the control function is identified by the final bit combination F alone.

Note – The number of intermediate bit combinations is not limited by this standard; in practice, at most one intermediate will be sufficient since over one thousand control functions may be identified using not more than one intermediate.

- F is a bit combination of column 4, 5, 6 or 7 (except 7/15) which terminates the control sequence and, together with the intermediate bit combinations $I_1 \ldots I_m$, if present, identifies the control function (see § 9).

The occurrence of any bit combinations which do not conform to the above format is an error condition for which recovery is not specified by this standard.

The final bit combinations (either used alone or together with intermediates) are classified in two categories:

- The control functions identified by final bit combinations of columns 4, 5 and 6 are either standardized or reserved for future standardization.
- The control functions identified by final bit combinations of column 7 (except 7/15) are not standardized and are available for private or experimental use.

There are two types of parameters: numeric and selective (see § 4.4). A numeric parameter represents a number; a selective parameter merely represents a character string, the meaning of which depends on the control function.

The final bit combinations of columns 4, 5 and 6 and the intermediate bit combinations are defined in § 4.3.

4.4 *Parameter representations*

A control sequence may contain a string of bit combinations $P_1 \ldots P_n$ representing one or more parameters to complete the specification of the control function.

The string of bit combinations $P_1 \ldots P_n$ contained in a control sequence is called the parameter string. It consists of bit combinations of column 3 and is interpreted as follows:

– If the first bit combination of the parameter string is in the range 3/0 to 3/11, the parameter string is interpreted according to the format described below.

– If the first bit combination of the parameter string is in the range 3/12 to 3/15, the parameter string is available for private or experimental use. Its format and meaning are not specified in this standard.

4.4.1 *Parameter string format*

– A parameter string consists of one or more parameter substrings, each of which represents a parameter value.

– Each parameter substring consists of one or more bit combinations from 3/0 to 3/9, representing the decimal digital ZERO to NINE.

– Parameter substrings are separated by one bit combination 3/11.

– Bit combination 3/10 is reserved for future standardization as an additional parameter separator.

– Bit combinations 3/12 to 3/15 shall not be used.

– In each parameter substring, leading bit combinations 3/0 are not significant and may be omitted.

– If the parameter string starts with the bit combination 3/11, an empty parameter substring is assumed preceding the separator; if the parameter string terminates with the bit combination 3/11, an empty parameter substring is assumed following the separator; if the parameter string contains successive bit combinations 3/11, empty parameter substrings are assumed between the separators.

– An empty parameter substring or a parameter substring which consists of bit combinations 3/0 only represents a default value which depends on the control function.

4.4.2 *Types of parameters*

There are two types of parameters: numeric parameters and selective parameters.

4.4.2.1 *Numeric parameters*

In a control sequence representing a control function with numeric parameters, each parameter substring corresponds to one parameter.

The number of parameters is fixed and depends on the control function. If the control function has more than one numeric parameter, and some (but not all) parameter substrings are omitted, the separators (bit combination 3/11) must still be present. Only if all parameter substrings are omitted, are the separators not required.

Each numeric parameter substring which contains at least one bit combination from 3/1 to 3/9 represents a number in decimal notation.

4.4.2.2 *Selective parameters*

In a control sequence representing a control function with a selective parameter, each parameter substring represents one value of the selective parameter. These values, whilst expressed by digits, are not quantitative. Each corresponds to one of the actions the control function can perform. Neither the maximum number of values nor the order in which the corresponding actions are performed are prescribed by this standard. The effect of a sequence of values corresponding to conflicting actions depends on implementation.

A particular parameter value may have the same meaning as a combination of two or more separate values."

ANNEX E

(to Recommendation S.61)

Standardized options

E.1 *General*

E.1.1 This annex contains detailed definitions that shall be used to implement Teletex standardized options included in the Teletex repertoire of graphic characters and control functions.

E.2 *Definitions*

E.2.1 The definitions contained in § 2 of the Recommendation shall apply unless explicitly amended.

E.2.2 Additional definitions are for further study.

E.3 *Teletex character repertoire*

E.3.1 *Teletex optional repertoire of graphic characters*

For further study.

E.3.2 *Teletex optional repertoire of control functions*

Note – For the definition of optional control functions and the associated optional parameter values, the appropriate ISO standards should be considered.

E.3.2.1 *Format effectors*

Identifier	Abbreviation	Name and definition
CF20	RLF	*Reverse line feed* A format effector that moves the active position to the corresponding character position on a preceding line, defined by the current value of the vertical spacing (see SVS).

E.3.2.2 *Presentation control functions*

Identifier	Abbreviation	Name and definition
CP01	PFS	*Page format selection* (Definition: see § 3.3.3 of the Recommendation) The meaning of the parameter value is: 0: vertical basic page format [1]; 1: horizontal basic page format [1]; 2: vertical A4 page format; 3: horizontal A4 page format.
CP04	SHS	*Select horizontal spacing* (Definition: see § 3.3.3 of the Recommendation) The meaning of the parameter value is: 0: 10 characters per 25.4 mm [1]; 1: 12 characters per 25.4 mm [1]; 2: 15 characters per 25.4 mm [1].

[1] As defined for the basic Teletex service.

CP05	SVS	*Select vertical spacing* (Definition: see § 3.3.3 of the Recommendation)

The meaning of the parameter value is:

0: 6 lines per 25.4 mm [1];
1: 4 lines per 25.4 mm [1];
2: 3 lines per 25.4 mm [1];
3: 12 lines per 25.4 mm [1];
4: 8 lines per 25.4 mm;
5: 6 lines per 30.0 mm;
6: 4 lines per 30.0 mm;
7: 3 lines per 30.0 mm;
8: 12 lines per 30.0 mm.

E.4 *Coded representations*

E.4.1 *Optional graphic character sets*

For further study.

E.4.2 *Optional control functions*

E.4.2.1 *Format effectors*

Identifier	Abbreviation	Coded representation
CF20	RLF	8/13

References

[1] CCITT Recommendation *International Alphabet No. 5*, Vol. VIII, Fascicle VIII.1, Rec. V.3.

[2] CCITT Recommendation *Teletex service*, Vol. II, Fascicle II.4, Rec. F.200.

[3] *7-bit coded character set for information processing interchange*, ISO Standard 646-1973.

[4] *Code extension techniques for use with the ISO 7-bit coded character set*, ISO Standard 2022-1973.

[5] *Additional control functions for character-imaging devices*, ISO Standard DIS-6429.

[6] *Coded character set for text communication*, ISO Standard DP-6937.

[6] CCITT – Question 20/VIII, Contribution COM VIII-No. 1, Study Period 1981-1984, Geneva, 1981.

[1] As defined for the basic Teletex service.

Recommendation S.62

CONTROL PROCEDURES FOR THE TELETEX SERVICE

(Geneva, 1980)

CONTENTS

1 General

1.1 *Scope*

1.1.1 Recommendation F.200 [1] lays down the provisions for the operation of the automatic international Teletex service. On the technical side, Recommendation S.60 specifies the requirements for international compatibility between Teletex terminals and Recommendation S.61 defines the character repertoire and coded character sets for the international Teletex service.

1.1.2 Network-dependent communication procedures for call establishment and termination are defined in Recommendation S.60.

1.1.3 This Recommendation defines the end-to-end procedures to be used within the Teletex service.

1.1.4 Specifically, this Recommendation concerns the end-to-end control procedures that are network-independent. The network-dependent procedures forming a network-independent transport service are specified in Recommendation S.70.

1.1.5 The procedure described in this Recommendation should also be used between a Teletex terminal and a Teletex/telex conversion facility (see Recommendations F.200 [1] and S.60).

1.1.6 Interworking between Teletex and services other than telex is for further study.

1.1.7 This Recommendation assumes that the terminal initiating a call is the terminal regarded as responsible for call charges and that it retains full control of the call.

1.1.8 The provisions in this Recommendation are to be regarded as a first stage in the establishment of Teletex service in accordance with Recommendations F.200 [1], S.60, S.61 and S.70 as defined in 1980. Enhancements and additions to these Recommendations must ensure compatibility with established services.

1.2 *Fundamental principles*

1.2.1 The relationship between the Teletex control procedures and the transport service shall respect the principle that the higher level procedures require the transport service to preserve the structure of blocks, which may be of arbitrary size, given to it by the session level for transmission. Only one session command or response is allowed in such a block. Only one document command or response is allowed in a CSUI or RSUI field (Command or Response Session User Information).

1.2.2 The sending terminal is responsible for verifying the correct delivery of the information in its Teletex document to the recipient's store. This may include linking and other relevant information.

1.3 *Definitions*

1.3.1 Terms and their definitions are listed in Annex A. Where appropriate, each definition mentions the layer to which it refers.

1.3.2 Some of the terms used in this Recommendation have been defined in ways that may differ from the meanings of similar terms in other Recommendations.

2 Functions of the procedures

2.1 *General*

2.1.1 The broad functional categories provided to implement the Teletex service control procedures are listed in Tables 1/S.62 and 2/S.62.

2.1.2 The procedural elements have also been listed in the appropriate categories since the definitions of the elements together with their associated rules completely specify the functions of the procedures.

TABLE 1/S.62

Session commands and responses

Command	Response	Abbreviation	Reference
Session establishment and clearing			
Command session start		CSS	§ 3.2.1
	Response session start positive	RSSP	§ 3.2.2
	Response session start negative	RSSN	§ 3.2.3
Command session end		CSE	§ 3.2.4
	Response session end positive	RSEP	§ 3.2.5
Command session abort		CSA	§ 3.2.6
	Response session abort positive	RSAP	§ 3.2.7
Information transfer			
Command session user information		CSUI	§ 3.2.8
	Response session user information	RSUI	§ 3.2.9
Session management			
Command session change control		CSCC	§ 3.2.10
	Response session change control positive	RSCCP	§ 3.2.11

Note – For CSTW (command session two-way simultaneous), RSTWP (response session TWS positive) and RSTWN (response session TWS negative), all of which concern a possible two-way simultaneous mode (under study), see Annex C.

TABLE 2/S.62

Document commands and responses

Command	Response	Abbreviation	Reference
Document control			
Command document start		CDS [a]	§ 3.4.1
Command document continue		CDC [a]	§ 3.4.3
Command document capability list		CDCL	§ 3.4.4
	Response document capability list positive	RDCLP	§ 3.4.5
Command document end		CDE [b]	§ 3.4.6
	Response document end positive	RDEP	§ 3.4.7
Command document discard		CDD	§ 3.4.8
	Response document discard positive	RDDP	§ 3.4.9
Command document resynchronize		CDR	§ 3.4.10
	Response document resynchronize positive	RDRP	§ 3.4.11
Information transfer			
Command document user information		CDUI	§ 3.4.12
Error recovery			
	Response document general reject	RDGR	§ 3.4.2
Command document page boundary		CDPB	§ 3.4.13
	Response document page boundary positive	RDPBP	§ 3.4.14
	Response document page boundary negative	RDPBN	§ 3.4.15

[a] RDGR is used as a negative response to this command. A specific negative response is not required.

[b] The negative response to this command is RDPBN.

Note – For CDRP (command document recovery point), RDRPN (response document recovery point negative), CDRPR (command document recovery point restart) and RDRPR (response document recovery point restart), see Annex G concerning the optional error recovery mechanism.

2.2 *Background information*

Note – § 2.2 is given as an aid for the understanding of the procedures. The exact definitions of the control procedures are given in subsequent points of the Recommendation.

2.2.1 *Exchange of service identification*

2.2.1.1 Two terminals, when connected by a transport service, will, at session establishment, need to exchange information identifying the CCITT-defined service that they intend to use and thus they will invoke the relevant service facilities and the associated protocol, e.g. the Teletex service and its protocol. The use of service identifiers for other services is for further study.

2.2.2 *Negotiation of optional capabilities*

2.2.2.1 Two methods are provided. The first is used at session initiation to exchange a limited list of capabilities. The second method may be used when required, after session initiation, to indicate the sender's requirements for extended capabilities.

2.2.3 *Negotiation of storage requirements*

2.2.3.1 Storage availability can be indicated in the following ways:

a) When a call is established it is implicitly assumed that there is adequate receive memory for the call. Exceptionally a receiver memory overflow will occur. The continued sending of the document from the source will be stopped by the sink. The sink shall indicate the reason for stopping the transmission.

b) The provision is also made in the procedure for a mandatory indication that the ability of the receiving terminal to continue to accept traffic is jeopardized.

c) The control procedure also provides the possibility to investigate the storage availability at the receiving terminal prior to the transmission of a document. The use of this possibility is for further study under Question 8/I [2].

3 Elements of procedure

3.1 *General*

3.1.1 § 3 contains elements of procedure and rules of use that, when combined, define the Teletex procedure.

3.1.2 Definitions applying to the elements of procedure may be found in Annexes A and B.

3.1.3 Annexes C and D describe the two-way simultaneous (TWS) mode of session operation and the session suspension function, which are not applicable to the basic Teletex service.

3.2 *Session commands, responses and parameters*

(For a summary of session commands and responses, see Table 1/S.62.)

3.2.1 *Command session start (CSS)*

3.2.1.1 The CSS initiates entry into a session.

3.2.1.2 Command parameters are:

a) *Service identifier* – This mandatory parameter identifies the service (e.g. Teletex, facsimile) that the sender of this command intends to use.

b) *Terminal identifier* – This mandatory parameter identifies the calling terminal in accordance with the terminal identification specified in Recommendation F.200 [1].

c) *Date and time* – This mandatory parameter gives date and time information as specified in Recommendation F.200 [1].

d) *Additional session reference number* – This number may be used in addition to the basic session reference (called terminal's identifier, calling terminal's identifier, date and time) to identify uniquely the session. If the additional session reference number is not used the parameter shall not be included.

e) *Non-basic terminal capabilities* – These parameters indicate which non-basic terminal capabilities are available as receiving capabilities of the sender of this command. These parameters are mandatory if the terminal is capable of any of the specific functions listed in Table 3/S.62 below; absence of the parameter indicates that the specific function is not available.

f) *Non-basic session capabilities* – If used, this non-mandatory parameter indicates which non-basic sessions capabilities are available as receiving capabilities of the sender of this command.

Note – Examples of the uses for this parameter are session suspension (see Annex D), two-way simultaneous operation (see Annex C) and negotiation of the window size for checkpoint (see § 4.3).

g) *Private use parameters* – These parameters are not mandatory. Their definition and use are not standardized.

TABLE 3/S.62

Non-basic terminal capabilities included in CSS

Parameter	Function
Control character sets	Reverse line feed
Page formats	A4 printable area (vertical and horizontal orientation)
Miscellaneous terminal capabilities	Character spacing of 2.12 mm (12 characters per 25.4 mm) Character spacing of 1.69 mm (15 characters per 25.4 mm) Line feed parameter value of one spacing of 3.175 mm Line feed parameter value of one spacing of 0.5, 1.0, 1.5 and two spacings of 5 mm

Note – The definitions of these presentation capabilities may be found in Recommendation S.60. Future extensions and private-use capabilities are to be accommodated with CDCL.

3.2.2 *Response session start positive (RSSP)*

3.2.2.1 The RSSP shall be used to acknowledge entry into a session. It indicates that the CSS command has been understood and is in a correct format.

3.2.2.2 Response parameters are:

a) *Service identifier* – This mandatory parameter identifies the service (e.g. Teletex, facsimile) that the sender of this response intends to use.

Note – For the basic Teletex service, the service identifiers in RSSP and CSS must be identical.

b) *Terminal identifier* – This mandatory parameter provides the terminal identification of the sender of the RSSP in accordance with the terminal identification specified in Recommendation F.200 [1].

c) *Date and time* – This mandatory parameter must be identical to the corresponding parameter in the CSS. It is used in conjunction with the terminal identifications of both terminals in a session as a reference to that session.

d) *Additional session reference number* – If used in the CSS and if used by the receiver of CSS, this parameter shall have the same value as in the CSS. If it is not used by the receiver of CSS it shall not appear in the RSSP.

e) *Non-basic terminal capabilities* (i.e. those available as receiving capabilities of the sender of the RSSP) – The same conditions apply as for § 3.2.1.2 e) above.

f) *Non-basic session capabilities* – As for § 3.2.1.2 f) above.

g) *Private use parameters* – As for § 3.2.1.2 g) above.

3.2.3 *Response session start negative (RSSN)*

3.2.3.1 The negative response indicates that the session was not entered by the receiver of the CSS. It is not mandatory to indicate the reasons for rejection. A non-mandatory private-use parameter may be used with this response.

Note – Reasons to be identified and coded – for further study.

3.2.4 *Command session end (CSE)*

3.2.4.1 The CSE is used for normal (or error-free) termination of a session.

Note – A parameter is reserved to indicate whether the transport connection is to be cleared. Absence of this parameter will cause the transport connection to be cleared.

3.2.5 *Response session end positive (RSEP)*

3.2.5.1 The RSEP indicates to the calling terminal that the called terminal has entered the idle state in an orderly manner.

3.2.6 *Command session abort (CSA)*

3.2.6.1 The CSA may be used at any time by either terminal to terminate a session, whenever a condition is detected indicating that the session cannot be continued successfully.

3.2.6.2 One of the following reasons for the abnormal termination of the session must be given as a CSA parameter:

a) local terminal error;

b) unrecoverable procedural error;

c) reason not defined.

Note – One value is reserved to indicate whether the transport connection is to be cleared.

3.2.7 *Response session abort positive (RSAP)*

3.2.7.1 The RSAP response indicates to the sender of a CSA command (either the source or the sink terminal) that the receiver of CSA has entered the idle state in an orderly manner.

3.2.8 *Command session user information (CSUI)*

3.2.8.1 The CSUI is used to indicate to the receiver that the associated information field of this command conveys command, parameters and information for the document procedures.

3.2.8.2 CSUI does not call for a response. There is no relationship between this command and the response RSUI.

3.2.9 *Response session user information (RSUI)*

3.2.9.1 The RSUI is used to indicate to the receiver of this response (source) that the associated information field conveys responses and parameters for the document procedures. A non-mandatory parameter *request session function* may be used with this command.

3.2.9.2 This RSUI response is not related to any CSUI command.

3.2.10 *Command session change control (CSCC)*

3.2.10.1 In the two-way alternate (TWA) mode CSCC changes the source/sink relationship between the two terminals.

Note – A signal for *request transmit* is available in some responses (see coding scheme). It may be used to indicate that a terminal sending this signal has information to transmit. The terminal receiving this signal is not required to take any action if this signal is detected.

3.2.11 *Response session change control positive (RSCCP)*

3.2.11.1 The RSCCP indicates to the sender of the CSCC that the sink terminal intends to enter the session sending state.

3.3 *Session procedures*

3.3.1 *Session modes of operation*

3.3.1.1 The following provisions concern the TWA mode of session operation:

a) the basic Teletex protocol provides the capability of the TWA mode;

b) at session initiation the sender of the CSS is defined as being the current source of any text information and is therefore the source terminal;

c) the CSCC exchanges the source/sink relationship between the two terminals – the CSCC command should only be invoked outside document boundaries;

d) only the terminal that is currently the source terminal may send the CSCC;

e) there is no requirement for sending text information prior to sending a CSCC;

f) when the called terminal has finished transmitting text it shall hand back the right of sending text to the calling terminal. Only the calling terminal is allowed to send CSE.

3.3.1.2 The following provisions concern the *one-way communication* (OWC) mode of session operation:

a) the OWC mode is achieved by the CSS sender's not issuing a CSCC;

b) there is no requirement to send text information;

c) this mode is a subset of TWA.

3.3.2 *Rules for session elements of procedure*

3.3.2.1 Only the terminal that has established the transport connection (the *calling* terminal) shall send CSS.

3.3.2.2 It is the responsibility of the sender of CSS to examine the parameters of RSSP and to determine whether the session should continue. If it is not to be continued, the session shall be ended normally (by CSE).

3.3.2.3 In continuing the session, neither terminal is permitted to use any procedure or to send any information that does not comply with the receiving capabilities indicated by the session partner, in the *service identifier* and *non-basic terminal capabilities* parameters of the CSS/RSSP exchange at session initiation and/or by the parameters of CDCL/RDCLP exchange.

3.3.2.4 In the TWA or OWC mode only the sender of CSS may send CSE when he is the current source.

3.3.2.5 In the TWA mode, the recipient of both CSS and CSCC must terminate his period as source by sending CSCC.

3.3.2.6 In any mode of session operation, CSA may be sent at any time by either terminal whenever a condition is detected indicating that the session cannot be successfully continued (e.g. due to failure or charging problems). After having sent CSA, the sender may clear the connection. In all cases the connection must be cleared when the inactivity timer has expired.

3.3.2.7 The parameter value *window size* is not mandatory. It may have a value in the range of 1 to 255. The default value is three. If the parameter is indicated and accepted, the sender of CSS must take during that session the smaller window size exchanged.

3.3.2.8 Figure 1/S.62 is a state transition diagram for TWA and OWC session modes. The *change control* commands (marked with an "a)" in the diagram) do not apply to the OWC mode. The general description and rules of operation for state diagrams may be found at Annex E.

3.4 *Document commands, responses and parameters*

(For summary of document commands and responses, see Table 2/S.62.)

3.4.1 *Command document start (CDS)*

3.4.1.1 The CDS indicates the start of a document (delivery unit) to the receiver of this command. It also indicates the start of the first page (commitment unit). (For the definition of delivery and commitment units, see Annex B.)

3.4.1.2 Command parameters are:

a) Service interworking identifier – not a mandatory field.

   Note – When communicating with a conversion facility an identifier may be required for:

   i) Teletex/telex interworking – the identifier will indicate that the document(s) has been prepared in accordance with the rules given in Recommendation F.200 [1];

   ii) Teletex/Videotex interworking – for further study;

   iii) Teletex/facsimile interworking – for further study.

b) Document type identifier – not a mandatory field; absence of this parameter indicates a normal document (for a description of types of document, see Annex F).

c) Document reference number (see § 4.2.9).

d) Indication of required terminal capability (standardized or private use) – not a mandatory field; however, this parameter must be used if standardized optional terminal capabilities are required for the document.

e) Private use parameters (not mandatory) – definition of such parameters is not standardized.

3.4.1.3 There is no response to CDS except in the case of an error, for which RDGR is used.

3.4.2 *Response document general reject (RDGR)*

3.4.2.1 The RDGR may be used by the sink to indicate to the source that a procedural error has occurred and that resynchronization is requested. The bit pattern of the command or response up to and including the error shall be returned to the source. Only the first detected error within a command or response must be processed by this method.

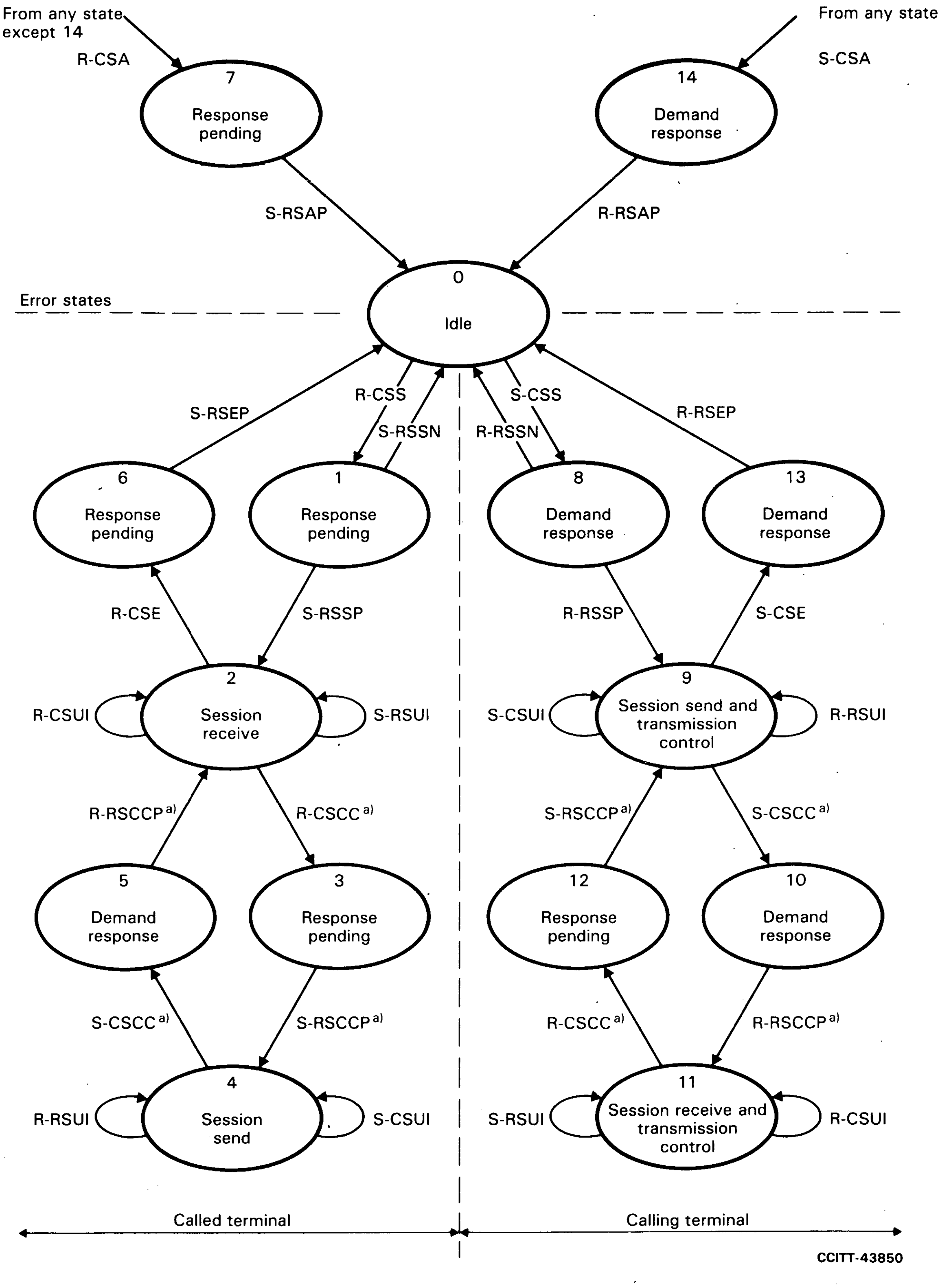
3.4.2.2 The response parameter is the bit pattern required by § 3.4.2.1.

3.4.2.3 It is the responsibility of the terminal receiving an RDGR response to take appropriate action.

Note – Use of RDGR for other kinds of error is for further study.

3.4.3 *Command document continue (CDC)*

3.4.3.1 The CDC indicates to the receiver of this command the continuation of transmission of a document (delivery unit) that has previously been partially transmitted.



a) These "change control" commands do not apply to the OWC mode.

FIGURE 1/S.62

State transition diagram for TWA and OWC session modes

3.4.3.2 Command parameters are:

a) Document linking information, in order to identify the previous transmission of the partial document, including:

   – the checkpoint reference number (see § 4.2.6) from which the transmission is being continued;

   – the document reference number, which shall be the same as the document reference number in the CDS;

   – the session reference information identifying the session in which the *first* part of the document was sent.

   Note 1 – If several continuations are required to complete transmission of a document, all are linked to the partial transmission in which the CDS was used. The sequence of checkpoint reference numbers is then used to identify the correct sequencing for linking and all such continuations shall be transmitted in this sequence.

   Note 2 – It is the responsibility of the receiving terminal to discard any text information that has been duplicated in the process of continuation of an interrupted transmission.

b) Service interworking identifier – not mandatory field [see the note under § 3.4.1.2 a) for CDS].

c) Document type identifier – not a mandatory field; absence of this parameter indicates a normal document (for a description of the types of document, see Annex F).

d) Document reference number (of the current session) – see § 4.2.9.

e) Optionally, any other parameter field(s) that appeared in the CDS command at the start of the document may be repeated as parameter(s) in CDC.

3.4.3.3 There is no response to CDC except in the case of an error, for which RDGR is used.

3.4.4 *Command document capability list (CDCL)*

3.4.4.1 The CDCL initiates an exchange of information to enable a check of the terminal capabilities (both standardized and private use). The command shall include a list of receiving capabilities that may be needed at the receiver by the sender of this command.

3.4.4.2 The command may also be used to investigate the storage capability of the remote terminal. The required amount of storage (given in kilo-octets) is indicated in a parameter of the command in this case.

Note – Other mechanisms for storage negotiation are for further study.

3.4.4.3 Command parameters are the list of receiving capabilities and the required amount of storage.

3.4.4.4 The CDCL command should only be invoked outside document boundaries.

3.4.5 *Response document capability list positive (RDCLP)*

3.4.5.1 The RDCLP acknowledges the CDCL and contains one of the following three parameters:

a) confirmation that all the requested capabilities are available at the receiver;

b) a list of the requested capabilities that are available at the receiver;

c) a complete list of non-basic receiving capabilities.

3.4.5.2 If the CDCL is used for memory negotiation, one of the following parameters shall also be included:

a) confirmation that the amount of memory requested is available and has been reserved;

b) indication of the available (and reserved) amount of memory (in kilo-octets);

c) indication that the available memory cannot be estimated;

d) indication that the requested memory capacity cannot now be reserved.

3.4.6 *Command document end (CDE)*

3.4.6.1 The CDE shall be used to indicate to the receiver of this command the end of a document (delivery unit). It also represents the final checkpoint to which a response shall be made.

3.4.6.2 The command parameter is the checkpoint reference number.

3.4.6.3 The RDPBN shall be used as the negative response to the checkpoint in CDE.

3.4.7 *Response document end positive (RDEP)*

3.4.7.1 The RDEP gives a positive acknowledgement to the last checkpoint (commitment unit). In the basic Teletex service this is the last page reference number.

3.4.7.2 The RDEP shall also indicate that the receiver:

a) has not detected any error;

b) accepts responsibility for the received document (delivery unit);

c) is ready to receive a new CDS or CDC.

3.4.7.3 The RDEP shall include as a parameter the checkpoint reference number of the CDE.

3.4.7.4 After sending RDEP, there is no further means within these control procedures for error recovery for that document.

3.4.8 *Command document discard (CDD)*

3.4.8.1 The CDD shall be used to indicate to the receiver of this command the abnormal ending of a document and that the receiver of the command is not held responsible for the part of the document received so far. Therefore, as a local function outside these control procedures, the receiver can delete the part of the text received.

Note – The receiving terminal may discard the document from its memory and/or indicate to the operator that this part of the document has no value.

3.4.8.2 The reason for sending the CDD command may be given as a CDD parameter. If used, only one of the following reasons shall be indicated:

a) local terminal error;

b) unrecoverable procedural error;

c) reason not defined.

3.4.8.3 The CDD may only be used to terminate the current document, instead of using CDE or CDR. It cannot be used after a CDR has been sent.

3.4.8.4 The receiver of a CDD is allowed to delete the received part of the document, but has no obligation to do so. If the text is not deleted, the operator shall be informed.

3.4.9 *Response document discard positive (RDDP)*

3.4.9.1 The RDDP acknowledges the CDD and indicates that the receiver of the command is ready to receive a new CDS or CDC. No negative response is allowed.

3.4.10 *Command document resynchronization (CDR)*

3.4.10.1 The CDR shall be used by the source to indicate to the sink the point of resynchronization. If used within a document it shall abnormally end that document.

3.4.10.2 The reason for an abnormal ending of a document may be given as a CDR parameter. If used, only one of the following reasons may be given:

a) local terminal error;

b) unrecoverable procedural error;

c) reason not defined.

3.4.10.3 If, during the transmission of a document, there is an interruption of the transport connection or session such that another call and/or session establishment is needed, the following rules apply:

a) the receiving terminal shall treat the failure as if a CDR had been received and an RDRP had been sent;

b) the sending terminal shall treat the failure as if a CDR had been sent and an RDRP had been received.

3.4.11 *Response document resynchronization positive (RDRP)*

3.4.11.1 The RDRP is sent by the receiver of a CDR as a positive acknowledgement of the command.

3.4.11.2 IF RDRP is used with a document, it confirms to the sender of a CDR that the sender of RDRP has already accepted responsibility for the received document (up to the last checkpoint for which a positive acknowledgement has been sent). It does not indicate that the receiver of the command will be able to perform linking of the following parts of the interrupted document (delivery unit).

3.4.11.3 The control procedures provide a means for resuming transmission of an interrupted document.

3.4.11.4 The linking of the parts of an interrupted document is a local operation at the receiver and is therefore not within the responsibility of the control procedures. Thus these procedures cannot guarantee that this linking of parts of a document will be effected.

3.4.12 *Command document user information (CDUI)*

3.4.12.1 The CDUI indicates to the receiver of this command that the associated information is to be interpreted as the user text information field being conveyed by the Teletex service.

3.4.12.2 The basic Teletex service does not require any parameter for CDUI. The procedure provides means for adding parameters. Any such need is for further study.

3.4.13 *Command document page boundary (CDPB)*

3.4.13.1 The CDPB indicates to the receiver the boundary between pages. It also indicates a checkpoint for error recovery purposes (see § 4). CDPB invites the sink to accept responsibility for the previously received page (page commitment unit – see Annex B).

3.4.13.2 The CDPB command parameter is the checkpoint reference number, which, in the basic Teletex service, is the page reference number.

3.4.14 *Response document page boundary positive (RDPBP)*

3.4.14.1 This response shall be used to indicate that the receiver accepts responsibility for that page (acknowledgement of commitment unit).

3.4.14.2 Response parameters are:

a) a mandatory parameter giving the checkpoint reference number (see § 3.4.13.2 above);

b) a mandatory parameter indicating that the ability of the receiving terminal to continue to accept traffic is jeopardized (e.g. memory threshold reached).

3.4.15 *Response document page boundary negative (RDPBN)*

3.4.15.1 This response shall be used to indicate that the receiver does not accept the responsibility for that page (commitment unit), e.g. due to a detected error or other failure.

3.4.15.2 The value of the mandatory parameter giving the reason for a negative response should be one of the following:

a) memory overflow;

b) sequence error;

c) local terminal error;

d) unrecoverable procedural error;

e) no specific reason stated (used for reasons other than those listed).

3.5 *General rules for document elements of procedure*

3.5.1 When a document has been either started by CDS or continued by CDC, it must be terminated by either CDE, CDR or CDD prior to sending the next CDS or CDC.

3.5.2 The following rules relate to the CDS and CDC parameters:

a) the service interworking parameter may be used to indicate that the document is suitable for interworking; however, use of this parameter is mandatory in the case of service interworking;

b) absence of the document type identifier indicates that the associated document is a normal text document.

3.5.3 No negative response to CDS or CDC may be sent after the sending of a positive response to any checkpoint within that document.

3.5.4 No negative response to CDD or CDR is allowed except for error conditions where RDGR applies.

3.5.5 With regard to the responses to CDPB (RDPBP or RDPBN), the receiver may reject reception for a detected error, but the receiver is not obligated to monitor for errors in the document. Once a page (commitment unit) has been positively acknowledged, any error recovery for the subsequent detection of an error is beyond the scope of these control procedures.

3.6 *Rules for document state diagrams in the basic Teletex service*

3.6.1 *General*

3.6.1.1 The rules common to all state diagrams are given in Annex E.

3.6.1.2 For any error a terminal is permitted to send CSA. If this procedure is not used, the following rules shall apply.

3.6.2 *Rules for the sending protocol* (see Figure 2/S.62)

3.6.2.1 Any command or response received in state 1 shall cause an abnormal end of the session and sending of CSA.

3.6.2.2 Reception of any command or response not shown as allowed in the state diagram in states 2 to 11 shall cause CDR or CDD to be sent.

3.6.2.3 Reception of any command or response except RDCLP in state 14 shall cause CDR to be sent.

3.6.2.4 In state 13 receipt of RDRP or RDDP will cause a transition to state 1. Any other command or response will be discarded.

3.6.2.5 The inactivity timer started when state 13 is entered is only reset when a valid response is received.

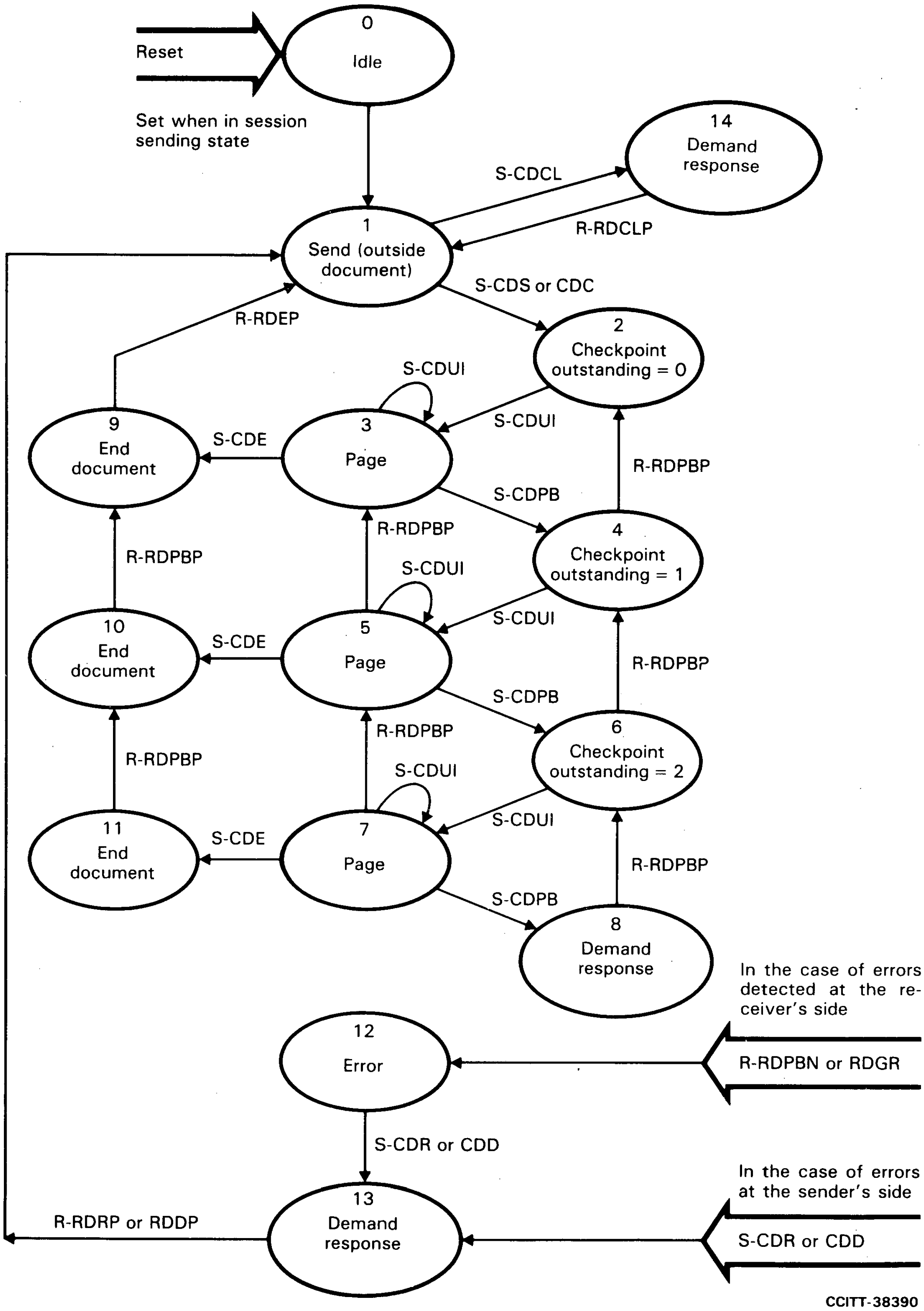


FIGURE 2/S.62

Document state diagram for a window size of 3 (sending protocol)

3.6.3 *Rules for the receiving protocol* (see Figure 3/S.62)

3.6.3.1 Reception of any command or response except CDS, CDC, CDCL in state 1 shall cause RDGR to be sent.

3.6.3.2 In state 12 receipt of CDR or CDD will cause a transition to state 13. Any other command or response received will be discarded.

3.6.3.3 Reception of any command or response not allowed in the state diagram or any invalid parameters or parameter values in state 2 to 11 may cause RDGR to be sent.

3.6.3.4 The inactivity timer started when state 12 is entered is only reset when a valid command is received.

4 Error recovery in the basic Teletex service

4.1 *General principles*

4.1.1 During a session, each partner is responsible for monitoring for the correct operation of the following:

a) maintenance of the currently agreed source/sink relationship;

b) proper use of the command/response procedural sequences as described in the state diagrams and rules for operation (see § 3.6);

c) detection of any period of inactivity in excess of 60 s (indicating, for example, a failure or other inability to continue productive use of the session).

4.1.2 Upon detection of any failure to maintain proper operation as described in § 4.1.1, use of the error recovery procedures defined for each state is mandatory; or, where such error recovery procedures are not specifically defined, session termination (abnormal end) is mandatory.

4.1.3 In the event of an error, this control procedure allows for repeated transmission of information. The number of repetitions should be limited by the sender.

4.2 *Rules for checkpointing*

4.2.1 After an abnormal termination of a document, for recovery in the same session the checkpoint reference number and the document reference number are required in order to identify unambiguously the point from which to recover.

4.2.2 A new session (and call) has to be initiated after abnormal termination of a document where recovery is to be effected in a subsequent session or after an abnormal termination and/or interruption of the call. The information required in order to identify unambiguously the point from which to recover is:

a) the reference for the interrupted session;

b) the document reference number; and

c) the checkpoint reference number.

4.2.3 In the basic Teletex service a checkpoint must be inserted at each page boundary using CDPB.

4.2.4 If a negative response is received to a command representing a checkpoint, the transmission must be interrupted by sending a CDR or CDD.

4.2.5 Within a document, a final checkpoint will be represented by the CDE. Transmission of another document is not permitted until the response to this command has been received.

4.2.6 No other checkpointing is permitted in the basic service. For other applications an optional checkpointing mechanism may be used, as described in Annex G.

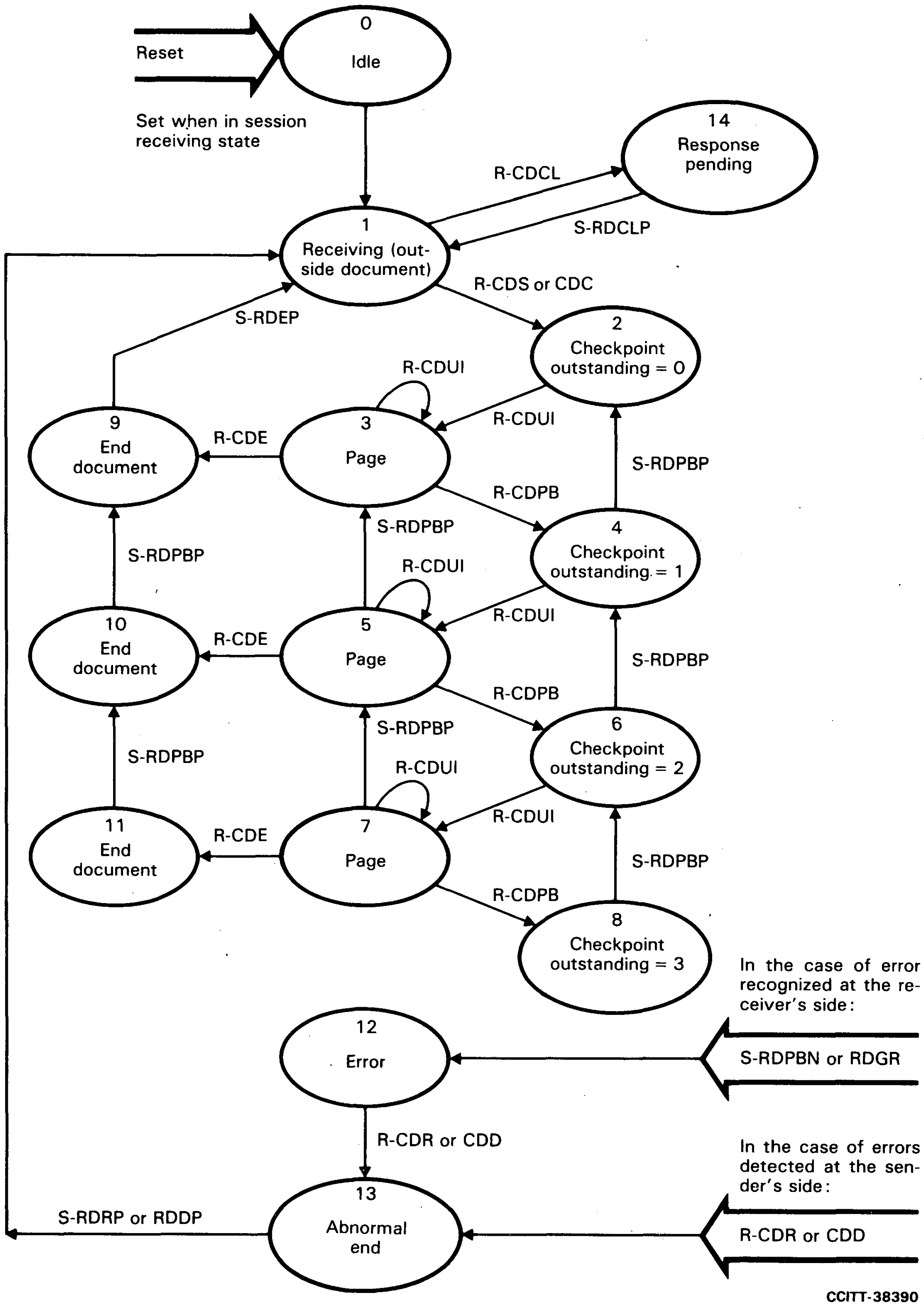


FIGURE 3/S.62

Document state diagram for a window size of 3 (receiving protocol)

4.2.7 Each command representing a checkpoint shall contain a parameter showing the reference number. Each such command calls for a response, which shall contain a parameter showing the checkpoint reference number to which that response applies.

4.2.8 Checkpoint reference numbers shall be assigned as decimal digits starting from 001 and sequentially incremented by one for each checkpoint within a document.

4.2.9 Document reference numbers shall be assigned as decimal digits, preferably, but not necessarily, starting from 001 and sequentially incremented by one for each successive document. Document reference numbers shall be assigned to all documents in a session, irrespective of the document type identifier or whether CDS or CDC is used as the initiating command.

4.2.10 The sum of the numbers of digits contained in the checkpoint reference number and the document reference shall not exceed six, to permit printing in the available space in the *Call identification line* as defined in Recommendation F.200 [1]. There is no constraint on the maximum number of digits in either number, as long as this limitation is not exceeded.

4.3 *Acknowledgement window*

4.3.1 In the basic Teletex service the sender is prohibited from exceeding an acknowledgement window size of three. The maximum window size may be negotiated during session establishment using the CSS command parameters (see § 5.7.8).

4.3.2 The sender is permitted to recover from an interrupted transmission at only one of two points:

a) the sender may transmit the entire document, cancelling the earlier partial transmission of that document;

b) the sender may resume, starting at the point in the text of the last checkpoint for which an acknowledging response was received.

On this basis, the receiver must be able to resume reception at a checkpoint ranging from the last acknowledged checkpoint to the last acknowledged checkpoint plus one, minus the window size.

4.3.3 The window mechanism has been introduced in order to allow continuous transmission of documents. The window mechanism may also be used by the receiving terminal to resolve local time problems without affecting the continuous transmission.

4.3.4 The design of a terminal should be such that continuous reception is possible in normal operation of the terminal (with an average page content of 1500 octets). The use of the window mechanism should take into account the quality of service requirements in Recommendation F.200 [1].

4.3.5 If transmission flow control is needed, it shall be provided by the transport service.

5 Coding

5.1 *Definition of terms used in coding*

5.1.1 **command identifier (CI) or response identifier (RI)**

F: identificateur de commande (IC) *ou de réponse* (IR)

S: identificador de instrucción (II) *o identificador de respuesta* (IR)

The heading information that identifies the command or response concerned.

5.1.2 **length indicator (LI)**

F: indicateur de longueur (IL)

S: indicador de longitud (IL)

Represents the length in octets of an associated field or group of fields.

5.1.3 **parameter identifier (PI)**

F: identificateur de paramètre (IP)

S: identificador de parámetro (IP)

Indicates the type of information contained in an associated field or group of fields.

5.1.4 **parameter group identifier (PGI)**

F: identificateur de groupe de paramètres (IGP)

S: identificador de grupo de parámetros (IGP)

A special case of a parameter identifier, which indicates that the associated field consists entirely of a group of parameters, each identified by a parameter identifier.

5.1.5 **parameter value (PV)**

F: valeur de paramètre (VP)

S: valor de parámetro (VP)

The information that represents the value of the parameter identified by either a PI or PGI.

5.1.6 **field**

F: champ

S: campo

Either a group of one or more bits within a single octet or a group of one or more octets, used to represent a particular set of information.

5.2 *Principles of coding*

5.2.1 The coding of session commands and parameters is independent of the coding of document commands and parameters and vice versa.

5.2.2 Binary field encoding principles have been used to allocate bit patterns for the CI, RI, PGI and PI.

5.2.3 The first section of a session or document field consists of either a CI or an RI. Each CI or RI is always immediately followed by an LI.

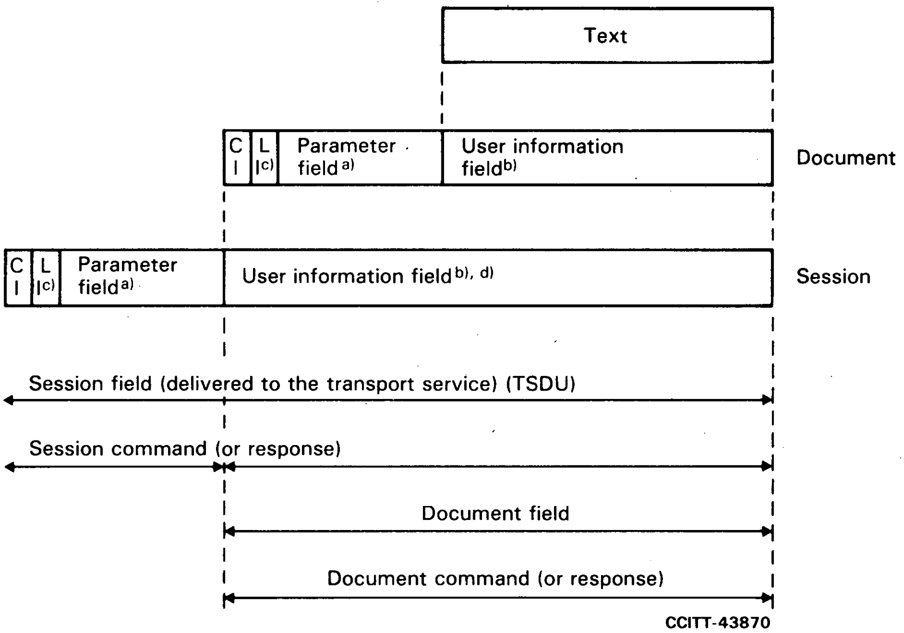
5.2.4 The value of an LI is a binary number that represents the total length of the immediately following parameter field(s) in octets. The value of the LI does not include either itself or any subsequent user information.

5.2.5 If a parameter field indicated by a PGI appears within a parameter field initiated by a PGI, the PV field of the *nested* PGI field may not extend beyond the end of the PV of the enclosing PGI field.

5.2.6 To decode CI, RI, PGI and PI, all the bits of the identifier must be considered.

5.2.7 The format of a parameter field initiated by a PGI is the same as the format of such a field initiated by a PI except that the entire PV field consists of a sequence of one or more parameter fields, each of which is initiated by either PI or PGI.

5.2.8 Figures 4/S.62, 5/S.62 and 6/S.62 illustrate the coding principles.



a) Present only if LI ≠ 0.

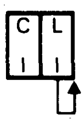
b) Present only after user information commands (or responses).

c) See § 5.2.4.

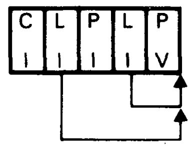
d) See § 1.2.1.

FIGURE 4/S.62

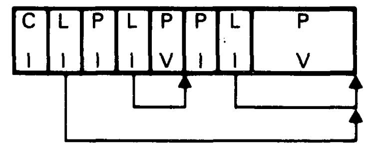
Illustration of the relationship between session and document commands



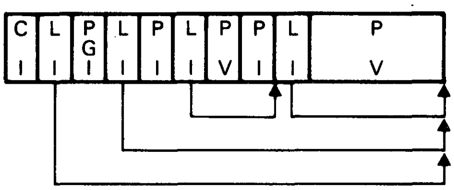
a) LI = 0 (i.e. no parameter field)



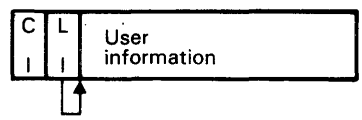
b) LI = 3 and 1 respectively means one parameter of one octet value



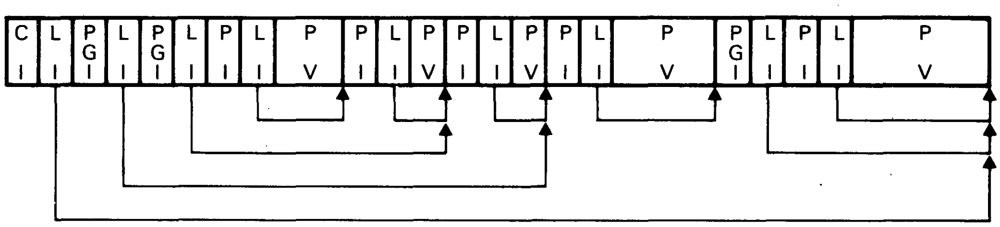
c) Two parameters of 1 and 3 octets respectively, LIs are 8, 1 and 3 respectively



d) One PGI with two enclosed PIs



e) The most simple carrier of user information



CCITT-43881

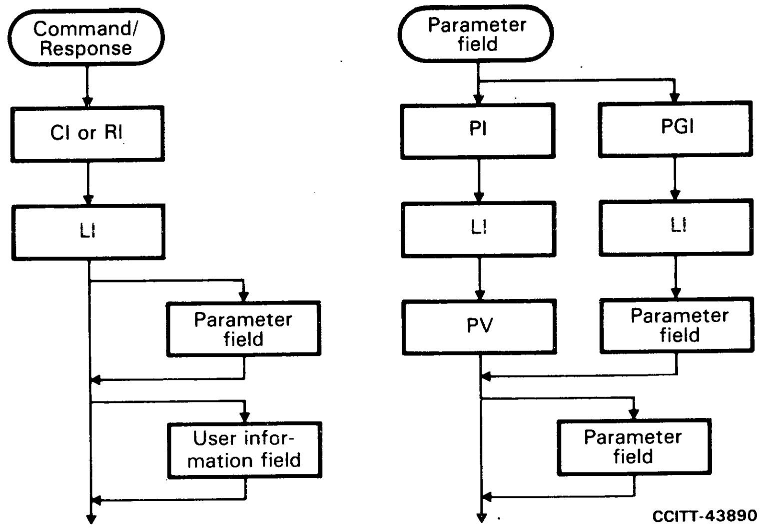
f) Example of complex use of PGIs

Note 1 – In every case the CI can be replaced by an RI.

Note 2 – Any PI or PGI may be omitted when it is not used for conveying information (i.e., parameter values). PIs and PGIs within the same nesting level are put in order of increasing binary value.

FIGURE 5/S.62

Examples of command structure



Note – This figure may need further study.

FIGURE 6/S.62

Allowable sequences of units within a command or response

5.3 *Coding of length indicators*

5.3.1 The value of an LI is a binary number that represents the total length in octets of the immediately following CI, RI, PI and/or PGI fields. The value of the LI does not include either itself or any subsequent user information, as noted in § 5.2.4 above.

5.3.2 The basic LI consists of a single octet with a maximum value of 254 in decimal (i.e., a binary value of 11111110).

5.3.3 If the first octet of the LI is 255 decimal (i.e., a binary value of 11111111), this indicates that the value of the LI is contained in the next two following octets allowing a maximum value of 65 535 octets.

5.3.4 Within any octet, the highest order bit is bit 8 with the remaining bits assigned in descending order. Where the length value is represented in two octets, the first contains the higher order bits.

5.4 *Coding of command and response identifiers for session elements*

5.4.1 The coding of CI and RI for sessions commands and responses is shown in Table 4/S.62.

5.4.2 Apart from private use, the codes of the command and responses in Table 4/S.62 are assigned in such a way that the bits may be interpreted as follows:

Bit 1	1 = Command	0 = Response
Bit 2	1 = Positive	0 = Negative (response)
Bit 3	1 = Initiate	0 = Stop (for most commands)
Bits 4, 5	11 Session 10 Session 01 Interaction 00 Session user	
Bits 6, 7, 8	Set to zero and reserved for extension.	

TABLE 4/S.62

Command and response identifiers for session elements

Command/ Response	Bit number 8	7	6	5	4	3	2	1
CSS	0	0	0	0	1	1	0	1
CSE	0	0	0	0	1	0	0	1
CSA	0	0	0	1	1	0	0	1
CSCC	0	0	0	1	0	1	0	1
CSUI	0	0	0	0	0	0	0	1
RSSP	0	0	0	0	1	1	1	0
RSSN	0	0	0	0	1	1	0	0
RSEP	0	0	0	0	1	0	1	0
RSAP	0	0	0	1	1	0	1	0
RSCCP	0	0	0	1	0	1	1	0
RSUI	0	0	0	0	0	0	1	0
CSTW	0	0	0	1	1	1	0	1
RSTWP	0	0	0	1	1	1	1	0
RSTWN	0	0	0	1	1	1	0	0
Private use	1	1	1	1	x	x	x	x

Note – For CSTW, RSTWP and RSTWN, which concern two-way simultaneous operation, see Annex C.

Note – If possible, this binary field coding structure should be followed in making future code assignments, but this is not mandatory if the number of available code combinations is insufficient. Therefore, it is not intended as a guide for implementation.

5.4.3 One or more of the nonallocated values are to be reserved for future extension. The method of future extension is for further study.

5.5 *Coding command and response identifiers for document elements*

5.5.1 The coding of command and response identifiers for document commands and responses is shown in Tables 5/S.62 and 6/S.62 respectively.

TABLE 5/S.62

Coding for document command identifiers

Command	Bit number 8	7	6	5	4	3	2	1
CDS	0	0	1	0	1	1	0	1
CDC	0	0	0	1	1	1	0	1
CDE	0	0	1	0	1	0	0	1
CDR	0	0	0	1	1	0	0	1
CDD	0	0	1	1	1	0	0	1
CDPB	0	0	1	1	0	0	0	1
CDRP	0	0	1	0	0	0	0	1
CDRPR	0	0	1	0	0	1	0	1
CDCL	0	0	1	1	1	1	0	1
CDUI	0	0	0	0	0	0	0	1
Reserved for private use	1	1	1	1	x	x	x	x

Note – For CDRP (command document recovery point) and CDRPR (command document recovery point restart), see Annex G concerning the optional error recovery mechanism.

TABLE 6/S.62

Coding for document response identifiers

Response	Bit number 8	7	6	5	4	3	2	1
RDEP	0	0	1	0	1	0	1	0
RDRP	0	0	0	1	1	0	1	0
RDDP	0	0	1	1	1	0	1	0
RDPBP	0	0	1	1	0	0	1	0
RDPBN	0	0	1	1	0	0	0	0
RDCLP	0	0	1	1	1	1	1	0
RDGR	0	0	0	0	0	0	0	0
RDRPN	0	0	1	0	0	0	0	0
RDRPR	0	0	1	0	0	1	0	0
Reserved for private use	1	1	1	1	x	x	x	x

Note – For RDRPN (response document recovery point negative) and RDRPR (response document recovery point restart), see Annex G concerning the optional error recovery mechanism.

5.5.2 Apart from private use, the codes of the commands and responses in Tables 5/S.62 and 6/S.62 are assigned in such a way that the bits may be interpreted as follows:

Bit 1	1 = Command	0 = Response
Bit 2	1 = Positive	0 = Negative (for responses)
Bit 3	1 = Initiate	0 = Stop (for most commands)
Bits 4, 5, 6	111, 110, 101	Document/Delivery unit
	100	(Reserved)
	011	Page (commitment unit)
	010	Reserved
	001	(Reserved for recovery unit)
	000	Text
Bits 7, 8	Set to zero, and reserved for future extension.	

5.5.3 See §§ 5.4.2 and 5.4.3 above.

5.6 *Coding of parameter group and parameter identifiers*

5.6.1 The coding of PGIs and PIs for session commands and responses is shown in Table 7/S.62. The coding of the PGIs and PIs for document commands and responses is shown in Table 8/S.62.

5.6.2 Tables 9 and 10/S.62 list the PGIs and PIs for each command and response for the session and document elements of procedure together with an indication of whether the PGIs and PIs concerned are mandatory or not.

5.6.3 Where a PI is allocated to a particular PGI this is shown in Table 7/S.62 or 8/S.62. Some PIs are not allocated to a PGI and are used as required. Some PIs may be used without preceding PGIs as defined in Tables 9/S.62 and 10/S.62.

5.6.4 The codes of these PGIs and PIs are assigned in such a way that the binary field consisting of bits 8, 7 and 6 may be interpreted as follows:

bits 876		
000	Session related	
001	Document related	(These documents related PGIs and PIs may possibly be of use to other services.)
010	Document related	
011, 100, 101, 110	Reserved	
111	Private use	

The binary field consisting of bits 5 and 4 may be interpreted as follows:

bits 54	
00	PGI
01	PI
10	PI
11	PI

The binary field consisting of bits 3, 2 and 1 is used to extend the PGIs when set to 000.

Note – If possible, this binary field coding structure should be followed in making future code assignments, but this is not mandatory if the number of available code combinations is insufficient. Therefore, it is not intended as a guide for implementation.

TABLE 7/S.62

Coding of session PGIs and PIs

Parameter group identifiers (PGI)									Parameter identifiers (PI)								
Name or function	Bit number 8	7	6	5	4	3	2	1	Name	Bit number 8	7	6	5	4	3	2	1
Reserved for extension	0	0	0	0	0	0	0	0									
Session reference	0	0	0	0	0	0	0	1	Terminal identifier of the called terminal	0	0	0	0	1	0	0	1
									Terminal identifier of the calling terminal	0	0	0	0	1	0	1	0
									Date and time	0	0	0	0	1	0	1	1
									Additional session reference number	0	0	0	0	1	1	0	0
Nonbasic session capabilities	0	0	0	0	0	0	1	0	Miscellaneous session capabilities	0	0	0	0	1	1	0	1
									Window size	0	0	0	0	1	1	1	0
Nonbasic terminal capabilities	0	1	0	0	0	0	0	1	Control character set	0	1	0	0	1	0	0	1
									Page format	0	1	0	0	1	0	1	0
									Miscellaneous terminal capabilities	0	1	0	0	1	0	1	1
Private use	1	1	1	0	0	x	x	x	Private use	1	1	1	0	1	x	x	x
									Private use	1	1	1	1	0	x	x	x
									Private use	1	1	1	1	1	x	x	x
No PGI associated with these PIs									Service identifier	0	0	0	0	1	0	0	0
									Request session functions	0	0	0	1	0	0	0	0
									Session termination parameter	0	0	0	1	0	0	0	1
									Graphic character set	0	1	0	0	1	0	0	0

TABLE 8/S.62

Coding of document PGIs and PIs

Parameter group identifiers (PGI)									Parameter identifiers (PI)								
Name or function	Bit number 8	7	6	5	4	3	2	1	Name	Bit number 8	7	6	5	4	3	2	1
Reserved for extension	0	0	1	0	0	0	0	0	-								
Reserved for extension	0	1	0	0	0	0	0	0									
Document linking	0	0	1	0	0	0	0	1	Terminal identifier of the called terminal	0	0	0	0	1	0	0	1
									Terminal identifier of the calling terminal	0	0	0	0	1	0	1	0
									Date and time	0	0	0	0	1	0	1	1
									Additional session reference number	0	0	0	0	1	1	0	0
									Document reference number	0	0	1	0	1	0	0	1
									Check point reference number	0	0	1	0	1	0	1	0
Nonbasic standardized terminal capabilities	0	1	0	0	0	0	0	1	Control character set	0	1	0	0	1	0	0	1
									Page format	0	1	0	0	1	0	1	0
									Miscellaneous terminal capabilities	0	1	0	0	1	0	1	1
No PGI associated with these PIs									Service interworking identifier	0	0	1	0	1	0	0	0
									Document reference number	0	0	1	0	1	0	0	1
									Reserved (possible binary check point number)	0	0	1	0	1	0	1	1
									Acceptance of CDCL parameters	0	0	1	0	1	1	0	0
									Storage capacity negotiation	0	0	1	0	1	1	0	1
									Storage overflow warning	0	0	1	0	1	1	1	0
									Reserved	0	0	1	0	1	1	1	1
									Document type identifier	0	0	1	1	0	0	0	0
									Reflect parameter values	0	0	1	1	0	0	0	1
									Reason (document)	0	0	1	1	0	0	1	0
									Graphic character set	0	1	0	0	1	0	0	0

TABLE 9/S.62

PGIs and PIs for session elements of procedure

Session command or response identifier	Parameter group identifiers (PGI)		Parameter identifiers (PI)	
	Description	Mandatory or not mandatory	Description	Mandatory or not mandatory
CSS	Session reference	m	Terminal identification of the called terminal	m
			Date and time	m
			Additional session reference number	nm
	Nonbasic session capability	nm	Window size	nm
			Miscellaneous session capabilities	nm
	Nonbasic terminal capabilities	nm	Control character sets	nm
			Page formats	nm
			Miscellaneous terminal capabilities	nm
	Private use	nm	–	–
			Service identifier	m
CSE			Session termination	nm
CSA			Session termination	m
CSCC				
CSUI				

TABLE 9/S.62 *(continued)*

Session command or response identifier	Parameter group identifiers (PGI)		Parameter identifiers (PI)	
	Description	Mandatory or not mandatory	Description	Mandatory or not mandatory
RSSP	Session reference	m	Terminal identification of the called terminal	m
			Date and time	m
			Additional session reference number	nm
	Nonbasic session capabilities	nm	Window size	nm
			Miscellaneous session capabilities	nm
	Nonbasic terminal capabilities	nm	Graphic character sets	nm
			Control character sets	nm
			Page formats	nm
			Miscellaneous terminal capabilities	nm
			Service identifier	m
	Private use	nm	–	–
			Request session functions	nm
RSSN	Private use			nm
	For further study	–	–	–
RSEP				
RSAP				
RSCCP				
RSUI			Request session functions	nm

TABLE 10/S.62

PGIs and PIs for document elements of procedure

Document command or response identifier	Parameter group identifiers (PGI)		Parameter identifiers (PI)	
	Description	Mandatory or not mandatory	Description	Mandatory or not mandatory
CDS			Document reference number	m
			Service interworking identifier	nm
			Document type identifier	nm
	Nonbasic terminal capabilities	nm	Graphic character sets	nm
			Control character sets	nm
			Page formats	nm
			Miscellaneous terminal capabilities	nm
	Private use	nm	–	–
CDC	Document linking	m	Document reference number	m
			Checkpoint reference number	m
	(Only required if linking in a new session)		Terminal identifier of the calling terminal	m
			Terminal identifier of the called terminal	m
			Date and time	m
			Additional session reference number	nm
			Service interworking identifier	nm
			Document type identifier	nm
			Document reference (current session)	m
			Other parameters of CDS	nm
	Private use	nm	–	–

TABLE 10/S.62 *(continued)*

Document command or response identifier	Parameter group identifiers (PGI)		Parameter identifiers (PI)	
	Description	Mandatory or not mandatory	Description	Mandatory or not mandatory
CDE			Checkpoint reference number	m
CDR			Reason (document)	nm
CDD			Reason (document)	nm
CDPB			Checkpoint reference number	m
CDCL			Storage capacity negotiation	nm
	Nonbasic terminal capabilities	nm	Graphic character sets	nm
			Control character sets	nm
			Page formats	nm
			Miscellaneous terminal capabilities	nm
	Private use	nm	–	–
CDUI			–	–
CDRP			Recovery point reference number	m
CDRPR			Recovery point reference number	m
RDEP			Checkpoint reference number	m
RDRP			–	–
RDDP			–	–
RDPBP			Checkpoint reference number	m
			Receiving ability jeopardized	m
RDPBN			Reason (document)	m

TABLE 10/S.62 *(concluded)*

Document command or response identifier	Parameter group identifiers (PGI)		Parameter identifiers (PI)	
	Description	Mandatory or not mandatory	Description	Mandatory or not mandatory
RDCLP			Acceptance of CDCL parameters	nm
			Storage capacity negotiation	nm
	Nonbasic terminal capabilities	nm	Graphic character sets	nm
			Control character sets	nm
			Page formats	nm
			Miscellaneous terminal capabilities	nm
	Private use		–	–
RDGR			Reflect parameter values	m
RDRPN			Recovery point reference number	m
RDRPR			Recovery point reference number	m

5.7 *Parameter values*

5.7.1 Unless otherwise specified the following rules apply to the fields containing parameter values (PV):

a) Where a binary number is used to represent a value, the highest order bit of each octet is bit 8 with the remaining bits assigned in descending order. Where a binary value is represented by more than one octet, the first octet contains the highest order bits, with successive octets assigned in descending order.

b) All bits reserved for future standardization shall be set to zero.

c) Where a PV contains graphic characters that may be printed or displayed, they shall be in the intended printing/display sequence and shall be coded as defined in Recommendation S.61.

d) For a PGI designated for extension, the PIs and/or PGIs included in the parameter field do not necessarily conform to the following assignments of PI and PGI values.

5.7.2 Assignment of coding to the various parameter values is shown in the following points.

5.7.3 *Terminal identifier of the called terminal*

A sequence of graphic characters as defined in Recommendation F.200 [1].

5.7.4 *Terminal identifier of the calling terminal*

A sequence of graphic characters as defined in Recommendation F.200 [1].

5.7.5 *Date and time*

A sequence of graphic characters as defined in Recommendation F.200 [1].

5.7.6 *Additional session reference number*

A fixed length sequence of two decimal digits as coded in Recommendation S.61.

5.7.7 *Miscellaneous session capabilities*

Bit 1 of the first octet set to 1 indicates the terminal capability for two-way simultaneous information transfer.

Bit 2 of the first octet set to 1 indicates the terminal capability for session suspension.

All other bit values are reserved for future standardization.

5.7.8 *Window size*

A binary number of fixed length of one octet, with a minimum value of one and a maximum value of 255 in decimal (i.e., a binary value of 11111111). The default value is three in decimal (i.e., a binary value of 00000011).

5.7.9 *Graphic character sets* (refer to Recommendations S.60 and S.61)

A variable length field indicating the receiving capabilities for non-basic standardized graphic character sets. Each such graphic character set shall be indicated by the sequence of characters used after an ESCAPE character to designate that set, as defined in Recommendation S.61. Where more than one such character set is to be indicated, a single SPACE shall be used as a separator between the character set indicators.

5.7.10 *Control character sets* (refer to Recommendations S.60 and S.61)

A variable length field indicating the receiving capability for non-basic standardized control character sets. Each such control character set shall be indicated by the sequence of characters used after an ESCAPE character to designate that set, as defined in Recommendation S.61. Where more than one such character set is to be indicated, a single SPACE shall be used as a separator between the character set indicators.

5.7.11 *Page formats* (refer to Recommendations S.60 and S.61)

Bit 1 of the first octet set to 1 shall indicate the capability for use of the optional maximum printable area for the ISO A4 paper size, as defined in Recommendation F.200 [1]. All other bit values are reserved for future standardization.

5.7.12 *Miscellaneous terminal capabilities* (refer to Recommendation S.61)

A variable length field indicating the receiving capabilities for non-basic standardized values of character spacing, line spacing and graphic renditions. Each such function shall be indicated by the sequence of characters used after a Control Sequence Introducer (CSI) for: the Select Horizontal Spacing (SHS) for a character pitch, the Select Vertical Spacing (SVS) for a line pitch and the Select Graphic Rendition (SGR) for a graphic rendition. When more than one such character sequence is to be indicated, a single SPACE shall be used as a separator between them.

5.7.13 *Service identifier*

Bit 1 of the first octet set to 1 indicates the intention to use the Teletex service. All other bit values are reserved for future standardization.

5.7.14 *Reason* (session)

For further study (RSSN).

5.7.15 *Session termination parameter*

Bit 1 of the first octet set to 1 indicates that the transport service connection shall be cleared (default value). When set to 0 it indicates that the connection should not be cleared.

Bit 2 of the first octet set to 1 indicates a local terminal error.

Bit 3 of the first octet set to 1 indicates an unrecoverable procedural error.

Bit 4 of the first octet set to 1 indicates that no reason is given.

All other bits are reserved for future standardization. The CSE command uses only bit 1; all other bits shall be set to 0.

5.7.16 *Request session functions*

In the first octet the following bit assignments are defined:

a) bit 1 if set to 1 indicates request transmit (as defined in this Recommendation);

b) bit 2 if set to 1 indicates request session suspension (as defined in this Recommendation).

All other bits are reserved for future standardization.

5.7.17 *Private use*

A set of PGI and PI values is designated as being for private use. Other than the PGIs designated for extensions and the permitted use of private parameters only with certain commands and responses, the use of these parameters is not defined.

5.7.18 *Service interworking identifier*

Bit 1 of the first octet set to 1 shall indicate that the associated document is suitable for forwarding via the telex service.

All other bit values are reserved for future standardization.

5.7.19 *Document reference number*

A sequence of decimal digits as defined in this Recommendation and coded in Recommendation S.61.

5.7.20 *Checkpoint reference number*

A sequence of decimal digits as defined in this Recommendation and coded in Recommendation S.61.

5.7.21 *Acceptance of CDCL parameters*

Bit 1 of the first octet set to 1 indicates acceptance of all non-basic terminal capabilities requested by a CDCL command.

All other bit values are reserved for future standardization.

Note – Parameters b) and c) of RDCLP (§ 3.4.5.1) are coded as non-basic terminal capabilities.

5.7.22 *Storage capacity negotiation*

A fixed length sequence of two octets:

a) bit 1 of the first octet set to 1 indicates that a terminal has reserved a requested amount of storage;

b) bit 2 of the first octet set to 1 indicates that the binary field in the following octet contains a number indicating storage capacity requested/reserved in kilo-octets;

c) bit 3 of the first octet set to 1 indicates that a terminal cannot estimate its memory capacity;

d) bit 4 of the first octet set to 1 indicates that a terminal cannot now reserve the requested amount of memory;

e) bits 5 to 8 of the first octet are reserved for future standardization.

Octet 2 indicates the memory size available and/or reserved (the meaning is defined in the first octet). It shall be set to 11111111 if bit 3 and/or 4 in the first octet is set to 1.

5.7.23 *Receiving ability jeopardized*

Bit 1 of the first octet set to 1 indicates that the ability of the receiving terminal to continue to accept user information is jeopardized (e.g. memory threshold reached).

All other bits are reserved for future standardization.

5.7.24 *Document type identifier*

Absence of this parameter shall indicate a normal text document. This parameter, if used, is a binary encoded field of fixed length of one octet identifying the document type as follows:

	bit 87654321
Operator document	00000001
Control document	00000010
Monitor document	00000011

All other binary values are reserved for future standardization.

5.7.25 *Reflect parameter value*

This is an arbitrary length field that contains the bit pattern of the command or response up to and including the detected error.

5.7.26 *Reason* (document)

A binary encoded field indicating the reason for failure:

bit 87654321	
00000000	No specific reason stated (used for reasons other than those listed)
00000001	Memory overflow
00000011	Sequence error
00000101	Local terminal error
00000110	Unrecoverable procedural error

The absence of this parameter indicates that no reason is given.

ANNEX A

(to Recommendation S.62)

Definitions

Note – Some of the terms used in this Recommendation have been defined in ways that may differ from the meanings of similar terms in other Recommendations.

A.1 *General*

A.1.1 **Teletex terminal**

F: terminal télétex

S: terminal teletex

A device that is capable of transmitting and receiving Teletex documents in accordance with the basic requirements of Recommendation S.60.

A.1.2 **Teletex call**

F: communication télétex

S: comunicación teletex

The temporary connection (or apparent connection as perceived by the caller) of one terminal to another for the purpose of exchanging information.

A.1.3 **calling terminal**

F: équipement terminal demandeur

S: terminal que llama (o solicitante)

That terminal that initiates the procedures to establish a call.

A.1.4 **called terminal**

F: équipement terminal demandé

S: terminal llamado (o solicitado)

That terminal to which a call is made.

A.1.5 **service interworking**

F: interfonctionnement de service

S: interfuncionamiento de servicios

The facility of sending and receiving information between a Teletex terminal and a terminal of another service, e.g. telex.

A.1.6 **command**

F: commande

S: instrucción

A command is control information sent to another terminal to initiate execution of a specific function. Some commands require a response.

A.1.7 **response**

F: réponse

S: respuesta

A response is control information sent by the recipient of the command to advise the sender of the command of the action taken. Exceptionally, the reaction to a response may be another response.

A.1.8 **source/sink relationship**

F: relation source/collecteur

S: relación fuente/aceptor (o fuente/sumidero)

Customer information is transferred from a source to a sink.

A.2 *Terms specific to session procedures*

A.2.1 **session**

F: échange

S: sesión

A session is the interval during which a logical, mutually agreed correspondence between two application/presentation processes exists for the transfer of application and presentation related information.

A.2.2 *Modes of session*

There are three different modes:

a) One Way Communication (OWC). Customer information is transferred in one direction only during the session, i.e. only one of the terminals will have the right to be the source.

b) Two Way Alternate (TWA). Customer information is transferred in both directions, but only in one direction at a time, i.e. the source/sink relation will be changed one or more times during the session.

c) Two Way Simultaneous (TWS). Customer information is transferred in both directions simultaneously, i.e. both terminals are simultaneously a source as well as a sink.

Note – TWS mode is for further study.

A.2.3 **basic session reference**

F: référence de base de l'échange

S: referencia de sesión básica

The basic session reference is used to identify a session. It consists of:

a) called terminal's identifier;

b) calling terminal's identifier;

c) date and time.

A.2.4 **expanded session reference**

F: référence élargie de l'échange

S: referencia de sesión ampliada

The expanded session reference is used to identify a session uniquely. It consists of the mandatory basic session reference plus an optional additional session reference number.

A.3 *Terms specific to document procedures*

A.3.1 **document**

F: document

S: documento

A document is a sequence of one or more pages intended by the originator to be delivered to the address(es) as a single entity in the original page sequence.

A.3.2 **Teletex page**

F: page télétex

S: página teletex

The basic element of office correspondence in the Teletex service. One A4 (or A4L or North American Standard) page or the information that may be presented on it.

A.3.3 **check point**

F: point de repère

S: punto de comprobación (o de validación)

A check point is a numbered mark inserted by the sender in the text stream to provide a reference point for error recovery.

A.3.4 **acknowledgement window**

F: fenêtre d'accusé de réception

S: ventana de acuse de recibo

The maximum number or check points that a sender can transmit without receiving an acknowledgement from the receiver.

ANNEX B

(to Recommendation S.62)

Elementary functions of the procedure

B.1 *Introduction*

B.1.1 The purpose of this annex is to provide a more formal description of the document elements of procedure. The definition of independent and elementary functions forming a basic set of elements leads to the following:

a) the description of each element of procedure in this basic set is unambiguous (open to a single interpretation);

b) the functions that are common in two different elements of procedure appear clearly in the description of these elements (see Table B-1/S.62);

c) the separation of the elements of procedure into dialogue elements and elements concerning the structure of the user information;

d) for future elements of procedure, this basic set helps to re-use the elements in the basic set, which are already implemented, in new combinations.

TABLE B-1/S.62

Analysis of document layer commands and responses in terms of elementary functions

Command/ Response	User structure	Dialogue
CDS	Start of D, P	Start of DU (CU, RU)
CDE	End of D, P	End of DU (CU, RU)
CDR	Suspend D	End of DU (CU, RU)
	Discard current P	
CDPB	End of P	End of CU (RU)
	Start of P	Start of CU (RU)
CDUI	Start of DUIB	
CDC	Continue D	Start of DU (CU, RU)
	Start of P	
CDD	Discard D	End of DU (CU, RU)
RDEP	–	Ack DU (CU, RU)
RDPBP	–	Ack CU (RU)
RDPBN	–	Nack CU (RU)
RDRP	–	Ack DU (CU, RU)
RDGR	–	End of DU (CU, RU)
CDRP	See Annex G –	Start of RU
RDRPN	See Annex G –	Nack RU
CDRPR	See Annex G –	Start of RU
RDRPR	See Annex G –	Start of RU

B.1.2 §§ B.2 and B.3 below describe the basic set of elementary functions. These functions have been selected such that:

a) they are elementary (they cannot be subdivided);

b) they are independent;

c) any element of procedure shall be capable of being described using the basic set.

B.1.3 Only the document elements of procedure have been taken into account.

B.2 *Dialogue elements*

B.2.1 *Recovery unit (RU)*

A unit delimited by a recovery mark inserted by the sender in the text stream to provide a reference point for resuming transmission after a transmission interruption.

Note – The RU may be used to provide for different recovery mechanisms. The recovery mark may or may not require an acknowledging response depending upon the recovery mechanism.

B.2.2 *Commitment unit (CU)*

Element inviting the sink to take over responsibility for the transmitted information.

B.2.3 *Delivery unit (DU)*

One or more commitment units that are to be considered as a single entity for the purpose of synchronization.

B.2.4 *Interaction unit (IU)*

Element indicating the change of source and sink of data.

B.3 *User structure elements*

B.3.1 *Document user information block (DUIB)*

Smallest quantity of information preserved as one unit by the procedure.

B.3.2 *Page (P)*

The unit of information that may be presented on one physical page.

B.3.3 *Document (D)*

A sequence of one or more pages intended to be delivered as a single unit in the original page sequence.

B.4 *Rules*

B.4.1 The dialogue elements are related in accordance with the following hierarchy:

RU – lowest level in the hierarchy

CU ↓

DU

IU – highest level in the hierarchy

B.4.2 Initiation/termination of any unit in this hierarchy also initiates/terminates all units at lower levels of the hierarchy.

ANNEX C

(to Recommendation S.62)

Two-way simultaneous session mode of operation

Note – Two-way simultaneous (TWS) session mode of operation is envisaged as being one of a range of standardized options. At present, however, Recommendation F.200 [1] states that the use of TWS mode in the international Teletex service is for further study.

C.1 *General*

C.1.1 The TWS mode of operation may be used in addition to the basic session procedure.

C.2 *Elements of procedure*

C.2.1 *Command session TWS (CSTW)* shall be used to invoke the TWS mode of session operation. When this mode has been invoked it continues until ended by the called terminal.

C.2.2 *Response session TWS positive (RSTWP)* shall indicate that the receiver of CSTW has entered into the TWS mode of session operation.

C.2.3 *Response session TWS negative (RSTWN)* shall indicate that the TWS mode of operation has not been entered by the receiver of CSTW. It is not mandatory to indicate the reasons for rejection. An optional parameter field is provided to indicate the reason.

C.3 *Rules for TWS mode*

C.3.1 The TWS mode shall be initiated by CSTW, preferably immediately following reception of RSSP. The use of CSTW at any other time within a session is for further study.

C.3.2 Once invoked, the TWS mode continues until terminated by the called terminal's sending CSCC.

C.3.3 CSTW may only be sent by the calling terminal while it is in the sending state.

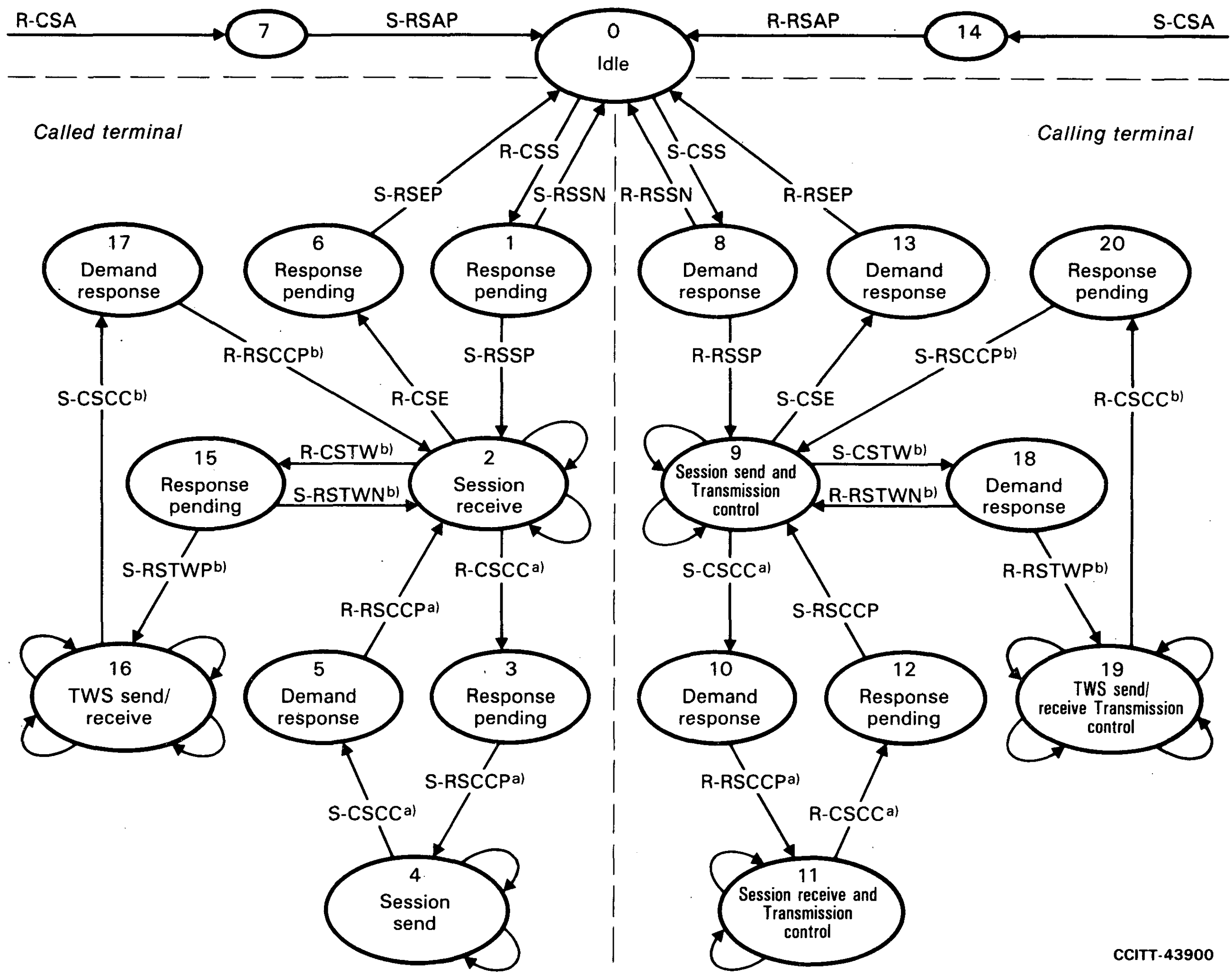
C.3.4 The TWS mode is not a basic capability of the Teletex service and therefore the CSTW may be responded to negatively.

C.3.5 To terminate the TWS mode, the called terminal shall send a CSCC when it has finished its transmission of documents. This implies that the session mode returns to the ordinary TWA mode.

After responding to CSCC with a RSCCP, the calling terminal will send CSE once it too is ready for normal session termination.

C.4 *State diagram*

C.4.1 Figure C-1/S.62 is a state diagram for OWC, TWA and TWS showing the error states.



a) Only applicable for TWA mode.

b) Only applicable for TWS mode.

FIGURE C-1/S.62

State diagram for OWC, TWA and TWS modes (error states)

ANNEX D

(to Recommendation S.62)

Session suspension facility

Note – Further study of the session suspension facility is required.

D.1 *General*

D.1.1 The session suspension facility is an extension of the basic Teletex control procedure. For a negotiable time, it gives the possibility of clearing the call without losing the logical relationship represented by the session.

D.2 *Elements of procedure*

D.2.1 *Command session suspend (CSSU)*

D.2.1.1 The CSSU is sent by the calling terminal when a suspension of the session is required. A session cannot be expected to exist after the indicated time has expired (see CSR in § B.2.5 below).

D.2.1.2 The command parameters are:

a) the time interval during which the session may be reactivated (format for study under coding);

b) an indication for the release of the transport connection.

D.2.2 *Response session suspend positive (RSSP)*

D.2.2.1 The RSSP indicates that the suspended state has been entered by the called terminal in a controlled way.

D.2.3 *Response session suspend negative (RSSUN)*

D.2.3.1 The RSSUN indicates that the session suspension cannot be accepted. The reason for the rejection shall be indicated as a parameter.

D.2.3.2 The RSSUN parameter indicates one of the following reasons for rejection:

a) the CSSU was illegally used (e.g. by a terminal that is not the paying terminal); this shall not be regarded as an error leading to clearing;
b) a suspended session is temporarily not possible;
c) more than one suspended session per terminal is not possible;
d) the indicated time for the suspension is too long.

D.2.4 *Command session suspension request (CSUR)*

D.2.4.1 The CSUR can be used by the called terminal to indicate that a halt in the information flow is needed. The calling terminal can then decide what to do.

D.2.4.2 No explicit response is required since a suspension is implicitly the positive response and a negative response has no meaning. The request shall be void if not acted upon within ... (period to be defined).

D.2.4.3 The CSUR parameter is an indication of the required duration for the suspension.

D.2.5 *Command session reactivate (CSR)*

D.2.5.1 The CSR is sent when reactivating a suspended session.

D.2.5.2 The terminal that initiated the session is responsible for reactivating it before the time that was indicated in the suspension command has expired. This responsibility does not exclude the possibility of the other terminal's reactivating the session.

Note — The rules for reactivating require further study.

D.2.5.3 The parameters required for the linking of the reactivated session require further study.

D.2.6 *Response session reactivate positive (RSRP)*

D.2.6.1 The RSRP indicates that the session reactivation is accepted and that the communication can start.

D.2.6.2 The RSRP parameters are for further study.

D.2.7 *Response session reactivate negative (RSRN)*

D.2.7.1 The RSRN indicates that the session reactivation cannot be effected.

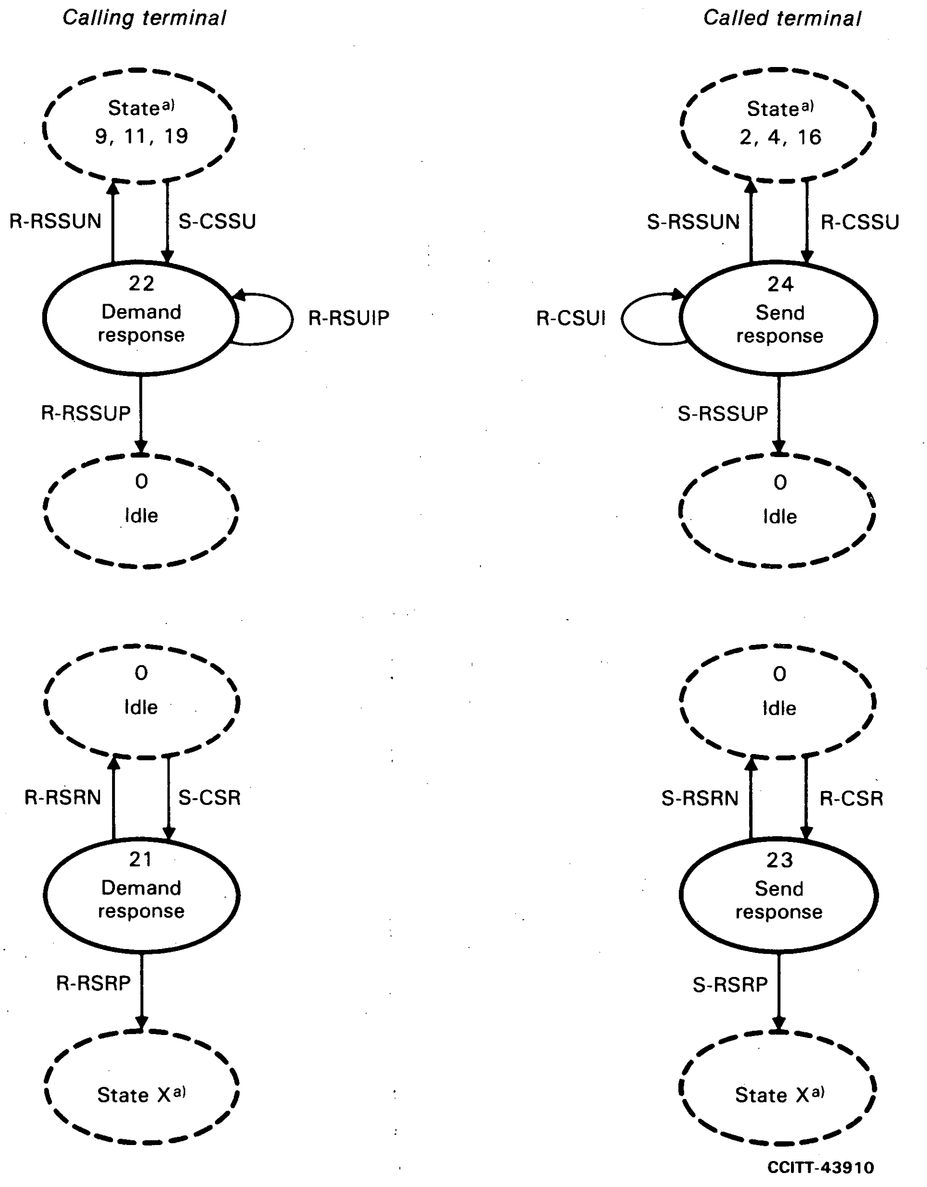
D.2.7.2 The RSRN parameter shall indicate the reason for the negative response from amongst the following (for further study):

a) the command was used illegally (was sent by the called terminal and referred to a session that was already active, or was sent before clearing or suspension of another session);

b) the linking information is not recognized (wrong terminal identifier, wrong session identifier, or the session has been cleared during the suspension by the called terminal).

D.3 *State diagram*

D.3.1 Figure D-1/S.62 is a session state transition diagram for the session suspension facility (showing additions to the session state transition diagram required for the facility).



a) This is the state from which the session was suspended and from which it is to be resumed.

FIGURE D-1/S.62

Session state diagram for session suspend

ANNEX E

(to Recommendation S.62)

General description and rules of operation for state diagrams

E.1 Each state diagram is in only one state at any time.

E.2 Each state is represented as an ellipse, which contains a number for reference and a descriptive name.

E.3 Permissible transitions from one state to another are shown as connecting lines with an arrow indicating the permitted direction of the state transition and labelled with the event or events that cause that transition.

E.4 Where a transition may originate from any of several states, it may be indicated by a broad arrow terminating on the description state and labelled with the permissible states of origination and with the event or events that cause that entry into the destination state.

E.5 An event is either the sending (S-) or reception (R-) of a command or a response or an indicated local operation.

E.6 Each state diagram has a state named "idle" and numbered zero. This is the initial or reset state when that state diagram is inactive.

E.7 Upon sending any command that causes entry into a state named "demand response", the sending of any additional commands is not permitted until a response is received. An inactivity timer is started, and, if a response is not received prior to expiration of that time-out, session termination, either directly, if Command Session Abort (CSA) was sent, or by sending CSA, is mandatory.

E.8 The effect of each event that causes a state transition must be completed prior to consideration of a subsequent event.

E.9 During a session, each session partner has a responsibility for monitoring for proper operation as follows:

a) maintenance of the currently agreed source/sink relationship;

b) proper use of command/response procedural sequences as described in the state diagrams and the rules for their operation;

c) monitoring for a period of inactivity (e.g. indicating a failure or other inability to continue productive use of the session).

Upon detection of a failure to maintain proper operation as described above, use of error recovery procedures defined for each state diagram is mandatory, or where such error recovery procedures are not specifically defined, session termination (abnormal end) is mandatory. This is necessary in order to avoid unproductive use of Teletex facilities, incurring unnecessary charges where the service is not being used effectively, and causing degradation of the service.

E.10 The purpose of the state diagrams is to assist in defining proper use of the elements of procedure, not to define any particular implementation.

ANNEX F

(to Recommendation S.62)

Types of document

F.1 *General*

F.1.1 An indication of the type of document that is transferred shall be given at the start of each document; if not, the normal type of document is used.

F.1.2 A document type indication will indicate to the operating system of the receiving terminal that a special action is required (the action is defined for each type of document).

F.1.3 No additional procedure elements or changes in state transition diagrams are required.

F.2 *Normal document*

F.2.1 This is the normal type of document to be used to transfer text in the Teletex service. The document is supposed to be immediately stored. Presentation of the text is a local function and is not controlled by the procedure. The unit document can in its turn be divided into a number of pages. The subdivision of the text into different pages must be maintained in the handling and during the presentation. The same is valid for the presentation format within the page.

F.2.2 From the procedures point of view, every Teletex terminal must be able to handle this type of document.

Note – Where appropriate the rules for the usage of optional functions have to be followed.

F.3 *Operator document* (optional)

F.3.1 The operator document represents a type of priority message. It can be used in the conversational mode of operation.

It is intended to be presented immediately to the operator (although the decision to present it is left to the receiving operator). It may therefore be immediately indicated to the operator that a new operator document has been received. The operator document shall conform to the same presentation control functions and be treated in the procedure as a normal document. The length of an operator document is arbitrary but it shall preferably (due to the application) not exceed one page. Note that a terminal that does not have a special dialogue mode, can handle an operator document as a normal document.

F.4 *Control document* (optional)

F.4.1 The control document can be used in communication with intermediate store-and-forward equipment.

F.4.2 The addressing information (and other control information required) can be included as text within such a document. The control document shall, except for the document type indication, follow the same rules (in the procedure) as a normal document. The use of the control document is a national matter and is outside the scope of this Recommendation.

F.5 *Monitor document* (optional)

F.5.1 The monitor document will not be made available to the user. It is intended to be available for purposes that can be defined by each Administration, e.g. for maintenance purposes.

F.5.2 The monitor document will be handled by the operating system of the terminal and not displayed to the operator. The monitor document shall, except for the document type indication, conform to the same rules (in the procedure) as a normal document.

ANNEX G

(to Recommendation S.62)

Optional error recovery mechanism

G.1 *Introduction*

G.1.1 § 4 of this Recommendation describes the error recovery mechanism used in the basic Teletex service. With mixed-mode operation (e.g. Teletex and facsimile) or with facsimile alone, there is a need for another recovery mechanism, as described below, that allows resynchronization of the source and the sink within a page (commitment unit) or a document (delivery unit) without ending the document and discarding the whole current page.

G.1.2 This recovery mechanism may also be applied, as an option in the Teletex service.

G.1.3 The commands and responses, together with their parameters, required for this optional recovery (or resynchronization) mechanism are described below.

G.2 *Command document recovery point (CDRP)*

G.2.1 The CDRP shall be used to indicate a recovery point from which the source or the sink may ask for a resynchronization.

G.2.2 The CDRP parameter is the recovery point reference number.

G.2.3 The CDRP command is sent by the source at arbitrary points in the text.

G.2.4 The commands CDS, CDC, CDPB are to be considered as an implicit recovery point number 0.

G.3 *Response document recovery point negative (RDRPN)*

G.3.1 The RDRPN shall be used by the sink to resynchronize the source from a recovery point.

G.3.2 The RDRPN parameter is the recovery point reference number.

G.4 *Command document recovery point restart (CDRPR)*

G.4.1 The CDRPR shall be used by the source to resynchronize the sink from the indicated recovery point.

G.4.2 The CDRPR parameter is the recovery point reference number.

G.5 *Response document recovery point restart (RDRPR)*

G.5.1 The RDRPR shall be used by the sink to indicate to the source from which recovery point the resynchronization is available.

G.5.2 The RDRPR parameter is the recovery point reference number.

G.5.3 The recovery point reference number shall be lower than or equal to the number indicated by the source in the CDRPR command.

References

[1] CCITT Recommendation *Teletex service*, Vol. II, Fascicle II.4, Rec. F.200.

[2] CCITT – Question 8/I, Contribution COM I-No. 1, Study Period 1981-1984, Geneva, 1981.

Recommendation S.70

NETWORK-INDEPENDENT BASIC TRANSPORT SERVICE FOR TELETEX

(Geneva, 1980)

The CCITT,

considering

(a) that the Teletex service will be introduced in different types of network, i.e. circuit-switched public data networks (CSDN), packet-switched public data networks (PSDN) and the public switched telephone network (PSTN);

(b) that there is a need for international interworking between Teletex terminals connected to different types of networks;

unanimously declares the following view

1 Scope

1.1 This Recommendation defines the *network-independent basic transport service* applicable to Teletex terminals connected to the types of network mentioned in (a) abcve in terms of the:

a) transport services provided to the higher layer [the transport services are provided by the transport layer (layer 4) in association with the underlying services provided by the supporting layers 1 to 3];

b) transport layer procedure (see § 5 below).

Note – The transport layer procedure for integrated services digital networks is for further study.

2 Transport service

2.1 *Transport service objectives*

2.1.1 The purpose of the transport service is to provide two communicating session entities within two Teletex terminals with transport services, i.e. the means for transparent and reliable end-to-end transfer of data between them irrespective of the particular type of network used.

2.1.2 The main requirements of the transport service to be provided by a transport entity to the local transport user, i.e. the session entity, are:

a) *Network independence.* The transport service shall be homogeneous, while allowing a suitable wide variety of underlying communications media, protocols and mechanisms.

b) *End-to-end significance.* The transport service shall have end-to-end significance, connecting the end users irrespective of the number of individual communications links used.

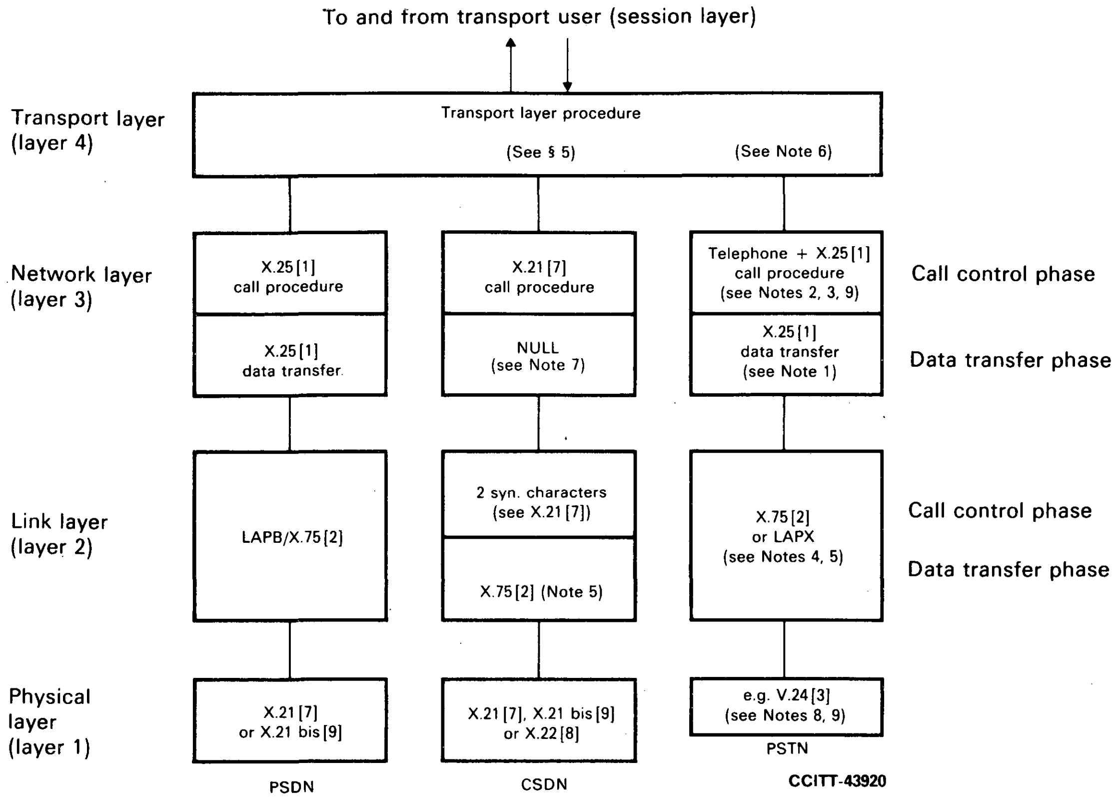
c) *Transparency.* The transport service shall be octet transparent, i.e. not restrict the content, format or coding of the information (data or control) received from or delivered to the transport user.

d) *Error free delivery.* The transport service shall assure error-free delivery. Nonrecoverable errors are to be visible to the transport service user.

e) *Cost efficiency.* The transport service shall optimize the use of the available communication resources to provide the performance required by each communicating transport user at maximum efficiency.

2.2 *General structure of the transport service*

2.2.1 The general structure of the transport service is shown in Figure 1/S.70.



Note 1 — The X.25 [1] network layer procedure is introduced to ease interworking with PSDNs.

Note 2 — The establishing of the network connection is performed by two-stage selection ; the first using normal telephone procedures and the second using X.25 [1] call control procedures.

Note 3 — For terminals connected to PSTN accessing PSDN, the procedures in Note 2 apply.

Note 4 — LAPX is a half-duplex link access procedure, based on Recommendation X.75 [2] for single link operation (see § 3.2.2).

Note 5 — The link level procedures are in accordance with Recommendation X.75 for single link operation (however, see §§ 3.2.2 and 3.3.2) and in this respect Recommendation X.75 [2] (1980 version) is to be regarded as the reference specification of this protocol.

Note 6 — In the case of interworking between Teletex terminals connected to different types of networks (i.e. CSDN, PSDN, PSTN), this transport layer procedure is executed peer-to-peer between the communicating Teletex terminals.

Note 7 — For terminals connected to CSDNs, no function is needed in the network layer in the data transfer phase as indicated in this figure. However, in order to facilitate interworking with PSDNs a minimum network layer is introduced (see § 3.3.3).

Note 8 — The modem may also be integrated within the terminal and in such cases Recommendation V.24 [3] need not apply (see § 3.2.1).

Note 9 — For automatic calling and/or answering, Recommendation V.25 [4] may be applicable.

FIGURE 1/S.70

Transport service general structure

3 Transport service implementation for different types of networks

Note – The transport layer procedure on all types of networks is defined in § 5. The network dependent control procedures of the underlying layers are described in the following.

3.1 *Terminals connected to a PSDN*

3.1.1 *Physical layer DTE/DCE interface characteristics*

The physical layer of Recommendation X.25 [1] applies.

3.1.2 *Link layer procedure*

The link layer procedure shall, unless otherwise specified, be the symmetrical procedures as specified in Recommendation X.25 [1], LAPB (Link Access Procedure B) and compatible with Recommendation X.75 [2] for single link operation.

3.1.3 *Network layer procedure*

Recommendation X.25 [1] Virtual Call procedures apply. However the following points should be noted:

a) The qualifier bit in data packets should always be set to 0.

b) Delivery confirmation bits in all packets should be set to 0.

c) The Teletex terminal should not send an *interrupt request* packet.

d) Normal X.25 [1] reset procedures will apply. However, for CSDN/PSDN interworking X.25 reset will be mapped to a link level disconnection on CSDN.

e) Transport control blocks and transport data blocks shall be carried in a complete data packet sequence.

f) The Teletex terminal should not send a *DTE REJ packet.*

g) Terminals using this transport protocol shall use a specific protocol identifier within call request/incoming call packets for the Teletex service. This identifier is represented by the first octet of the call user data field as shown below:

bit	87654321
octet 1	00000010

In the case of CSDN/PSDN interworking the functional mapping of this protocol identifier requires further study.

h) Teletex terminals shall not use the fast select facility.

3.2 *Terminals connected to the PSTN*

3.2.1 *Physical layer DTE/DCE interface characteristics*

The DTE/DCE physical layer element shall be in accordance with existing Series V Recommendations. The physical layer may provide for half-duplex or full-duplex transmission depending on the modem standard.

Note – The PSTN modem standards are discussed in Study Group XVII. Furthermore, in the case of a modem integrated in the terminal, the interface may only be functionally equivalent to a Series V Recommendation. This is also for further consideration in Study Group XVII.

3.2.2 *Link layer procedure*

3.2.2.1 Depending on the service provided by the physical layer, the link layer procedures over a single physical circuit between two terminals have to cater for a half-duplex or full-duplex transmission facility to provide a full-duplex service to the network layer. For full-duplex physical layer service, the link layer procedure shall conform to the Link Access Procedure described in Recommendation X.75 [2], for single link operation. For addressing assignments and the system parameters see §§ 3.2.2.2 and 3.2.2.3 respectively. For half-duplex physical layer service the link layer procedure (LAPX) will apply. LAPX is a half-duplex Link Access Procedure, based on Recommendation X.75 for single link operation. Some elements of this link layer procedure have been established, but need to be studied further under Question 20/VIII [5]. Those elements already agreed are annexed to that Question.

3.2.2.2 The following describes the application of the link addressing procedure of Recommendation X.75 [2]. Link addresses (A and B) shall be assigned dynamically or on a per-call basis according to the following rules:

a) the calling terminal shall take Address A;

b) the called terminal shall take Address B;

c) commands and responses shall be transferred as shown in Figure 2/S.70;

d) A and B addresses are coded as follows:

Address	12345678
A	11000000
B	10000000

Note – The terminal will discard all frames received with an address other than A and B.

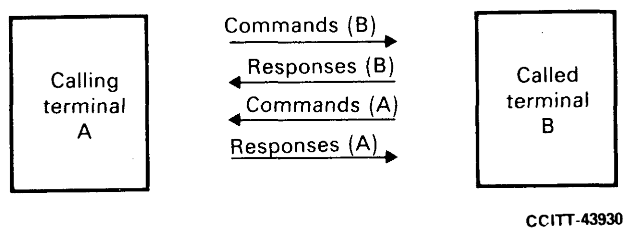


FIGURE 2/S.70

3.2.2.3 System parameters are:

a) timer, T1;

b) maximum number of retransmissions, N2;

c) maximum number of bits in an I frame, N1;

d) maximum number of outstanding I frames, k.

The above system parameters are to be specified by the Administration. However, the possible range of values that may be attributed to each parameter is to be standardized. Such values are for further study.

3.2.3 *Network layer procedure*

3.2.3.1 See § 3.1.3. In addition, for all calls (PSTN only, PSTN-PSDN, PSTN-PSDN-PSTN) second stage addressing will apply using X.25 [1] virtual call procedures. The calling terminal should include the called address and the calling address (see Note 2) in call request packets. The format of the called address shall conform to:

a) the telephone network addressing scheme for PSTN only calls;

b) the telephone network addressing scheme with an X.121 [6] DNIC for PSTN-PSDN-PSTN calls (see Note 3);

c) the X.121 [6] addressing scheme for PSTN-PSDN calls (see Note 1).

Note 1 – For other cases of internetworking the above rule shall apply.

Note 2 – In the case of PSTN-PSDN calls the verification of the calling address by the network requires further study. The format of the calling address is for further study.

Note 3 – The feasibility of such connections is for further study.

3.3 *Terminals connected to a CSDN*

3.3.1 *Physical layer DTE/DCE interface characteristics*

The DTE/DCE physical interface characteristics shall be in accordance with Recommendation X.21 [7], or as an option, X.22 [8] for multi-call operation.

3.3.2 *Link layer procedure*

3.3.2.1 The link layer procedure shall be used during the data phase of Recommendation X.21 [7] or X.21 *bis* [9] for data interchange over a single physical circuit between two terminals operating in user classes of service 3-7 as indicated in Recommendation X.1 [10]. The link layer procedure shall conform to the level 2 procedures described in Recommendation X.75 [2] for single link operation.

3.3.2.2 The following describes the application of the link addressing procedures of Recommendation X.75 [2]. Link addresses (A and B) shall be assigned dynamically on a per-call basis according to the following rules:

a) the calling terminal shall take address A;

b) the called terminal shall take address B;

c) commands and responses shall be transferred as shown in Figure 2/S.70;

d) A and B addresses are coded as follows:

Address	12345678
A	11000000
B	10000000

Note – The terminal will discard all frames received with an address other than A and B.

3.3.2.3 The system parameters shall have the following values:

a) timer T1 = 6 s (for average I frame length of 518 octets);

b) maximum number of retransmissions N2 = 8;

c) maximum number of outstanding I frames k = 7;

d) maximum number of bits in an I frame N1 = 16 512 bits. The actual maximum number of bits in an I frame is a terminal design parameter, which may depend upon the maximum length of the network layer data block. The lower limit for N1 to be implemented by Teletex terminals is 1152 bits.

3.3.3 *Network layer procedure*

3.3.3.1 *Call control phase*

The call control procedure conforms to Recommendation X.21 [7], or as an option, X.22 [8] for multi-call operation.

3.3.3.2 *Data transfer phase*

A minimal network layer is present during the data transfer phase and accommodated through the use of a two-octet network block header. The header comprises a one-octet length indicator followed by a network block type code. The only network block currently defined is a network data block as shown in Figure 3/S.70.

4 **Interworking between networks**

4.1 It is the responsibility of Administrations to decide in which network(s) the Teletex service is to be provided.

4.2 Three possibilities are considered below:

a) Teletex terminals connected to a circuit switched public data network (CSDN);

b) Teletex terminals connected to a packet switched public data network (PSDN);

c) Teletex terminals connected to a public switched telephone network (PSTN).

Octets \ Bits	8	7	6	5	6	3	2	1
1	0	0	0	0	0	0	0	1[a]
2	M[b]	Q[c]	0	0	0	0	0	0
	Network user data field							

a) The length indicator expresses in octets the length of the network data block header. This length does not include octet 1.

b) The more data mark (M) is used to preserve the integrity of transport layer control and transport data blocks. When M is set to 1 it indicates that more data are to follow.

c) The qualifier bit (Q) is introduced to provide a functional mapping with the X.25[1] qualifier bit for CSDN/PSDN interworking. The Q bit is not used for the Teletex service and shall be set to 0.

FIGURE 3/S.70
Network data block

4.3 Interworking between Teletex terminals connected to any network must be possible.

4.4 International interworking between Teletex terminals shall preferably take place between networks of the same type when these networks are provided by both countries involved.

4.5 In the case of international interworking between Teletex terminals connected to public data networks of different types, Recommendation X.75 [2] shall apply.

Note – The interworking between CSDNs and PSDNs will require a gateway function between the two networks. Two specific requirements of this gateway function have been identified:

a) For an interim period, a packet level reset in a PSDN will be mapped to a link level disconnection in a CSDN. Alternative functional mappings are for further study.

b) The execution of necessary supervisory functions. This aspect requires further definition.

5 Transport layer procedure

5.1 *Transport functions*

5.1.1 *General*

5.1.1.1 The transport layer will perform all those functions that are necessary to bridge the gap between the services provided by the network layer and the services needed by the session layer. Therefore, the functions performed are dependent on two criteria: the services provided by the underlying network layer and the services required by the session layer.

5.1.1.2 It is the responsibility of the transport service user to select a given quality of service, which may imply the use of certain transport layer functions such as:

a) establishment of a transport connection

- transport connection identification
- transport connection multiplexing;

b) data transfer

- sequence control
- error detection
- error recovery
- segmenting and combination
- flow control
- purge;

c) termination of a transport connection.

Note – Not all of the above functions will be available in the basic transport service (see § 5.1.3).

5.1.2 *Transport service classes and functions*

5.1.2.1 A limited set of functions is proposed for a basic transport service. It is recognized that, as more general studies on transport service progress, more sophisticated functions will be introduced within the transport layer and a functional negotiation mechanism will be required during connection establishment to facilitate inter-working between different transport service implementations. Furthermore, it seems likely that transport service functions will be grouped (for ease of negotiation) into a hierarchical system of classes whereby classes occupying superior positions in the hierarchy implement all functions of the lower classes together with the additional functions identified for their own class.

5.1.2.2 It is therefore proposed that during transport connection establishment the use of a given transport service and/or individual transport service functions should be negotiated according to the following rules:

- the calling terminal indicates the transport service class and/or optional functions required;
- the called terminal indicates the transport service class and/or optional functions that it is willing to support;
- all parameters to be used in the transport connection must be explicity indicated, otherwise default values will apply.

5.1.2.3 The transport service class for the basis Teletex service is denoted as class zero.

5.1.3 *The basic transport service for Teletex*

5.1.3.1 Transport layer functions are performed by *transport layer protocol elements.*

5.1.3.2 Transport protocol information and control units are called *blocks.*

5.1.3.3 Transport layer block types are as follows:

a) transport connection request (TCR) block;

b) transport connection accept (TCA) block;

c) transport connection clear (TCC) block;

d) transport data (TDT) block;

e) transport block reject (TBR) block.

5.1.3.4 The TCR and TCA blocks are used to indicate the protocol class, and optional functions, applying to a transport connection. The TCC block is used to indicate the reason for refusing a connection establishment.

5.1.4 *Transport layer functions*

5.1.4.1 Basic class functions and associated transport layer protocol elements, i.e. blocks, include:

a) transport connection establishment, transport connection identification, optional extended addressing and optional transport data block size negotiation (TCR, TCA and TCC blocks);

b) data delimitation, segmentation/combination of arbitrarily long transport service data units (TSDU). These are contained within TDT blocks. The end of a TSDU is indicated by a TSDU end mark in the last data block;

c) detection and indication of procedural errors (TBR block).

5.1.4.2 Other characteristics of the basic transport service are:

a) maintenance of TSDU integrity;

b) overflow: if the user cannot absorb new data and if the appropriate buffers are not available, flow control is performed at network/link level as appropriate;

c) error: no mechanism is provided within the transport service to facilitate recovery from detected errors. Where such errors are detected the user of the transport service should be informed so that appropriate recovery action may be taken.

5.2 *Description of connection establishment and termination procedures*

5.2.1 *General*

5.2.1.1 The transport layer connection establishment and termination procedures shall also be used for negotiating transport service class and/or optional transport connection functions.

5.2.1.2 The basic transport service class provides means to establish a transport connection using a TCR block and a TCA block. This exchange provides:

a) a way to negotiate options;

b) a transport connection identification. The transport connection is identified by use of cross-references. Each end of the connection is responsible for selecting a suitable transport connection identifier.

5.2.1.3 This mechanism also provides an identification of the transport connection independent of any network connection identification and therefore provides independence from the life of the network connection. The binary value 0 should not be used as an identifier. The use of such references for reconnection requires further definition.

5.2.2 *Transport connection request (TCR) block*

5.2.2.1 The calling terminal shall indicate a transport connection request by transferring a TCR block to the remote terminal. The TCR block includes the transport functions (e.g. source reference, class, and optional functions) for negotiation of the characteristics of the transport connection being established.

5.2.3 *Transport connection accept (TCA) block*

5.2.3.1 The called terminal shall indicate its acceptance of the transport connection by transferring a TCA block to the remote terminal. The TCA block includes the transport parameters applying to the connection and to be used by the calling terminal.

5.2.4 *Transport connection clear (TCC) block*

5.2.4.1 If a transport connection cannot be established, the called terminal shall respond to the TCR block with a TCC block. The clearing cause shall indicate why the connection was not accepted.

Note – There is no explicit transport connection termination procedure for the basic class. For the basic class the lifetime of the transport connection is directly correlated to the lifetime of the supporting network connection.

5.2.5 *Transport connection collision*

5.2.5.1 If the calling terminal receives a TCR block it shall transfer a TBR block to notify the called terminal of the procedure error.

5.3 *Description of data transfer procedures*

5.3.1 *General*

5.3.1.1 The data transfer procedure described in the following subsections applies only when the transport layer is in the data transfer phase, i.e. after completion of transport connection establishment and prior to clearing.

Note – When a connection is cleared, transport data blocks may be discarded. Hence it is left to the transport service user to define protocols able to cope with the various possible situations that may occur.

5.3.2 *Transport data block length*

5.3.2.1 The standard maximum transport data block length is 128 octets including the data block header octets. However, the transport data block length may be restricted to a lower value when the transport data block is concatenated with other transport data blocks (see § 5.5.3).

5.3.2.2 Other maximum data field lengths may be supported by Teletex terminals in conjunction with an optional transport data block size negotiation connection function (see §§ 5.5.4.3 and 5.5.5.3). Optional maximum data field lengths shall be chosen from the following: 256, 512, 1024 and 2048 octets.

5.3.3 *Transport service data unit (TSDU) end*

5.3.3.1 The *TSDU end mark* is used to preserve the integrity of the TSDU. The TSDU end mark is set to binary 1 in the last transport data block carrying information related to a certain TSDU. In case of a TSDU that comprises a single transport data block the TSDU end mark is also set to 1. In all other cases the TSDU end mark is set to zero.

5.4 *Treatment of procedure errors*

5.4.1 At any time, a terminal may send a TBR block to report to the remote terminal the receipt of a block that is invalid or not implemented. No confirmation is required to be issued by the terminal following the receipt of a TBR block. A terminal receiving a TBR block shall take appropriate recovery action.

5.5 *Formats*

5.5.1 *General*

5.5.1.1 All transport protocol information units are called *blocks.* All blocks contain an integral number of octets.

5.5.1.2 Bits of an octet are numbered 8 to 1 where bit 1 is the low order bit and is transmitted first. Octets of a block are consecutively numbered starting from 1 and are transmitted in this order.

5.5.1.3 *Data blocks* are used to transfer transport service data units (TSDU) transparently whilst maintaining the structure of the latter by means of the TSDU end mark.

5.5.1.4 *Control blocks* are used to control the transport protocol functions, including optional functions.

5.5.1.5 A parameter field is present in all control blocks within the basic transport service to indicate optional functions. The parameter field contains one or more parameter elements. The first octet of each parameter element contains a parameter code to indicate the function(s) requested.

The general coding structure is shown in Figure 4/S.70.

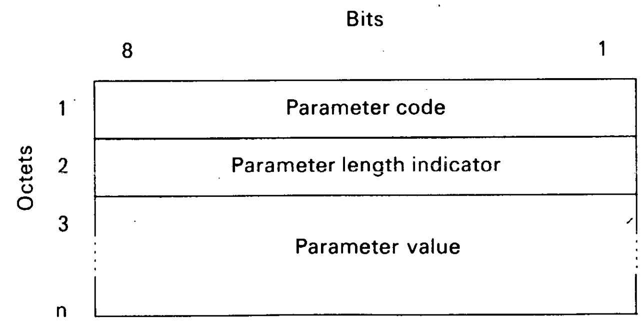


FIGURE 4/S.70
Parameter element coding structure

5.5.1.6 The parameter code field is binary coded and, without extension, provides for a maximum of 255 parameters. Parameter code 11111111 is reserved for extension of the parameter code. The extension mechanism is for further study.

Octet 2 indicates the length, in octets, of the parameter value field. The parameter field length is binary coded and bit 1 is the low order bit of this indicator.

Octet 3 and subsequent octets contains the value of the parameter identified in the parameter code field. The coding of the parameter value field is dependent on the function being requested.

5.5.2 *Structure of transport control and transport data blocks*

5.5.2.1 Figure 5/S.70 illustrates the general structure of transport layer blocks. A summary of transport layer blocks is given in Figure 6/S.70.

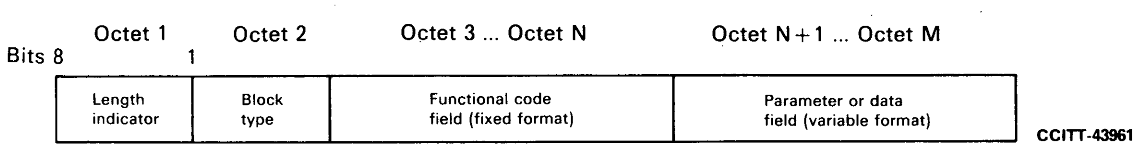


FIGURE 5/S.70
General block structure

5.5.2.2 *Length indicator (LI) field*

5.5.2.2.1 Octet 1 contains the length indicator (LI). The value of this indicator is a binary number that represents the length in octets of the control block (including parameters) and the header length in octets of data blocks (excluding any subsequent user information). In both cases this length does not include octet 1.

5.5.2.2.2 The basic LI consists of a single octet with a maximum value of 254 in decimal (i.e., a binary value of 11111110). The use of the binary value 11111111 for extension purposes is for further study.

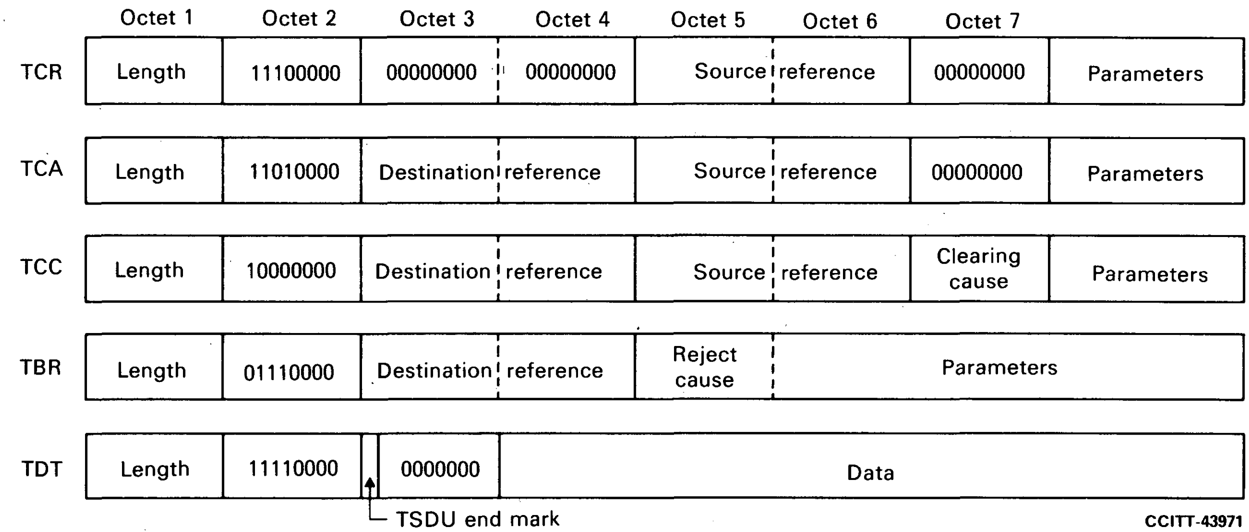


FIGURE 6/S.70

Transport layer block types

5.5.2.3 *Block type field*

5.5.2.3.1 Octet 2 contains the block type code. Bits 1 to 4 of octet 2 are set to 0 for all transport layer blocks currently defined. It is for further study to determine whether or not bits 1 to 4 are required for future extension to the range of transport layer blocks currently defined or are used for other functions.

5.5.2.4 *Functional code field*

5.5.2.4.1 Octet 3 and subsequent octets contain functional codes in a fixed format as per the block type (see Figure 6/S.70).

5.5.2.5 *Parameter of data field*

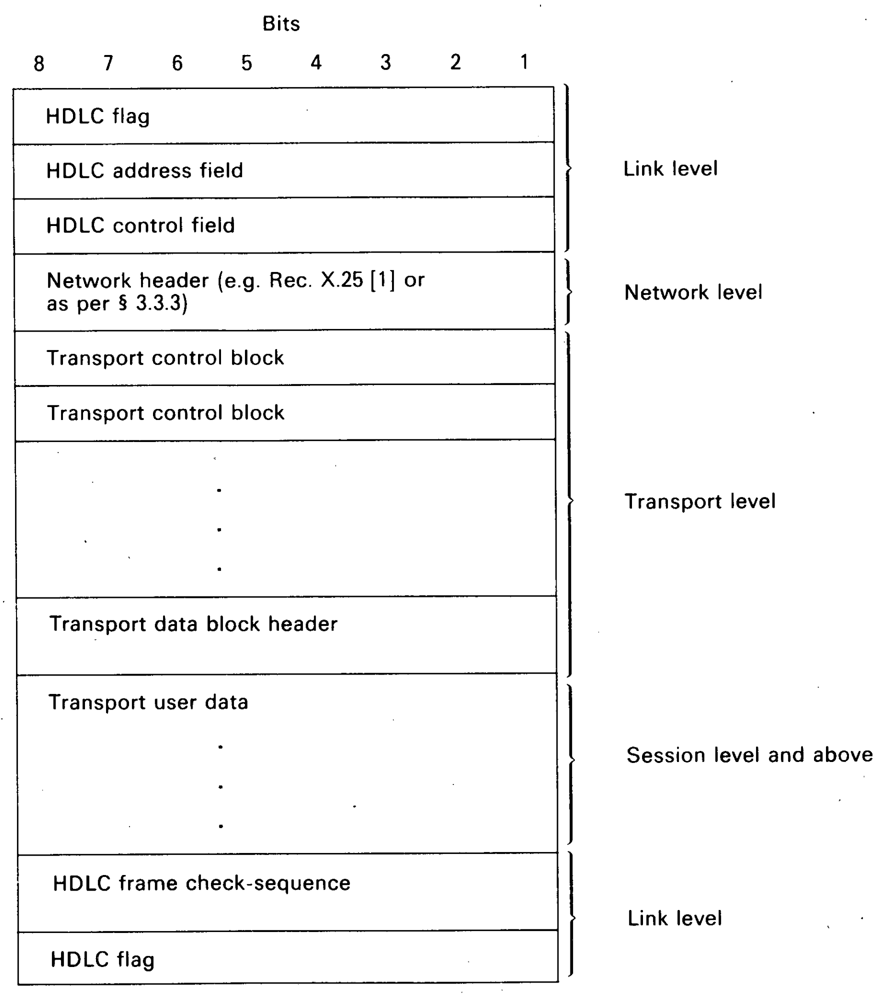
5.5.2.5.1 A parameter field or a data field may optionally follow the functional code field.

5.5.3 *Concatenation*

5.5.3.1 Concatenation of transport control and/or transport data blocks is not applicable to the basic class. However, where concatenation is used in the future, the arrangement shown in Figure 7/S.70 would apply.

5.5.4 *Transport connection request (TCR) block format*

5.5.4.1 Figure 8/S.70 illustrates the format of the TCR block.



Note — This figure does not imply that a transport data or control block will fit within a single network data block.

FIGURE 7/S.70

Information field structure of HDLC I-frame (example)

Bits

Octets	8	7	6	5	4	3	2	1
1	Length (octets)							
2	1	1	1	0	0	0	0	0 [a)]
3	Not used (set to 0)							
4	Not used (set to 0)							
5	Source							
6	reference							
7	0	0	0	0	0	0	0	0 [b)]
8 … n	Parameters [c)] (optional)							

a) Block type: TCR.

b) Transport service extension field: Octet 7 is reserved for any future extension such as providing for a range of transport service classes. In the basic transport service this octet shall be set to zero.

c) The parameter field is present only when the terminal is requesting an optional transport connection function.

FIGURE 8/S.70

Transport connection request block

5.5.4.2 *Parameters for extended addressing*

Separate parameters are provided for the indication of called and calling extension addresses. The coding of these parameters is shown in Figure 9/S.70.

Bits 8 7 6 5 4 3 2 1

Octets	Bits 8–1	
1	Extension address parameter type	11000001 for calling address type or 11000010 for called address type
2	Parameter length indicator	
3	IA5 digit 1 IA5 digit 2 ⋮ IA5 digit n	

FIGURE 9/S. 70

Extended addressing

5.5.4.3 *Parameter for transport data block size negotiation*

This parameter defines the proposed maximum transport data block size (in octets including the transport data block header) to be used over the requested transport connection. The coding of this parameter is shown in Figure 10/S.70.

Octets	Bits 8	7	6	5	4	3	2	1	
1	1	1	0	0	0	0	0	0	Parameter type code
2	0	0	0	0	0	0	0	1	Parameter length indicator
3	0	0	0	0	X	X	X	X	Transport data block size

XXXX:
- 1 0 1 1 = 2048 octets
- 1 0 1 0 = 1024 octets
- 1 0 0 1 = 512 octets
- 1 0 0 0 = 256 octets
- 0 1 1 1 = 128 octets

FIGURE 10/S. 70

Transport data block size parameter

5.5.5 *Transport connection accept (TCA) block format*

5.5.5.1 Figure 11/S.70 illustrates the format of the TCA block.

Octets	Bits 8	7	6	5	4	3	2	1
1	Length (octets)							
2	1	1	0	1	0	0	0	0[a]
3	Destination							
4	reference							
5	Source							
6	reference							
7	0	0	0	0	0	0	0	0[b]
8 … n	Parameters (optional)[c]							

[a] Block type: TCA.

[b] Transport service extension field; Octet 7 is reserved for any future extension such as providing for a range of transport service classes. In the basic Teletex service this octet shall be set to zero irrespective of the setting in the TCR block.

[c] The parameter field is present only when the terminal is requesting an optional transport connection function.

FIGURE 11/S.70

Transport connection accept block

5.5.5.2 *Parameters for extended addressing*

See § 5.5.4.2.

5.5.5.3 *Parameter for transport data block size negotiation*

See § 5.5.4.3. The parameter value shall be equal to or less than the value specified in the TCR block.

5.5.6 *Transport connection clear (TCC) block format*

5.5.6.1 Figure 12/S.70 illustrates the format of the TCC block.

Octets	Bits 8	7	6	5	4	3	2	1
1	Length (octets)							
2	1	0	0	0	0	0	0	0 [a]
3	Destination							
4	reference							
5	Source							
6	reference							
7	Clearing cause [b]							
8 … n	Parameters (optional)							

[a] Block type: TCC

[b] Clearing cause:

		Bits 8 7 6 5 4 3 2 1
0 – Reason not specified	=	0 0 0 0 0 0 0 0
1 – Terminal occupied	=	0 0 0 0 0 0 0 1
2 – Terminal out of order	=	0 0 0 0 0 0 1 0
3 – Address unknown	=	0 0 0 0 0 0 1 1

FIGURE 12/S.70
Transport connection clear block

5.5.6.2 *Parameter for additional clearing information*

This parameter is provided to allow additional information relating to the clearing of the connection. The coding of this parameter is given in Figure 13/S.70 below.

Octets	Bits 8	7	6	5	4	3	2	1	
1	1	1	1	0	0	0	0	0	Parameter code
2	Parameter length indicator								
3 … n	Additional information								

FIGURE 13/S.70
Additional clearing information parameter

5.5.7 *Transport block reject (TBR) block format*

5.5.7.1 Figure 14/S.70 illustrates the format of the TBR block.

Octets	Bits 8	7	6	5	4	3	2	1
1	Length (octets)							
2	0	1	1	1	0	0	0	0 a)
3	Destination							
4	reference							
5	Reject cause b)							
6 … n	Parameter field							

a) Block type: TBR

b) Reject cause:

		Bits 8 7 6 5 4 3 2 1
0 – Reason not specified	=	0 0 0 0 0 0 0 0
1 – Function not implemented	=	0 0 0 0 0 0 0 1
2 – Invalid block	=	0 0 0 0 0 0 1 0
3 – Invalid parameter	=	0 0 0 0 0 0 1 1

FIGURE 14/S.70
Transport block reject block

5.5.7.2 *Rejected block parameter* (mandatory)

This parameter is used to indicate the bit pattern of the rejected block up to and including the octet that caused the rejection. Only the first detected procedural error or parameter, which cannot be acted upon, shall be indicated by this method. The coding of this parameter is given in Figure 15/S.70 below:

Octets	Bits 8	7	6	5	4	3	2	1
1	1	1	0	0	0	0	0	1
2	Parameter length indicator							
3 … n	Rejected information							

FIGURE 15/S.70

5.5.8 *Transport data block*

5.5.8.1 Figure 16/S.70 illustrates the format of the transport data block.

Octets	Bits 8	7	6	5	4	3	2	1
1	Length (octets)							
2	1	1	1	1	0	0	0	0 [a]
3	TSDU end [b]	0	0	0	0	0	0	0
4 … n	Data							

[a] Block type: TDT

[b] TSDU end: indicates the end of TSDU when set to 1

FIGURE 16/S.70
Transport data block

References

[1] CCITT Recommendation *Interface between data terminal equipment (DTE) and data circuit terminating equipment (DCE) for terminals operating in the packet mode on public data networks*, Vol. VIII, Fascicle VIII.2, Rec. X.25.

[2] CCITT Recommendation *Terminal and transit call control procedures and data transfer system on international circuits between packet-switched data networks*, Vol. VIII, Fascicle VIII.3, Rec. X.75.

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

[4] CCITT Recommendation *Automatic calling and/or answering equipment on the general switched telephone network, including disabling of echo suppressors on manually established calls*, Vol. VIII, Fascicle VIII.1, Rec. V.25.

[5] CCITT – Question 20/VIII, Contribution COM VIII-No. 1, Study Period 1981-1984, Geneva, 1981.

[6] CCITT Recommendation *International numbering plan for public data networks*, Vol. VIII, Fascicle VIII.3, Rec. X.121.

[7] CCITT Recommendation *Interface between data terminal equipment (DTE) and data circuit terminating equipment (DCE) for synchronous operation on public data networks*, Vol. VIII, Fascicle VIII.2, Rec. X.21.

[8] CCITT Recommendation *Multiplex DTE/DCE interface for user classes 3-6*, Vol. VIII, Fascicle VIII.2, Rec. X.22.

[9] CCITT Recommendation *Use on public data networks of data terminal equipment (DTE) which is designed for interfacing to synchronous V-Series Recommendations modems*, Vol. VIII, Fascicle VIII.2, Rec. X.21 *bis*.

[10] CCITT Recommendation *International user classes of service in public data networks*, Vol. VIII, Fascicle VIII.2, Rec. X.1.

SECTION 3

VIDEOTEX TERMINALS

Recommendation S.100

INTERNATIONAL INFORMATION EXCHANGE FOR INTERACTIVE VIDEOTEX

(Geneva, 1980)

CONTENTS

Preamble

The CCITT,

considering

(a) that there is increasing interest in public network-based new interactive information retrieval services using domestic television receivers suitably supplemented, or other apparatus, as terminal equipment;

(b) that the CCIR is studying standards for broadcast *Teletext* services for general reception and has expressed a view that it is desirable that terminal equipment compatibility should exist between broadcast Teletext systems for general reception and public network-based data bank systems;

(c) that such services should be provided over public networks in accordance with CCITT Recommendations and may be required to operate as an international service;

(d) that such services may interwork with terminals provided for text communication services (Teletex for example);

(e) that some Administrations intend to have an early introduction of, or have already introduced, public interactive Videotex services;

unanimously recommends

that the following technical provisions be applied for international information exchange for interactive Videotex service.

1 Purpose and scope of the Recommendation

1.1 *Purpose*

1.1.1 The purpose of this Recommendation is:

a) to facilitate an orderly introduction of early Videotex services (including the continuation of existing services, with a clear identification of potential enhancements) that need to be considered in future developments;

b) to identify parameters needed to design Videotex terminals; and

c) to provide technical recommendations desirable for potential interworking of other services with Videotex services.

1.2 *Scope*

1.2.1 This Recommendation describes the characteristics of coded information that is exchanged between countries participating in the international interactive Videotex service (as described in Recommendation F.300 [2]) and defines the display features corresponding to its various elements.

1.2.2 Videotex systems are text communication systems having in addition the capability of a given level of pictorial representation and a repertoire of display attributes. The text and the pictures obtained are intended to be displayed using the current television (TV) raster standards of the different countries.

1.2.3 Different options are offered as a choice for the Administrations to implement their national services. Substantial degrees of compatibility exist between these options, but some transcoding may be necessary to facilitate interworking.

1.2.4 For the international service, four different options for representing pictorial information have been recognized:

a) mosaic character sets;

b) geometric system;

c) dynamically redefinable character sets;

d) photographic representation.

These options are not mutually exclusive and it is possible that systems may develop using two or more options.

1.2.5 For international interworking, two categories of TV systems have to be considered:

a) systems having a vertical resolution of 525 lines per TV frame at 30 TV frames per second;

b) systems having a vertical resolution of 625 lines per TV frame at 25 TV frames per second.

1.2.6 Interworking problems at the pictorial level between countries having different recognized pictorial systems and/or television standards require further study.

1.2.7 This Recommendation is structured as follows:

§§ 1, 2 and 3	deal with the features common to all the options;
§ 4	deals with the coding of characters of the Videotex alphanumeric repertoire defined in Annex B;
§ 5	deals with the alphamosaic option;
§ 6	deals with the alphageometric option;
§ 7	deals with the Dynamically Redefinable Character Sets (DRCS) option;
§ 8	deals with the alphaphotographic option;
§ 9	deals with future enhancements and identifies features requiring further study such as: audio, downloaded software, motion, etc.;
§ 10	deals with line and end-to-end protocols;
§ 11	deals with interworking with other services.

Some of these parts have not been completed, and therefore contain guidelines towards future extensions rather than a complete technical specification.

2 General Videotex coding structure

2.1 *General*

2.1.1 The basis of the coding structure for the Videotex service is Recommendation V.3 [3] and the international standards ISO 2022 [1], ISO 6937 [4] (subject to ISO approval) for the 7-bit environment. Specifically, the shift-in code SI (0/15) invokes the G0 set for alphanumeric text mode of operation, and the shift-out code SO (0/14) invokes the G1 set, for all the models (see Annex A). The use of the 8-bit coding scheme is for further study.

2.1.2 In addition to the provisions made by ISO 2022 [1], the transmission of alphabetic characters having diacritical signs is effected by transmitting the code representing the diacritical mark together with the code of the basic alphabetic character.

2.1.3 The different options are designated (and invoked) by specific escape sequences.

2.2 *Designation and invocation in the context of the alphamosaic option*

2.2.1 Two different modes for the alphamosaic option have been identified. They differ in their display control sets. These control sets are designated as the C1 set by control sequences of the form ESC 2/2 (F) where F is assigned by ISO. (A registration of these sets must be requested by CCITT.) Individual controls are represented by ESC F_e sequences.

2.2.2 The mosaic graphics set is designated (in the parallel mode) as the G1 set by an escape sequence of the form ESC 2/9 (F) or ESC 2/13 (F) to be allocated by ISO.

2.3 *Designation and invocation in the context of the alphageometric option*

2.3.1 The alphageometric coding scheme is to be designated and invoked by the escape sequence ESC 2/5 (5/x) in accordance with paragraph 5.3.8 of ISO 2022 [1] standard. This designates and invokes a complete code with interpretation as follows.

2.3.2 All the meanings and interpretation of Recommendation V.3 [3] and ISO 2022 [1] remain the same, including C0, G0 and G2 with the exception of SI and SO. The codes of the G1 set and their meanings and interpretations are as described in § 6.

2.3.3 The designation and invocation of the complete code by the sequence ESC 2/5 (5/x) is to be terminated only by ESC 2/9 (F) or ESC 2/13 (F), designating a normal G1 set.

2.4 *Designation and invocation in the context of DRCS*

2.4.1 A DRCS is a set of characters whose shapes are sent from the service and down-loaded via the line. It may be used to represent alphabetic characters, special symbols, or picture element symbols for constructing fine graphics. Once loaded, the DRCS are regarded as members of a library that can be designated by appropriate ESC sequences as G0, G1, G2, G3 sets. One scheme is described in § 7 in the context of a general architecture.

2.5 *Designation and invocation in the context of the alphaphotographic option*

(For further study.)

3 Common features

3.1 *General*

3.1.1 The features pertaining to individual systems will be described in the corresponding paragraphs. The common features comprise common display features and common control functions.

3.2 *Common display features*

3.2.1 The *defined display area* is that rectangular position of the display in which all text and pictorial images may be presented (see Figure 1/S.100).

3.2.2 The *border area* is that part of the visible display of a terminal that is outside the defined display area (see Figure 1/S.100).

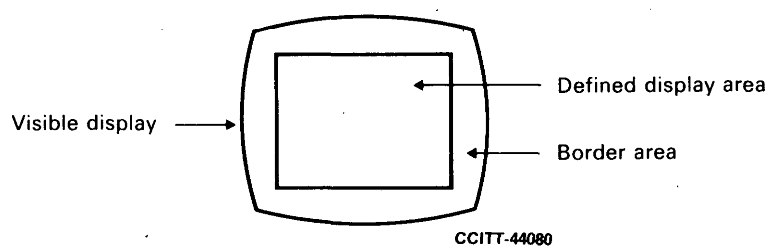


FIGURE 1/S.100
Common display features

3.3 *Common format effector and code extension control functions*

3.3.1 *General*

3.3.1.1 The format effector control functions described for the Videotex system permit the active drawing position to be moved on the visible display area. These are taken from the C0 set (see Figure 2/S.100) together with the *Space* character 2/0. In order to permit interworking between Videotex and other text communications services, these control functions have functional compatibility to the extent possible with the basic C0 control set utilized by these other services.

3.3.2 *Format effector controls*

3.3.2.1 Some of the format effector control functions may be used from terminal to computer with different meanings.

				b_7	0	0	0	0	1	1	1	1
				b_6	0	0	1	1	0	0	1	1
				b_5	0	1	0	1	0	1	0	1
b_4	b_3	b_2	b_1		0	1	2	3	4	5	6	7
0	0	0	0	0	NUL	2						
0	0	0	1	1	2	3						
0	0	1	0	2	2	3						
0	0	1	1	3	2	3						
0	1	0	0	4	2	3						
0	1	0	1	5	ENQ	2						
0	1	1	0	6	2	2						
0	1	1	1	7	1	2						
1	0	0	0	8	APB	CAN						
1	0	0	1	9	APF	SS2						
1	0	1	0	10	APD	1						
1	0	1	1	11	APU	ESC						
1	1	0	0	12	CS	1						
1	1	0	1	13	APR	SS3						
1	1	1	0	14	SO	3						
1	1	1	1	15	SI	3						

CCITT-44090

Note 1 — Reserved for future study.

Note 2 — Reserved for transmission control characters. Their use in Videotex is for further study.

Note 3 — The definitions of these control functions are given in the relevant options.

Note 4 — As in all the code tables in this Recommendation, the shaded positions do not belong to the character set described.

FIGURE 2/S.100

The primary set of control functions for International Interactive Videotex

3.3.2.2 *Active position backward (APB)*

This control function causes the active position to be moved one character position backwards on the same row. APB on the first character position on the row moves the active position to the last character position of the preceding row. APB on the first character position on the first row moves the active position to the last character position of the last row.

3.3.2.3 *Active position forward (APF)*

This function causes the active position to be moved to the next character position forward on the same row. At the last position on the row, this control moves the active position to the first character position on the following row. APF on the last character position of the last row moves the active position to the first character position of the first row.

3.3.2.4 *Active position down (APD)*

This function causes the active position to be moved to the equivalent character position on the following row. APD on the last row moves the active position of the equivalent character position of the first row of the display frame or causes a roll-up to be made.

3.3.2.5 *Active position up (APU)*

This function causes the active position to be moved to the equivalent character position on the preceding row. APU on the first row moves the active position to the equivalent character position on the last row of the same display frame.

3.3.2.6 *Clear screen (CS)*

This function causes the screen to be cleared and causes the active position to be moved to the first character position on the first row.

3.3.2.7 *Active position return (APR)*

This function causes the active position to be moved to the first character position of the same row.

3.3.2.8 *Space (SP)*

A control function that causes the active position to be moved one character width forward on the same row. It is also regarded as a graphic character with a transparent foreground. In those systems that define an explicit background, the space copies the background colour into the active position and moves the active position one character width forward. If used in conjunction with the inversion attribute it copies the foreground colour into the active position and moves the active position one character width forward.

3.3.2.9 *Cancel (CAN)*

A control function that fills all the character positions of the row, after the active position, with spaces and returns the active position to its original value.

3.3.3 *Code extension control functions*

3.3.3.1 Code extension control functions are used to expand the capability of the 7-bit code beyond 128 different characters or functions. Code extension functions alter the meaning of a number of characters following them.

3.3.3.2 *Escape (ESC)*

A control character that is used to provide additional control functions other than transmission control functions and that alters the meaning of a limited number of contiguously following bit combinations in the manner specified in Recommendation V.3 [3].

3.3.3.3 *Control sequence introducer (CSI)*

A code extension control function that is used to provide coded representations for additional control functions, in particular for control functions with parameters such as presentation control functions.

3.3.3.4 *Shift-out (SO)*

A control character that is used in conjunction with the *Shift-in* character to extend the graphic character set of the code and that alters the meaning of the bit combinations of columns 2-7 of the code table, until the occurrence of the *shift-in* character, except that the meaning of the bit combinations corresponding to the *space* character and the *delete* character (positions 2/0 and 7/15) are unaffected.

3.3.3.5 *Shift-in (SI)*

A control character, used in conjunction with the *shift-out* character, that reinstates the former meanings of the bit combinations of columns 2-7 of the code table. It ensures that the *space* and *delete* characters 2/0 and 7/15 are re-established in the geometric mode of operation.

3.3.3.6 *Single shift (SS2)*

This character alters the meaning of the single-bit combination following it. That bit combination must be one of those from columns 2-7 except 2/0 and 7/15. The meaning of the bit combination concerned is derived from an appropriately designated G2 graphic set.

3.3.3.7 *Single shift (SS3)*

This character alters the meaning of the single-bit combination following it. That bit combination must be one of those from columns 2-7 except 2/0 and 7/15. The meaning of the bit combination concerned is derived from an appropriately designated G3 graphic set.

3.4 *Miscellaneous*

3.4.1 *Null (NUL)*

This function may occur in non-transparent modes in the received bit stream at the terminal. It shall be regarded as a time filler and discarded.

3.4.2 *Enquiry (ENQ)*

A control character used as a request for a response from a remote station, which response may include station identification and/or station status.

3.5 *Coding of control functions*

3.5.1 A proposed coding of the control functions described is shown in Figure 2/S.100 as a C0 set.

4 Representation of alphanumeric characters in a Videotex system

4.1 *General*

4.1.1 The repertoire for the Latin alphabet is shown in Annex B. The repertoire is derived from ISO 6937 [4]. Terminals capable of displaying a subset of the Videotex repertoire shall be permitted.

4.1.2 Character repertoires for non-latin based languages can be accommodated in a similar manner to the latin alphabet (for further study).

4.1.3 In addition to the provisions made by ISO 2022 [1], the transmission of alphabetic characters having diacritical signs is effected by transmitting the code representing the diacritical mark together with the code of the basic alphabetic character.

4.2 *Coding*

4.2.1 § 4.2 describes the coding of characters the shape of which are stored in the terminal. Some languages require that consecutive letters or diacritical marks will be joined and that no space appear between the characters. When an intersymbol space is required it will be part of the character description.

4.2.2 The code tables are shown in Figures 3/S.100 and 4/S.100. The code combinations representing characters not included in the Videotex repertoire shall not be transmitted.

4.2.3 All the permitted combinations may be expected in the international exchange of information between two national services. It is the responsibility of Administrations and/or RPOAs to decide whether this exchange is a direct terminal to data-base operation or has to be performed through a gateway. See Recommendation F.300 [2].

4.2.4 The graphic characters from columns 2, 3, 5, 6 and 7 of the supplementary set are invoked one at a time by SS2.

4.2.5 A character with a diacritical mark is transmitted by the sequence SS2, a character from column 4 from the supplementary set, and the appropriate character from the primary set. The diacritical marks are non-spacing.

4.2.6 The ISO registration of graphics character sets will indicate any special features such as their use in conjunction with other graphic character sets or non-spacing characters,etc.

4.2.7 For languages based on other than the Latin alphabet further study is required.

5 Alphamosaic option

5.1 *General*

5.1.1 In the alphamosaic option, the display frame is composed of defined character positions, which may be occupied by any of the characters of the repertoire. The repertoire is composed of the alphanumeric repertoire and a mosaic repertoire. The mosaic repertoire is formed by dividing the character space into a matrix of 2 × 3 elements. There are 63 different combinations of these elements.

5.1.2 Two modes have been identified, which are known as *serial* and *parallel* modes respectively. The two modes are distinguished by their display control sets.

5.1.3 The two modes have common features and specific features described in §§ 5.2 to 5.4 below.

5.2 *Common control functions*

5.2.1 *General functions*

The *active position home (APH)*

This function causes the active position to be moved to the first position of the first row. Its coded representation is 1/14 in Figure 2/S.100.

5.2.2 *Device control functions*

The following device control functions have been defined.

5.2.2.1 *Definitions*

cursor on (CON)

F: curseur en marche (CON)

S: cursor activo (CON)

The cursor on (CON) causes the active position to be visualized as a marker.

cursor off (COF)

F: curseur arrêté (COF)

S: cursor inactivo (COF)

The cursor off (COF) causes the active position to be displayed in the same way as other character positions.

				b7	0	0	0	0	1	1	1	1
				b6	0	0	1	1	0	0	1	1
				b5	0	1	0	1	0	1	0	1
b4	b3	b2	b1		0	1	2	3	4	5	6	7
0	0	0	0	0				0	@	P		p
0	0	0	1	1			!	1	A	Q	a	q
0	0	1	0	2			"	2	B	R	b	r
0	0	1	1	3				3	C	S	c	s
0	1	0	0	4				4	D	T	d	t
0	1	0	1	5			%	5	E	U	e	u
0	1	1	0	6			&	6	F	V	f	v
0	1	1	1	7			'	7	G	W	g	w
1	0	0	0	8			(	8	H	X	h	x
1	0	0	1	9			)	9	I	Y	i	y
1	0	1	0	10			*	:	J	Z	j	z
1	0	1	1	11			+	;	K		k	
1	1	0	0	12			,	<	L		l	|
1	1	0	1	13			-	=	M		m	
1	1	1	0	14			.	>	N		n	
1	1	1	1	15			/	?	O	①	o	

CCITT-44100

① Position 5/15 can be displayed as "low line", —, or as "number sign" #, to represent the terminator function required for some existing Videotex services.

FIGURE 3/S.100

The primary set of graphic characters for international interactive Videotex

			b7		0	0	0	0	1	1	1	1
			b6		0	0	1	1	0	0	1	1
			b5		0	1	0	1	0	1	0	1
b4	b3	b2	b1		0	1	2	3	4	5	6	7
0	0	0	0	0				°		―	Ω	ĸ
0	0	0	1	1			¡	±	`		Æ	æ
0	0	1	0	2			¢	²	´		Đ	đ
0	0	1	1	3			£	³	^		ª	ð
0	1	0	0	4			$	×	~		Ħ	ħ
0	1	0	1	5			¥	µ	¯			ı
0	1	1	0	6			#	¶	˘		Ĳ	ĳ
0	1	1	1	7			§	·	˙		Ŀ	ŀ
1	0	0	0	8			¤	÷	¨		Ł	ł
1	0	0	1	9			‘	’			Ø	ø
1	0	1	0	10			“	”	˚		Œ	œ
1	0	1	1	11			«	»	¸		º	ß
1	1	0	0	12			←	¼			Þ	þ
1	1	0	1	13			↑	½	˝		Ŧ	ŧ
1	1	1	0	14			→	¾	˛		Ŋ	ŋ
1	1	1	1	15			↓	¿	ˇ		ŉ	

CCITT-44111

FIGURE 4/S.100

The supplementary set of graphic characters for international interactive Videotex

device stop (DSP)

F: arrêt dispositif (DSP)

S: detención de dispositivo (DSP)

The device stop (DSP) causes a designated terminal device to stop.

device start (DST)

F: mise en marche dispositif (DST)

S: arranque de dispositivo (DST)

The device start (DST) causes a designated terminal device to start.

device wait (DW)

F: dispositif en attente (DW)

S: espera de dispositivo (DW)

The device wait (DW) causes a designated terminal device to pause.

5.2.2.2 *Coding*

CON is coded 1/1, COF is coded 1/4 in the C0 set. DSP, DST and DW functions are coded as 3-character sequences of the Form ESC 3/x, (P) where x = 7, 6 and 5 respectively and P is a parameter that designates a particular device.

5.3 *Serial mode*

5.3.1 *General*

5.3.1.1 The serial mode is based on the assumption that changes in character attributes normally occur in interword spacings. This results in control characters being serially stored in the page memory and normally results in their display on the screen as a rectangle in the prevailing background colour. A set of 27 controls is incorporated in a C1 set (Figure 5/S.100). The C1 set is designated by a sequence ESC, 2/2, (F1), the final character will be allocated by ISO.

5.3.1.2 A display control of C1 is represented by a sequence ESC, (F_e), where (F_e) is a code specifying the particular control. The allocation of F_e code is given in Figure 5/S.100. Display controls of the serial set causes the active position to be moved one character position forward. In that case, the position thus vacated is to be generally displayed as a space. The display control *hold graphics* ESC 5/14 may modify this situation.

5.3.2 *Display control functions*

5.3.2.1 The (F_e) codes are listed as follows:

5.3.2.2 Alpha red Alpha green Alpha yellow Alpha blue Alpha magenta Alpha cyan Alpha white	Controls functions that cause the currently designated and invoked alphanumeric set to be displayed in the indicated colour until the occurrence of an explicit colour control or the end of a row.

5.3.2.3 *Flashing*

A control function that causes the characters following it in the same row to be displayed alternately as they would normally be displayed, and as spaces, in the prevailing background colour, under the control of a timing device in the receiver.

				b7	0	0	0	0	1	1	1	1
				b6	0	0	1	1	0	0	1	1
				b5	0	1	0	1	0	1	0	1
b4	b3	b2	b1		0	1	2	3	4	5	6	7
0	0	0	0	0					①	①		
0	0	0	1	1					Alpha red	Graphics red		
0	0	1	0	2					Alpha green	Graphics green		
0	0	1	1	3					Alpha yellow	Graphics yellow		
0	1	0	0	4					Alpha blue	Graphics blue		
0	1	0	1	5					Alpha magenta	Graphics magenta		
0	1	1	0	6					Alpha cyan	Graphics cyan		
0	1	1	1	7					Alpha white	Graphics white		
1	0	0	0	8					Flashing	Conceal display		
1	0	0	1	9					Steady	Contiguous graphics		
1	0	1	0	10					End box ①	Separated graphics		
1	0	1	1	11					Start Box ①	①		
1	1	0	0	12					Normal height	Black background		
1	1	0	1	13					Double height	New background		
1	1	1	0	14					①	Hold graphics		
1	1	1	1	15					①	Release graphics		

CCITT-44120

① Reserved for further study.

Note — This coding represents the final bit combination of ESC F_e sequences in a 7-bit code.

FIGURE 5/S.100

The supplementary set of control functions-serial mode

5.3.2.4 *Steady*

A control function that causes the action of *Flashing* to be stopped.

5.3.2.5 *Start box*

Reserved for starting the action of defining a picture area in a page of text (for further study).

5.3.2.6 *End box*

Reserved for terminating the action of boxing (for further study).

5.3.2.7 *Normal height*

A control function that causes the graphic characters following it to occupy one character position each.

5.3.2.8 *Double height*

A control function that causes the characters following it to occupy each its active positive and the corresponding position on the following row.

5.3.2.9 Graphics red Graphics green Graphics yellow Graphics blue Graphics magenta Graphics cyan Graphics white	Control functions that cause the mosaic graphic set to be displayed in the indicated colour until the occurrence of an explicit colour control or the end of the row. Unallocated code table positions (4/0-5/15) cause the characters of the currently designated and invoked alphanumeric set to be displayed. This is defined as *blast-through* operation.

5.3.2.10 *Conceal display*

A control function that causes all characters following it, although stored in the receiver, to be displayed as spaces until the user chooses to reveal them.

5.3.2.11 *Contiguous graphics*

A control function that causes the mosaic set to be displayed as represented in Figure 6/S.100 with all cells being contiguous.

5.3.2.12 *Separated graphics*

A control function that causes the mosaics set to be displayed as represented in Figure 6/S.100 with all cells being separated by the prevailing background colour.

5.3.2.13 *Black background*

A control function that causes the background colour to be black.

5.3.2.14 *New background*

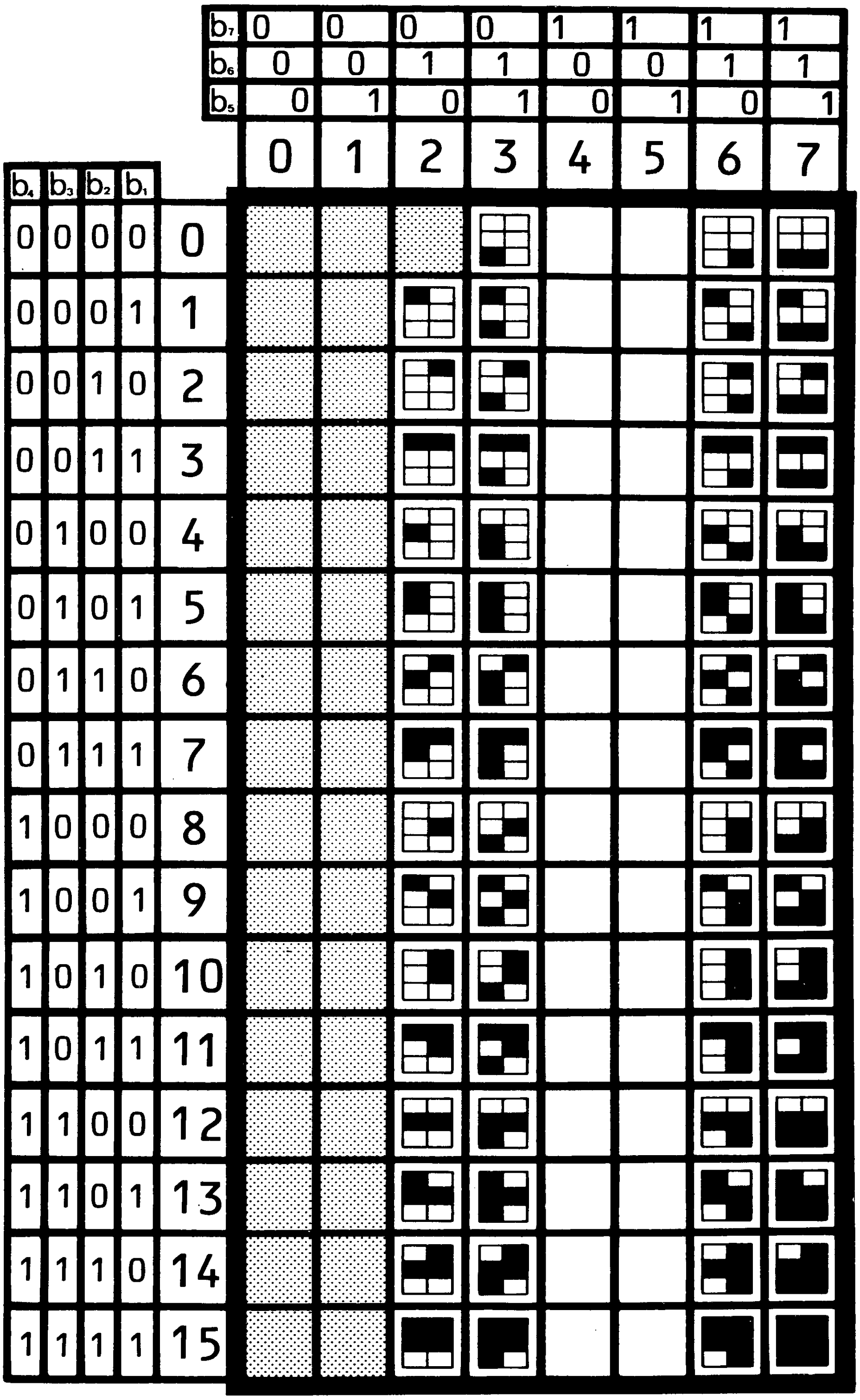
A control function that causes the current colour as defined by previous colour control functions to become the new background colour. The foreground colour is unchanged.

5.3.2.15 *Hold graphics*

A control function that causes the character positions occupied by display controls to be displayed by repetition of the last displayable mosaic character.

5.3.2.16 *Release graphics*

A control function that causes the action of *Hold graphics* to be stopped.




Separated graphics representation

FIGURE 6/S.100

The mosaic set for the serial mode with blast-through characters in columns 4 and 5

5.3.3 *Mosaic graphics*

5.3.3.1 The *serial mosaic* graphic set is given in Figure 6/S.100 and the default conditions of the mode are shown in Table 1/S.100.

5.4 *Parallel mode*

5.4.1 *General*

5.4.1.1 The *parallel* mode is based on an explicit description of the display frame. This means that the active position is moved only by action of the format effectors or at the reception of spacing display characters. All other functions, including display functions, are non-spacing, not depending on whether the terminal needs a space or not on the screen to process them. It is the responsibility of the information provider to limit the display of the pages to fit the capability assumed to receive, without any modification, pages designed for lower grade terminals.

5.4.1.2 In addition to functions described in § 3.3, the following functions are defined.

active position addressing (APA)

F: adressage de position active (APA)

S: direccionamiento de posición activa (APA)

This code is followed by two characters. If these both range from 3/0 to 3/9, they represent in decimal form respectively the tens and units of the row address of the first character to be displayed. This first character will be displayed on the first character position of the addressed row. If they both range from 4/0 to 7/14, they represent respectively the row address and the column address, in binary form with 6 useful bits, of the first characters to be displayed.

repeat (RPT)

F: répétition (RPT)

S: repetición (RPT)

This code indicates that the preceding graphics character is to be repeated. The number of repetitions is indicated in binary form by the six least significant bits of the subsequent character chosen from columns 4 to 7. The character itself is not included in the count. This function does not apply to control characters.

5.4.1.3 A supplementary set of 32 controls, of which 31 have been allocated, are coded as a C1 set (see Figure 7/S.100). The attributes defined by such controls become a property of the active position and move with it under the action of format effectors or spacing display characters.

5.4.1.4 The mosaic repertoire is coded as a G1 set, of which several representations may be defined (see Figure 8/S.100).

TABLE 1/S.100

Display modes and control characters-serial mode

Display mode	Set at	Set after (see Note)	Complementary display mode	Set at	Set after (see Note)
Alphanumerics	Row start	4/1 4/2 4/3 4/4 4/5 4/3 4/7	Block graphics	—	5/1 5/2 5/3 5/4 5/5 5/6 5/7
Contiguous	Row start 5/9	5/9	Separated	5/10	5/10
Foreground display colour: includes red	Row start	4/1 4/3 4/5 4/7 5/1 5/3 5/5 5/7	Foreground display colour: excludes red	—	4/2 4/4 4/6 5/2 5/4 5/6
Foreground display colour: includes green	Row start	4/2 4/3 4/6 4/7 5/2 5/3 5/6 5/7	Foreground display colour: excludes green	—	4/1 4/4 4/5 5/1 5/4 5/5
Foreground display colour: includes blue	Row start	4/4 4/5 4/6 4/7 5/4 5/5 5/6 5/7	Foreground display colour: excludes blue	—	4/1 4/2 4/3 5/1 5/2 5/3
Black background	Row start 5/12	—	New background colour	5/13	—
Reveal	Row start User control	4/1 4/2 4/3 4/4 4/5 4/6 4/7 5/1 5/2 5/3 5/4 5/5 5/6 5/7	Conceal	5/8	—
Steady	Row start 4/9	—	Flash	—	4/8
Unboxed	Row start 4/10	4/10	Boxed	4/11	4/11
Normal height	Row start 4/12	—	Double height	—	4/13
Release	Row start	5/15	Hold	5/14	—

Note — All attribute control characters are preceded by Escape ESC.

b4	b3	b2	b1									
				b7	0	0	0	0	1	1	1	1
				b6	0	0	1	1	0	0	1	1
				b5	0	1	0	1	0	1	0	1
					0	1	2	3	4	5	6	7
0	0	0	0	0					Black foreground	Black background		
0	0	0	1	1					Red F....	Red B....		
0	0	1	0	2					Green F....	Green B....		
0	0	1	1	3					Yellow F....	Yellow B....		
0	1	0	0	4					Blue F....	Blue B....		
0	1	0	1	5					Magenta F....	Magenta B....		
0	1	1	0	6					Cyan F....	Cyan B....		
0	1	1	1	7					White F....	White B....		
1	0	0	0	8					Flash	Conceal display		
1	0	0	1	9					Steady	Stop lining		
1	0	1	0	10					End box 1	Start lining		
1	0	1	1	11					Start box 1	2		
1	1	0	0	12					Normal size	Normal polarity		
1	1	0	1	13					Double height	Inverted polarity		
1	1	1	0	14					Double width	Transparent background		
1	1	1	1	15					Double size	Reveal display		

1 For further study

2 Reserved for CSI

CCITT-44140

Note — This coding represents the final bit combination of ESC F_e sequences in a 7-bit code.

FIGURE 7/S.100

Supplementary set of control functions — parallel mode

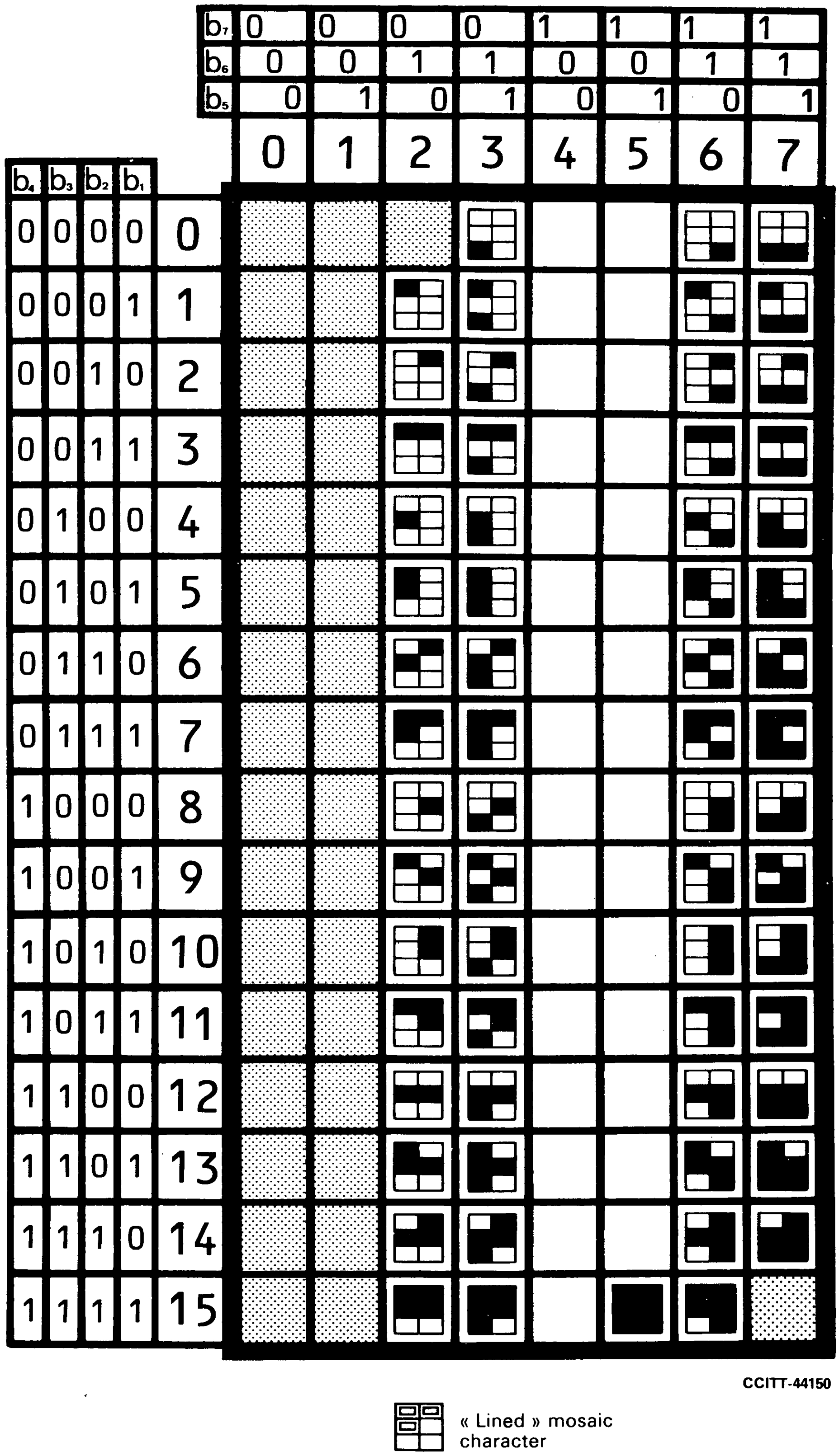


FIGURE 8/S.100

The mosaic character set — parallel mode

5.4.2 *Display control functions*

5.4.2.1 The display control functions are of two kinds depending on the range of their action:

- *Defined display area attributes* apply to individual character locations. Their action is limited to zones separated by APA functions.
- *Full screen attributes* apply to the full screen area and are taken as default values for defined display area attributes.

The defined display area attributes are coded as functions from the supplementary set of control functions (Figure 7/S.100) with two character escape sequences.

The full screen attribute is coded as a function from the supplementary set of control functions with four character escape sequences (see § 5.4.2.3).

5.4.2.2 Attributes for use in the defined display area are as follows.

5.4.2.2.1 Black foreground Red foreground Green foreground Yellow foreground Blue foreground Magenta foreground Cyan foreground White foreground	Causes the following characters to be written in the colour indicated.

5.4.2.2.2 *Flashing*

This control function causes the characters following it to be displayed alternatively as they would otherwise be displayed, and as spaces, under the control of a timing device in the receiver.

5.4.2.2.3 *Steady*

This control function causes the action of *flashing* to be stopped.

5.4.2.2.4 *Start box*

This control function causes the characters following it to be inset or added to a television picture, when the receiver is in the user's control (for further study).

5.4.2.2.5 *End box*

This control function causes the action of *start box* to be stopped (for further study).

5.4.2.2.6 *Normal size*

This control function causes the characters following it to occupy one character position each.

5.4.2.2.7 *Double height*

This control function causes the characters following it to occupy each its active position and the corresponding position on the previous row. (The origin of a character is the bottom left corner of the character position.)

5.4.2.2.8 *Double width*

This control function causes the characters following it to occupy two consecutive character positions on the same row, and the active position to be moved two positions forward with every character.

5.4.2.2.9 *Double size*

This control function causes the characters following it to occupy the active position, the next on the row and the two corresponding character positions on the previous row. The active position is moved two character positions forward with every character.

5.4.2.2.10 Black background Red background Green background Yellow background Blue background Magenta background Cyan background White background	Causes the following characters to be displayed in their foreground colour on a background of the colour indicated.

5.4.2.2.11 *Transparent background*

This control function causes the characters following it to be displayed with a transparent background. This means the area not occupied by the foreground colour takes the underlying background colour. This may be one of the eight colours or the video picture as defined by the off screen attributes.

5.4.2.2.12 *Conceal display*

This control function causes the characters following it, in the same unit although stored in the receiver, to be displayed as spaces until the user chooses to reveal them.

5.4.2.2.13 *Reveal display*

This control function causes the action of *conceal display* to be stopped.

5.4.2.2.14 *Start lining*

This control function causes the characters following in the same unit to be lined. The shape of lining may be different depending on the character set used. In the case of the mosaic set, the lining causes the six cells to be separated with a background boundary.

5.4.2.2.15 *Stop lining*

This control function causes the action of *start lining* to be stopped.

5.4.2.2.16 *Normal polarity*

This control function causes the action of *inverted polarity* to be stopped.

5.4.2.2.17 *Inverted polarity*

This control function causes the characters following it, in the same unit, to be displayed as if the background and the foreground colour have been exchanged. In the flashing attribute, the polarity of the flashing clock is also inverted.

5.4.2.3 *Full-screen attributes*

5.4.2.3.1 Full-screen attributes apply for the total display period and include the border area. In addition, provisions are made for full-row attributes, applying for the entire row including the border area related to that row.

Full-screen attributes display controls are represented by four character *Escape* sequences of the form ESC 2/3 2/0 F_e where F_e is taken from Figure 7/S.100.

Full-row attributes display controls are represented by four-character *Escape* sequences of the form ESC 2/3 2/1 F_e.

Note – The escape sequences have been assigned provisionally, subject to the approval of the corresponding changes to ISO 2022 [1].

5.4.2.3.2 Full-screen attributes are used as default conditions for defined display area attributes.

5.4.2.3.3 The following full-screen attributes need precise definition:

– *Transparent background:* The full-screen area is occupied by a picture, which may not be part of the Videotex service (e.g. a television picture). Now concealed characters appear on this picture. If they are also displayed with defined display area transparent background, only the foreground appears over the picture. Concealed characters are displayed as transparent spaces.

- *Conceal:* The defined display area is in the full-screen background colour until the user chooses to reveal it or until this attribute is stopped by full-screen reveal.
- *Full-screen reveal:* This has the same action as the action of the user on the reveal key.

5.4.2.3.4 For row-defined full-screen attributes, the following may also apply:

- lined;
- double width;
- double height.

5.4.3 *Coding of the mosaic repertoire*

5.4.3.1 The mosaic repertoire is designated as a G1 set invoked by the SO function. Two alternative fonts (contiguous and separated) are proposed. The separated font is obtained by applying the lining attribute applied to the mosaic set. The mosaic set code table is given in Figure 8/S.100 together with examples of the fonts.

5.4.4 *Default conditions*

5.4.4.1 *Default full-screen attributes*

At the beginning of a display frame (initiated by function CS) the default conditions for full-screen attributes are set at white foreground, black background, single size, unboxed, revealed, steady, non-lined.

5.4.4.2 *Default defined display area attributes*

After functions directly addressing a character location on the screen (APH or APA function) the defined display area attributes are reset to the value of the current full-screen attributes.

5.4.4.3 *Default full-row attributes*

The default condition of full-row attributes is the current value of full-screen attributes.

6 Alphageometric option

6.1 *General*

6.1.1 *Description*

6.1.1.1 In the alphageometric option, the display is composed of alphanumeric texts and pictorial drawings that are defined in terms of geometric primitives transmitted to the terminal as drawing commands.

6.1.1.2 One coding scheme for the alphageometric option for Videotex is described in § 6.

6.1.2 *Designation and invocation of geometric codes*

6.1.2.1 The designation and invocation of the alphageometric code is specified in § 2.3.

The occurrence of the control function SO invokes the geometric primitives in code table positions 2/0 to 7/15 inclusive. The occurrence of the code function SI re-establishes the G0 set and the *Space* (2/0) and *Delete* (7/15) functions.

6.1.3 *Geometric primitives*

6.1.3.1 The coding scheme for the G1 set together with the code positions 2/0 and 7/15 for the geometric model is based on geometric primitives. Each drawing primitive is specified in terms of Cartesian coordinates to describe the positions, end-points, or vertices of each drawing operation.

6.1.3.2 Geometric drawings are defined in terms of the drawing primitives: *point*, *line*, *arc*, *rectangle*, and *polygon*.

6.1.4 *Drawing position*

6.1.4.1 Drawings are positionally independent; therefore drawing primitives may overlay each other redefining the drawing at the position.

6.1.5 *Drawing space*

6.1.5.1 Space for geometric drawing operations consists of a rectangular area entirely visible on the display screen. Any area of the display screen outside of the valid drawing area is termed a *border area* and it is not possible to specify a coordinate position in a border area.

6.1.6 *Picture element*

6.1.6.1 The Cartesian coordinate grid is made up of square picture elements (pixels).

6.1.7 *Picture resolution*

6.1.7.1 Any number of picture elements may be implemented. Hence, picture resolution is at the discretion of terminal manufacturers.

6.1.8 *Coordinate system*

6.1.8.1 The coordinate specifications are defined based on a Cartesian 0 to 1 numbering scheme.

6.1.8.2 The numbering system is referenced to the visible valid drawing area and consists of coordinates ranging from 0 to 1 on both the X and Y axes, with coordinate values being specified as fractions of this range.

6.1.8.3 The coordinates are encoded in 2's complement notation and specified as signed numbers to a minimum accuracy of 9 bits, including the sign bit. Increased accuracy is obtained by additional increments of 3 bits. Unused least significant bits are truncated when the coordinates are defined to a greater accuracy than can be handled by the terminal.

6.1.8.4 Display screens with non-square visible areas map into the square drawing area number system so that the origin (0,0) remains in the lower left-hand corner. On a television-like display with a 4 : 3 aspect ratio, this corresponds to a range of 0 to 0.999 ... in the X axis and 0 to approximately 0.75 in the Y axis. Drawing commands addressing the entire square 0 to 1 grid are permissible but only the circumscribed 4 : 3 area is visible.

6.2 *Drawing command*

6.2.1 *General*

6.2.1.1 Drawing commands consist of *operational codes* (opcodes) and their associated data parameters.

6.2.1.2 Opcodes describe the types of drawing operation.

6.2.1.3 Following the opcode byte are one or more blocks of additional bytes of data to describe one or more (X, Y) coordinate positions. Each block of data for the (X, Y) coordinates may contain 3 bytes (9 bits accuracy), 4 bytes (12 bits accuracy), etc., depending on the degree of resolution desired.

6.2.1.4 Figure 9/S.100 is the code table for the opcodes and data bytes or status sub-commands.

b4	b3	b2	b1	b7 →	0	0	0	0	1	1	1	1
				b6 →	0	0	1	1	0	0	1	1
				b5 →	0	1	0	1	0	1	0	1
					0	1	2	3	4	5	6	7
0	0	0	0	0			Spare	Rect 4	Numeric data (for opcodes) or status commands			
0	0	0	1	1								
0	0	1	0	2								
0	0	1	1	3								
0	1	0	0	4			Point 1	Poly 5				
0	1	0	1	5								
0	1	1	0	6								
0	1	1	1	7								
1	0	0	0	8			Line 2	Reserved 6				
1	0	0	1	9								
1	0	1	0	10								
1	0	1	1	11								
1	1	0	0	12			Arc 3	Control 7				
1	1	0	1	13								
1	1	1	0	14								
1	1	1	1	15								

CCITT-44160

FIGURE 9/S.100

Operation code and data field assignments

6.2.2 *Opcode byte*

6.2.2.1 The structure of the opcode byte is as shown in Figure 10/S.100.

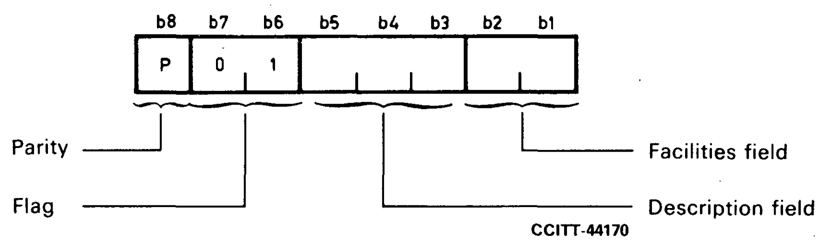


FIGURE 10/S.100
8-bit opcode byte

6.2.3 *Opcode definitions*

6.2.3.1 *Point*

Sets the drawing beam to any position in the display space and optionally draws a point.

6.2.3.2 *Line*

Draws a line based on the two given end points.

6.2.3.3 *Arc*

Draws a circular arc based on three points, which are the start point, a point on the arc and the end point of the arc. A circle results when the start and end points are coincidental and the point on the arc defines the opposite end of the diameter. The arc may be either in outline or the area enclosed by the arc and the chord may be filled.

6.2.3.4 *Rectangle*

Draws a rectangle based on specified width and height. The rectangle may be in outline or a filled-in area.

6.2.3.5 *Polygon*

Draws a closed polygon of arbitrary shape specified by the vertices. The polygon may be in outline or a filled-in area. The maximum number of vertices is limited to 256.

6.2.3.6 *Spare*

An opcode available for future definition.

6.2.3.7 *Reserved*

An opcode reserved for a specific future application.

6.2.3.8 *Control*

Provides control over the modes or attributes of the drawing commands.

6.2.4 *Opcode facilities*

6.2.4.1 Each opcode has four variants; these are defined by the facility bits (b2 and b1) as shown in Figure 11/S.100. Facility field interpretations are as given below.

Opcode	Parity	Flag	Descriptor field	Facility field			
				b2		b1	
	b8	b7 b6	b5 b4 b3	0	1	0	1
Spare	P	0 1	0 0 0	–	–	–	–
Point	P	0 1	0 0 1	INVIS	VIS	ABS	REL
Line	P	0 1	0 1 0	JOIN	SET	ABS	REL
Arc	P	0 1	0 1 1	JOIN	SET	OUTLINE	FILL
Rectangle	P	0 1	1 0 0	JOIN	SET	OUTLINE	FILL
Polygon	P	0 1	1 0 1	JOIN	SET	OUTLINE	FILL
Reserved	P	0 1	1 1 0	–	–	–	–
Control	P	0 1	1 1 1				

INVIS Invisible
VIS Visible
ABS Absolute
REL Relative

FIGURE 11/S.100
Opcode facilities

6.2.4.2 *b2 is binary 1*

a) *Point* – A visible point is drawn on the display screen.

b) *Line, arc, rectangle, polygon* – The initial drawing position is specified within the data bytes as absolute (X, Y) coordinates, i.e., the initial point is *set.*

6.2.4.3 *b2 is binary 0*

a) *Point* – An invisible point is located on the display screen.

b) *Line, arc, rectangle, polygon* – The initial drawing position is the same point as the final drawing position of the previous opcode, i.e., the current drawing is joined to the previous drawing.

6.2.4.4 *b1 is binary 1*

a) *Point* – The (X, Y) coordinates are relative displacements to the preceding coordinate specifications.

b) *Line* – The (X, Y) coordinates for the final drawing position of a line segment are relative displacements from initial drawing position of that line segment.

c) *Arc, rectangle, polygon* – The areas established are filled or crosshatched.

6.2.4.5 *b1 is binary 0*

a) *Point* – The (X, Y) coordinates of the point are absolute values.

b) *Line* – The (X, Y) coordinates of the final drawing position of the line segment are absolute values.

c) *Arc, rectangle, polygon* – The drawings are outlined.

6.3 *Opcode numeric data*

6.3.1 The numerical data bytes associated with an opcode immediately follow the opcode byte and are recognized when the flag bit (b7) is binary 1. Any number of blocks of data bytes defining pairs of coordinates or drawing displacements may follow the drawing opcode until one of the following conditions occurs:

a) when another opcode is encountered;

b) when the *shift-in* code (SI) is encountered;

c) when the *shift-out* code (SO) is encountered;

d) when the *single-shift* codes (SS2 or SS3) are encountered;

e) when an *escape* (ESC) code is encountered.

6.3.2 The minimum number of data bytes that forms a block that defines a pair of X, Y coordinates is three. The structure of the data block is shown in Figure 12/S.100.

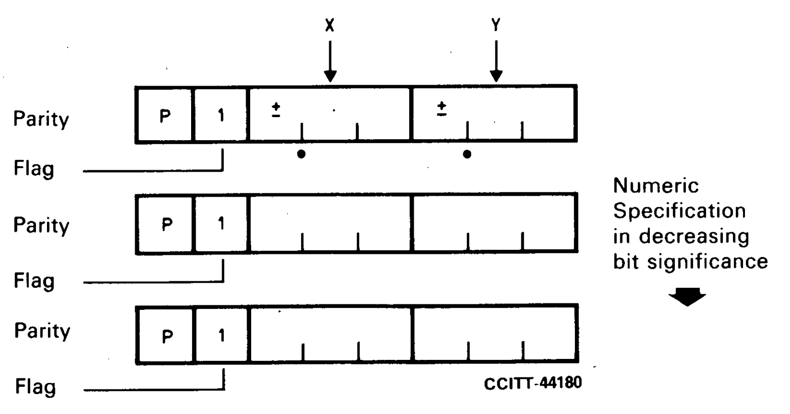


FIGURE 12/S.100

Structure of a block of 3 data bytes

6.4 *Repeated opcode operation*

6.4.1 For each of the *point*, *line* and *rectangle* opcodes, repeated drawing operations will automatically be effected if the numerical data field following the opcode byte contains more than one complete set of coordinate specifications. A complete set of coordinate specifications is defined as all the coordinates needed to define a *point*, *line* or *rectangle* drawing as a single drawing. That is, the repeated drawing feature allows concatenated drawings to be effected without having to repeat the opcode itself.

6.5 *Geometric control opcode*

6.5.1 *General*

6.5.1.1 The *control* opcodes control the drawing states of the terminal and the interpretation of the drawing opcode attributes. The sequence of *control* opcodes and their *status* sub-commands always precedes the opcodes for the geometric drawing primitives of *point, line, arc, rectangle, polygon.* The controls also apply to text in *shift-in* (SI) mode. The four *control* opcodes, distinguished by the opcode facilities bits, (b2 and b1), are given in Figure 13/S.100.

Control (value)	P	0	1	1	1	1	0	0
Control (status)	P	0	1	1	1	1	0	1
Control (reserved)	P	0	1	1	1	1	1	0
Control (private)	P	0	1	1	1	1	1	1

CCITT-44190

FIGURE 13/S.100
Control codes

6.5.1.2 *Control (value)*

This control opcode defines the colour or grey scale accessed by subsequent drawing opcodes.

6.5.1.3 *Control (status)*

This control opcode provides extension to a field of sub-commands.

6.5.1.4 *Control (reserved)*

This control opcode is reserved for future control commands.

6.5.1.5 *Control (private)*

This control opcode is reserved for use by terminal manufacturers to implement proprietary non-standard functions.

6.5.2 *Attributes*

6.5.2.1 A number of drawing attributes may be applied to the drawing commands. Attributes are defined by appropriate coded sequences as described below. Once an attribute is defined, it remains valid until the attribute is redefined.

6.5.2.2 In the implementation of attributes, the level of sophistication and complexity are left to the discretion of the implementer.

6.5.2.3 For the different drawing attributes and their feature levels see Recommendation F.300 [2].

6.5.3 *Control (value)*

6.5.3.1 This opcode specifies the colour attribute or grey scale value of the drawings (or text) that follow. Whether the *control (value)* opcode and its associated data bytes contain colour or grey scale information, is predetermined by the *tonal* status sub-command (see § 6.5.4). The number of data bytes is variable and the sequence is terminated on the appearance of another opcode. Less significant bits for colour or grey scale information are truncated where they are not used. The bit assignments of the data bytes are shown in Figure 14/S.100 (only the 6-bit data portion of the 8-bit byte is shown).

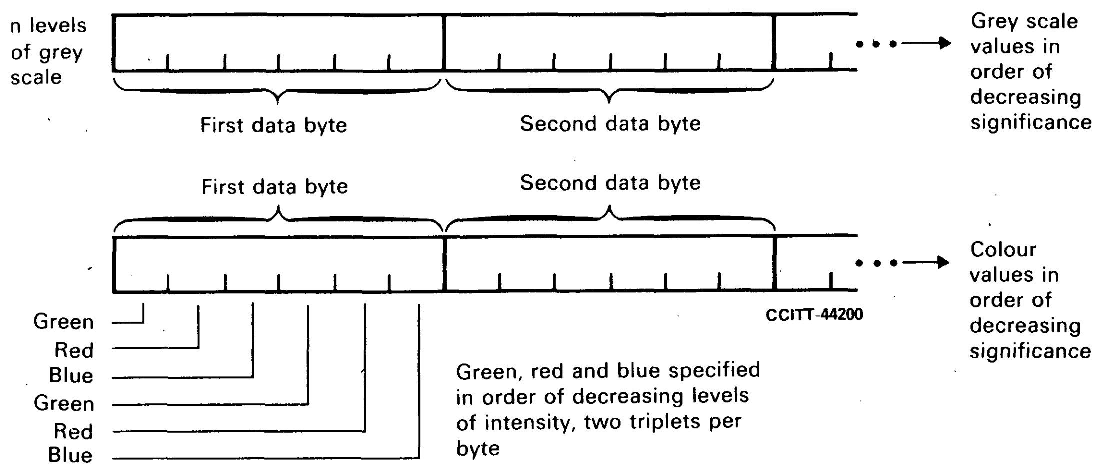


FIGURE 14/S.100

Bit assignments for grey scale or colour attributes

6.5.4 *Control (status) and status sub-commands*

6.5.4.1 The *control (status)* opcode accesses a field of *status sub-commands* (columns 4, 5, 6 and 7) which define in detail all the modes of drawing operation or attributes. The sequence is always *control (status)* followed by a *status sub-command*, which in turn may or may not be further followed by parameter data bytes. Figure 15/S.100 gives the codings of the *status sub-commands*. Detailed definitions of the *status sub-commands* are given below.

6.5.4.2 (4/0) *Clear-to-black*

This sub-command clears the entire display to black.

6.5.4.3 (4/1) *Clear-to-transparent*

This sub-command clears the entire display of the screen to transparent. By transparent is meant that conventional television pictures can be mixed with Videotex images or text.

6.5.4.4 (4/2) *Clear-to-black and initialize*

This sub-command clears the entire display to black and resets the terminal to the default mode.

6.5.4.5 (4/3) *Clear-to-current colour*

This sub-command clears the entire display to the colour currently specified by the *control (value)* opcode sequence.

				b7	0	0	0	0	1	1	1	1
				b6	0	0	1	1	0	0	1	1
				b5	0	1	0	1	0	1	0	1
b4	b3	b2	b1		0	1	2	3	4	5	6	7
0	0	0	0	0					Clear (to black)	Line (solid)	Text format	
0	0	0	1	1					Clear (to trans- parent)	Line (dotted)		
0	0	1	0	2					Clear (to black and initialize)	Line (dashed)		
0	0	1	1	3					Clear (to current colour)	Line (dot- dashed)		
0	1	0	0	4					Domain (3 bytes)	Fill		
0	1	0	1	5					Domain (4 bytes)			
0	1	1	0	6					Domain (5 bytes)	Fill (black highlight)		
0	1	1	1	7					Domain (6 bytes)			
1	0	0	0	8					Drawing (blink- off)			
1	0	0	1	9								
1	0	1	0	10					Drawing (blink- on)			
1	0	1	1	11								
1	1	0	0	12					Tonal control (colour)	Wait (timed)		
1	1	0	1	13				Control status	Tonal control (grey)	Wait (indef- inite)		
1	1	1	0	14								
1	1	1	1	15								

CCITT-44210

FIGURE 15/S.100

Control (status) and Status sub-commands assignment

6.5.4.6 (4/4) *Domain (3 bytes)*

The block of numerical data that follows an opcode contains 3 bytes. This is also the default condition.

6.5.4.7 (4/5) *Domain (4 bytes)*

The block of numerical data that follows an opcode contains 4 bytes.

6.5.4.8 (4/6) *Domain (5 bytes)*

The block of numerical data that follows an opcode contains 5 bytes.

6.5.4.9 (4/7) *Domain (6 bytes)*

The block of numerical data that follows an opcode contains 6 bytes.

6.5.4.10 (4/8) *Drawing (blink-off)*

Terminates the drawing (blink-on) status sub-command.

6.5.4.11 (4/9) *Reserved*

6.5.4.12 (4/10) *Drawing (Blink-on) (or flashing)*

This sub-command causes the drawing (or text) that follows to flash in a repetitive manner for the purpose of drawing attention. In general, an object of any colour or grey scale may be blinked, but in some implementations, blinking may be restricted.

6.5.4.13 (4/11) *Reserved*

6.5.4.14 (4/12) *Tonal (colour)*

This sub-command designates that the *Control (value)* sequence carries colour information (see § 6.5.3).

6.5.4.15 (4/13) *Tonal (grey scale)*

This sub-command designates that the *Control (value)* sequence carries grey scale information (see § 6.5.3).

6.5.4.16 (4/14) *Reserved*

6.5.4.17 (4/15) *Reserved*

6.5.4.18 (5/0) *Line (solid)* (See Note)

This sub-command indicates that the drawing lines will be solid. This is also the default condition.

6.5.4.19 (5/1) *Line (dotted)* (See Note)

This sub-command indicates that the drawing lines will be dotted in texture.

6.5.4.20 (5/2) *Line (dashed)* (See Note)

This sub-command indicates that the drawing lines will be dashed in texture.

6.5.4.21 (5/3) *Line (dot-dashed)* (See Note)

This sub-command indicates that the drawing lines will be dot-dashed in texture.

Note – The line texture pattern is referenced to the absolute coordinate grid of the display screen so that the texture pattern aligns between drawing commands.

6.5.4.22 (5/4) *Fill*

This sub-command fills the enclosed area drawn in the colour specified by the current *Control (value)* sequence.

6.5.4.23 (5/5) *Reserved*

6.5.4.24 (5/6) *Fill (border highlight black)*

This sub-command fills enclosed area drawn as § 6.5.4.22 above and the circumscribing border is highlighted in black.

6.5.4.25 (5/7) *Reserved*

6.5.4.26 (5/8) *Reserved*

6.5.4.27 (5/9) *Reserved*

6.5.4.28 (5/10) *Reserved*

6.5.4.29 (5/11) *Reserved*

6.5.4.30 (5/12) *Wait (timed)*

This sub-command causes a delay of a specific time in processing and display. The length of wait is specified in tenths of a second, either by one associated parameter byte (6 bits for up to 6.3 seconds) or two parameter bytes (12 bits for up to 6.8 minutes).

6.5.4.31 (5/13) *Wait (indefinite)*

This sub-command causes an indefinite wait. This may be achieved by the terminal responding with a *Pause flow* control character (DC3 in C0 set) towards the computer. The wait is then terminated when the terminal sends a *Resume data flow* character (DC1 in C0 set).

6.5.4.32 (5/14) *Reserved*

6.5.4.33 (5/15) *Reserved*

6.5.4.34 (6/0) *Text format*

This sub-command has an associated data byte, which defines the text formats as follows:

Bit b6 = 0: Free format, i.e., character strings are wrapped around on the right margin.

Bit b6 = 1: Annotation format, i.e., character strings are in fixed positions on the screen.

Bit b5 = 0: In free format, character strings are broken on a character boundary.

Bit b5 = 1: In free format, character strings are broken on a word boundary.

b4, b3: Defines character rotation as shown in Figure 16/S.100. Rotated strings of characters proceed in the direction of rotation. However, all other format controls on characters such as APB, APF, APD, APU and APR have their (unrotated) orientation meanings.

b2, b1 = 0,0: Vertical spacing = 1.0
b2, b1 = 0,1: Vertical spacing = 1.5
b2, b1 = 1,0: Vertical spacing = 2.0
b2, b1 = 1,1: Vertical spacing = 2.5

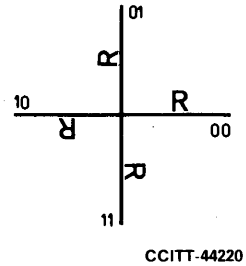


FIGURE 16/S.100
Character rotation

6.6 *Default conditions*

6.6.1 The default conditions of the attributes for the alphageometric coding scheme are summarized below:

			Reference
1)	Control (value):	White	§ 6.5.3
2)	Tonal control:	Tonal (colour)	§ 6.5.4.14
3)	Domain:	3 bytes (9 bits)	§ 6.5.4.6
4)	Drawing:	Blink-off	§ 6.5.4.10
5)	Line control:	Solid line	§ 6.5.4.18
6)	Fill:	Solid fill (no highlight)	§ 6.5.4.22
7)	Text format:	a) Free format b) Break on character boundary c) No rotation d) Vertical spacing = 1.0	§ 6.5.4.34 with bits 1 to 6 set to "0"

7 Alpha-dynamically redefinable character sets (DRCS) option

7.1 *General*

7.1.1 A DRCS is a set of characters whose shapes are sent from the data-base and down-loaded via the line. It may be used to represent alphabetic characters, special symbols, or picture element symbols for constructing fine graphics. Once loaded, the DRCS are regarded as members of a library that can be designated by appropriate ESC sequences as G0, G1, G2, G3 sets. Several schemes for the DRCS option are possible. One scheme is described in § 7 in the context of a general architecture. When used in its alphanumeric mode DRCS may be employed as a part of the alphabetic representations of any other Videotex option and in that case the attributes associated with that option are to be used.

7.2 *General architecture for down-loading DRCS*

7.2.1 *Initiation*

The down-loading process is initiated by a designation and invocation sequence. This sequence is followed by one or more of the following functions.

7.2.2 *Identification of character set (ICS)*

This function must immediately follow the initiating sequence. It identifies the *escape* sequence used for the designation of the character set.

7.2.3 *Select coding method (SCM)*

This function defines the type of coding used to describe the DRCS character.

7.2.4 *Select dot composition (SDC)*

This function defines the number of bits horizontally and vertically in a character matrix, the number of bits per pixel, the number of grey scale levels and the number of colours accessible within a character position.

7.2.5 *Pattern transfer (PT)*

This is the active part of the down-loading process. It defines the code location of the first character and provides instructions and data to draw characters. It may also incorporate an error checking procedure.

7.2.6 *Down-loading termination procedure (DLT)*

The down-loading process is terminated by a specific procedure, which may include acknowledgement.

7.3 *A possible coding scheme for the DRCS option*

7.3.1 *Initiating sequence*

The initiating sequence is ESC F_s followed by x bytes indicating the length of the loading data block, where x is for further study.

7.3.2 *Termination procedure*

The down-loading process is terminated by means of counting the length of the loading data block. See § 7.3.1.

7.3.3 *Designation and invocation of loaded DRCS*

7.3.3.1 Once loaded into the terminal, the DRCS is placed into a library. This library is used in the context of ISO 2022 [1] in the 7-bit environment as implemented in earlier sections. Before invoking the designated DRCS, it is required to designate a C1 set to be associated with it. For the scheme described herein any of the C1 sets (to be registered) that are defined in §§ 2.2 and 2.3 may be used.

7.3.3.2 The designation sequence will be of the form ESC I_1, 2/0, ($I_3 \ldots I_n$) F. I_1 will be 2/8, 2/9, ... or 2/15. $I_3 \ldots I_n$ are optional and if present together with F will identify the set. Means for associating the designating sequence with the process of defining the character shapes will be for further study.

8 **Alphaphotographic option**

8.1 The alphaphotographic option is used to render an image by the transmission and display of individual picture elements.

8.2 This option may include both continuous-tone images such as pictures of faces, etc., as well as pattern-oriented techniques for the display of pictures, including graphics, Latin and non-Latin characters for text, etc. The system features and attributes include colour and monochrome.

8.3 The detailed system proposals are for further study.

9 **Service enhancements**

9.1 *Introduction*

9.1.1 Many Administrations are offering or considering the introduction of a Videotex service, and it is recognized that this Recommendation may influence some of their decisions. While the other sections of this Recommendation contain details of those aspects of an international Videotex service that could be agreed upon, this § 9 identifies certain potential enhancements (features or attributes) that some Administrations believe need to be considered in future developments.

9.1.2 It is recognized that some of these potential enhancements may only exist on national Videotex services, while others may have international application. However, an enhancement that begins on a national service only could become international in the future. Therefore, it is considered desirable to have international coordination of future enhancements.

9.2 *General*

9.2.1 The growth of international Videotex services during the years following the publication of this Recommendation will be greatly affected by the specific specifications contained in the other parts of this Recommendation. However, some Administrations believe that experiments with and/or implementation of certain enhancements will allow the development of an international service that provides a range of capabilities that will maximize the desirability and utilization of Videotex service.

9.2.2 Some of the potential enhancements to Videotex service, national or international, are presented in the following. This is for the purpose of identifying to interested Administrations those enhancements that warrant serious consideration in the view of the CCITT, but which presently lack enough details to obtain the full agreement of all Administrations.

9.2.3 The enhancements have been grouped into three categories in order to assist the reader in understanding the application of each individual enhancement (which may be referred to by some Administrations as attributes or features or some other descriptive phrase) and to prompt an orderly investigation of them:

a) display-related enhancements;
b) transmission-oriented enhancements;
c) system level enhancements.

9.3 *Display related enhancements*

9.3.1 Most of the currently planned and/or offered services utilize images created with only eight colours, which are formed by the various combinations (on or off) of three primary colours – red, green and blue. Limiting Videotex to eight colours is an unnecessary restriction, since the electronic emission devices controlling the red, green and blue colours can be caused to have more than just the two states of on or off. For example, with just eight different states or levels, a potential of 512 colours exist. Additionally, for those services that use a matrix-oriented screen (e.g. a mosaic graphic mode) different colours could be identified for foreground symbols to those for background areas.

9.3.2 The ability to simulate motion (i.e. animation) is a potential enhancement that can be achieved by several means. These include:

a) alternating between slightly different display frames stored in the terminal;

b) dynamically altering the colour of portions of the display image, making them appear or disappear by redefining the colour table (an image disappears when its colour is set to the same colour as the surrounding area);

c) execution of a resident program to redefine the image at a controlled rate.

9.3.3 The flashing of symbols or areas of the display has typically been limited to changing the foreground symbol (in the case of a matrix-oriented screen) to the background colour, momentarily, or some other single-state change. An enhanced flashing capability could allow for different rates of change and for various conditions associated with each change (e.g. colour X to colour Y, rather than foreground colour to background colour or foreground colour to black).

9.3.4 Different pictorial (text and graphic) symbols may be developed that extend the repertoire of a Videotex service. This may be a fixed extension defined in the terminal memory, or can be a modification to the existing memory by downloading from the data base. The range of extended symbols includes different fonts of existing symbols, smoothed mosaic graphics, or other unique symbols.

9.4 *Transmission oriented enhancements*

9.4.1 The exchange of information directly between terminals, without communicating with a Videotex service may be permitted by some Administrations as an enhanced capability, and could be of value to the users of Videotex terminals. Such a capability would require the existence of control functions that might not otherwise be available in some terminals that utilize certain existing or planned national Videotex services, but this should not cause any incompatibilities with such services.

9.4.2 The optimization of the coded character stream for maximum data rate is a valuable enhancement. This might be accomplished by utilizing an 8-bit per word coding format rather than the 7-bit per word format currently planned by most Administrations, coupled with a related decision on the line or link level protocol selected. The selection of an 8-bit per word format could permit a more efficient transmission of data.

In addition, such techniques as run-length-encoding might be specified in the Recommendation to reduce the transmission of unnecessary or redundant data. The choice of higher speed modems/circuits is also considered by some Administrations as a way to optimize the transfer of data within or between Videotex services.

9.4.3 For some applications of a Videotex service, sophisticated error detection and correction schemes may be required and should be considered with other transmission-oriented enhancements on future Videotex services.

9.5 *System level enhancements*

9.5.1 An enhancement seriously considered by some Administrations is the provision of a Videotex service that provides visual information, augmented by audio information. This capability could permit access by a terminal to visual-only information in a data base, and to visual/audio information in the same or other data base. The audio information might be associated with the visual information, or treated separately, or even alternately depending upon the implementation. The audio information might be analogue or digitally encoded or handled as a composite signal.

9.5.2 The provisioning of peripheral input/output devices associated with the Videotex terminal is an important enhancement for future services. These could include magnetic storage devices for recording visual/audio information as received by the terminal, or recorded locally by the terminal for subsequent transmission to a data base or other terminal. Various hard copy printing devices could also be provided, with their design based upon the specific visual capabilities of the terminal, e.g. degree of resolution and colour of the image on the display screen.

10 Line and end-to-end protocols

10.1 The purpose of § 10 is to describe the protocols needed for international Videotex transactions. § 10 contains an introduction only. Detailed consideration is left for further study.

10.2 The transfer of information from a data base of one service to a user of another service may be split up into two parts:

a) the information transfer from one service to another;

b) the information transfer from the service to the user.

10.3 *Line protocols*

10.3.1 *Line protocols between services*

10.3.1.1 The international line between national data base computers must be able to transmit transparent coding schemes identified in this Recommendation and accept the protocols of § 10.4.

10.3.2 *Line protocols between service and user*

10.3.2.1 The following protocol functions should be studied:

PF1: Start of coded data starts a sequence of data to be understood as textual information (could be coded as STX).

PF2: Start of prefix causes the following bytes to be understood as a prefix containing framing information including codes for error check and/or correction (could be coded as SOH).

PF3: End of coded data ends a sequence of data to be understood as textual information (could be coded as ETX).

PF4: End of frame. Ends a frame of data and requests for reverse transmission and give an answer (could be coded as ETB).

PF5: Answer given in case of error free reception or when error correction is possible (could be coded as ACK).

PF6: Answer given in case of errors when no error correction is possible (could be coded as NAK).

10.3.2.2 It is noted that TC1 to TC10 (SOH to ETB of Recommendation V.3 [3]) are intended to control the transmission of information over transmission networks. The use of these functions may therefore not be used as part of the information stream from one service to another.

10.3.2.3 The use of protocol functions is for further study.

10.4 *Protocols for communication between services on the application level*

10.4.1 *General*

10.4.1.1 International exchange of information between national Videotex services may be sent in blocks, here called messages. For efficient use of networks and communication equipment it is important to design the messages to minimize the capacity needed for applications that are frequently used in Videotex services.

10.4.2 *Types of message elements*

10.4.2.1 A complete message is composed of message elements. Each element contains an element identifier, a data field and an indication of element length (explicit or implicit).

10.4.2.2 *Transmit a standardized function*

Codes for functions may be different from the character sequences, sent by the user.

10.4.2.3 *Transmit a service message*

A service message is a frame that is transmitted to the subscriber, without erasing the screen, moving the active position of the cursor, or changing the contents of the previous display.

10.4.2.4 *Transmit a service message code*

The proper service message is generated by the receiving system and transmitted to the subscriber.

10.4.2.5 *Transmit a frame*

Billing and other additional information is to be transmitted together with the frame.

10.4.2.6 *Transmit data block*

By data is meant all types of data that are not listed under separate items, e.g. software. It is necessary to transmit block length when transmitting transparent data.

10.4.2.7 *Transmit field description*

A field description is a list of positions on the screen, where an application program expects additional information to be filled in, either by the user or by the application program itself. It includes also format and type of information, which allows simple syntax control in the host computer.

Three formats are recognized; strings, which means any combination of graphical characters including space, integers (0-9), and free format.

A field may be of input and/or output type. An input field is a field where the information is user originated. An output field is a field in which the information is filled in by the application program.

10.4.2.8 *Transmit a user message to an application*

A user message is the data that is filled in by the user according to a field description. It is sent to the external computer. The transmission is initiated either by a send-function if it is available, or when all input fields are filled. The use of a delimiter causes the rest of the field to be filled with spaces. If a delimiter is used in the first position of a combined input and output field, the contents remain unchanged.

10.4.2.9 *Transmit an application message*

An application message is a block of data to be filled into the output fields, defined by a field description. It may be sent either in the same message as the field description or after.

10.4.2.10 *Request information on terminal capability*

(For further study.)

10.4.2.11 *Transmit information on terminal capability*

(For further study.)

10.4.2.12 *Error condition element*

The detection of contradicting information in a system will result in an error condition message to the other system, e.g. data with a format different to the corresponding field description. The entire message causing the error will be ignored, and it is the responsibility of its transmitting system to handle the error properly.

10.5 *User to data base protocol*

10.5.1 In order to use Videotex service, a user must be able to generate a set of functions, which enables him to access and use different applications. A set of user functions is listed in Recommendation F.300 [2].

10.5.2 The minimum set of characters to code these functions contains the digits 0-9 and two other symbols. For some applications however the generation of alphanumeric as well as pictorial and attribute information and other control characters may be needed.

10.5.3 Although it is desirable that all Videotex services employ the same keying sequences and visual identifiers for these functions, there are historical reasons why there will be different manners of coding the same user functions.

10.5.4 Accessing the national service of another country using an international connection between services is possible if the user obeys the function coding rules of the service of the other country. It is, however, possible that the local data bank may be able to translate the local keying sequence into the appropriate command in a national service level (§ 10.4.2.4). This subject is left for further study.

11 Interworking with other services

11.1 *Telex-Videotex*

11.1.1 Telex is a message transfer service and therefore interworking between telex and Videotex should be limited to the exchange of alphanumeric text between terminal equipments.

11.1.2 Only the graphic characters of the Videotex graphic character repertoire corresponding to International Telegraph Alphabet No. 2 should be used to compose messages.

11.1.3 The message format will be limited by the Videotex page format.

11.1.4 Telex can only display alphanumeric information without the capability of displaying the other attributes of Videotex.

11.2 *Teletex-Videotex*

11.2.1 *Graphic character repertoire*

11.2.1.1 The Teletex and Videotex graphic repertoires are largely identical. The following fallback representations of Videotex characters (Table 2/S.100) may be transcoded at a Videotex-Teletex interworking facility.

TABLE 2/S.100

Identifier	Videotex character	Fallback representation	
SM 30	←	<	SA03
SM 31	→	>	SA05
SM 32	↑	¡	SP03
SM 33	↓	!	SP02
SP 19	‘	'	SP05
SP 20	’	'	SP05
SP 21	“	''	SP04
SP 22	”	''	SP04
SM 12	—	–	SP 10
MG 01 to MG 63	Block graphics	/	SP 12

11.2.1.2 For Teletex terminals having the ability to present the Videotex character repertoire in its entirety the need for this transcoding disappears. Therefore on initial call establishment a determination of the terminal display/printing capabilities must be made by handshaking.

11.2.2 *Control functions*

11.2.2.1 Transcoding of the Videotex attribute control functions is for further study.

11.2.3 *Format*

11.2.3.1 Interworking between Videotex and Teletex will be limited to the Videotex display frame format.

11.3 *Videotex-facsimile*

(For further study.)

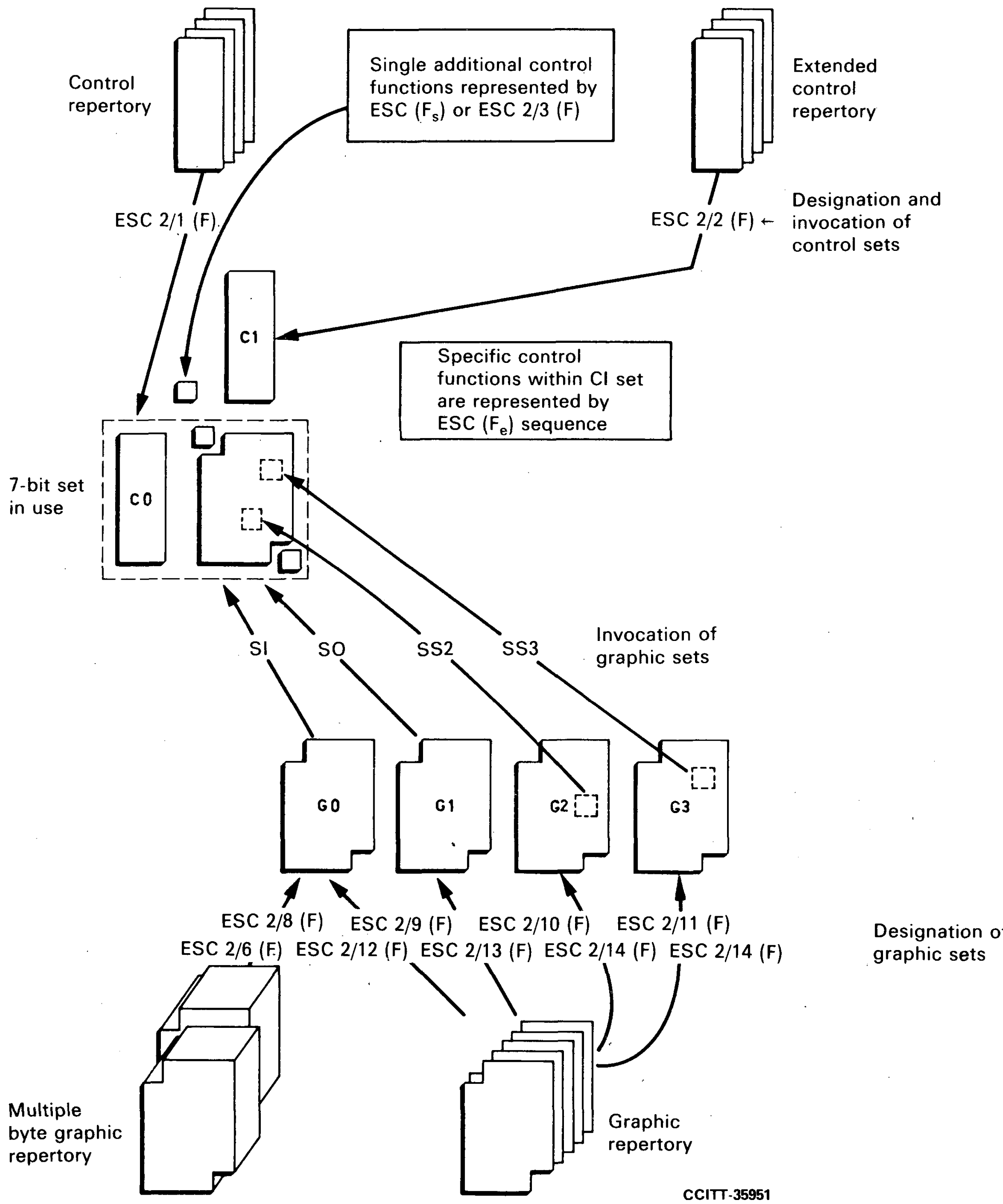
11.4 *Videotex-Teletex*

(For further study.)

ANNEX A

(to Recommendation S.100)

Part of the code extension scheme of ISO 2022 [1]



ANNEX B

(to Recommendation S.100)

Repertoire of graphic characters

B.1 *General*

B.1.1 This annex defines the basic graphic repertoire of the International Videotex Service. This repertoire consists of the total range of non-pictorial symbols, which may be communicated between Videotex services and terminals by means of coded character sets for Latin-alphabet based languages.

B.1.2 The repertoire of graphic characters defined in this part of the Recommendation consists of:

a) Latin alphabetic characters, listed in § B.2, which comprise:
   - the 52 small and capital letters of the basic Latin alphabet,
   - combinations of basic Latin letters and diacritical marks,
   - special alphabetic characters, which are neither basic Latin letters nor combinations of basic Latin letters and diacritical marks,

b) non-alphabetic characters, listed in § B.3, which comprise decimal digits, currency signs, punctuation marks, arithmetic signs and miscellaneous symbols that have individual special meanings.

B.1.3 A diacritical mark has no meaning as an individual character but is used only in combination with a basic Latin letter to form an accented letter or an umlaut.

B.1.4 The repertoire of graphic characters defined in this part of the Recommendation contains a limited set of accented letters and umlauts.

B.2 *Latin alphabetic characters*

B.2.1 The repertoire of Latin alphabetic characters is identical to that specified in § 3.2.2 of Recommendation S.61 (for the Teletex basic repertoire of graphic characters).

B.3 *Non-alphabetic characters*

B.3.1 Decimal digits (0 to 9), currency signs, arithmetic signs, subscripts and superscripts and fractions are as specified in §§ 3.2.3.1, 3.2.3.2, 3.2.3.4, 3.2.3.5 and 3.2.3.6 of Recommendation S.61.

B.3.2 Punctuation marks are as specified in § 3.2.3.3 of Recommendation S.61, with the exclusion of SP09 (low line) and the addition of SP19 to SP22, which are as shown in Table B-1/S.100.

B.3.3 Miscellaneous symbols are as shown in Table B-2/S.100.

B.3.4 The lists in Tables B-1/S.100 and B-2/S.100 are composed as described in the following.

The first column contains the identifier of each character, assigned in accordance with the identification system explained in Annex C of Recommendation S.61.

The second column presents the graphical representation of the character.

The third column specifies the name or the description of the character.

TABLE B-1/S.100

Punctuation marks

Identifier	Graphic	Name or description
SP19	‘	Single quotation mark left
SP20	’	Single quotation mark right
SP21	“	Double quotation mark left
SP22	”	Double quotation mark right

Note – In Videotex (and Teletex), *quotation mark, apostrophe* and *comma* are independent characters that cannot have the meaning of diacritical marks.

TABLE B-2/S.100

Miscellaneous symbols

Identifier	Graphic	Name or description
SM01	#	Number sign
SM02	%	Percent sign
SM03	&	Ampersand
SM04	*	Asterisk
SM05	@	Commercial at
SM12	—	Horizontal bar
SM13	|	Vertical line
SM17	µ	Micro sign
SM18	Ω	Ohm sign
SM19	°	Degree sign
SM20	º	Ordinal indicator, masculine
SM21	ª	Ordinal indicator, feminine
SM24	§	Section sign
SM25	¶	Paragraph sign, pilcrow
SM26	·	Middle dot
SM30	←	Leftward arrow
SM31	→	Rightward arrow
SM32	↑	Upward arrow
SM33	↓	Downward arrow

References

[1] *Code extension techniques for use with the ISO-7 bit coded character set*, ISO Standard 2022-1973.

[2] CCITT Recommendation *Videotex service*, Vol. II, Fascicle II.4, Rec. F.300.

[3] CCITT Recommendation *International Alphabet No. 5*, Vol. VIII, Fascicle VIII.1, Rec. V.3.

[4] *Coded character set for text communication*, ISO Standard 6937.

PAGE INTENTIONALLY LEFT BLANK

PAGE LAISSEE EN BLANC INTENTIONNELLEMENT

PART II

Series T Recommendations

TERMINAL EQUIPMENT AND TRANSMISSION FOR FACSIMILE SERVICES

PAGE INTENTIONALLY LEFT BLANK

PAGE LAISSEE EN BLANC INTENTIONNELLEMENT

Recommendation T.0

CLASSIFICATION OF FACSIMILE APPARATUS FOR DOCUMENT TRANSMISSION OVER THE PUBLIC NETWORKS

(Geneva, 1976; amended at Geneva, 1980)

1 For document facsimile transmission by international communications carried on the public networks there is a need for providing sufficient operating speeds to meet users' requirements.

2 Users' requirements may best be served at the present time by classifying the following four basic categories of document facsimile apparatus.

2.1 *Apparatus for use over the public telephone network*

Group 1 (See Note 1)

Apparatus which uses double sideband modulation without any special measures to compress the bandwidth of the transmitted signal and which is suitable for the transmission of documents of ISO A4 size at nominally 4 lines per mm in about six minutes via a telephone-type circuit.

Apparatus in this group may be designed to operate at a lower definition suitable for the transmission of documents of ISO A4 size in a time between three and six minutes.

Group 2 (See Note 2)

Apparatus which exploits bandwidth compression techniques in order to achieve a transmission time of about three minutes for the transmission of an ISO A4 size document at nominally 4 lines per mm via a telephone-type circuit. Bandwidth compression in this context includes encoding and/or vestigial sideband working but excludes processing of the document signal to reduce redundancy.

Group 3 (See Note 3)

Apparatus which incorporates means for reducing the redundant information in the document signal prior to the modulation process and which can achieve a transmission time of about 1 minute for a typical typescript document of ISO A4 size via a telephone-type circuit. The apparatus may incorporate bandwidth compression of the line signal.

2.2 *Apparatus for use over the public data networks*

Group 4 (See Note 4)

Apparatus which incorporates means for reducing the redundant information in the document signal prior to transmission mainly via public data networks (PDN). The apparatus will utilize procedures applicable to the PDN and will assure error-free reception of the document. The apparatus may also be used on the public telephone network where an appropriate modulation process will be utilized.

3 The users will choose among these apparatus, in accordance with their needs and the facilities afforded by the connection and the network.

4 Procedures for document facsimile transmission in the public switched telephone network should be in accordance with Recommendation T.30 (see Note 5).

Note 1 – This apparatus has been standardized in Recommendation T.2.

Note 2 – This apparatus has been standardized in Recommendation T.3.

Note 3 – This apparatus has been standardized in Recommendation T.4.

Note 4 – This apparatus is under study in Question 7/VIII [1].

Note 5 – Procedures for Group 4 document facsimile transmission is under study in Question 8/VIII [2].

References

[1] CCITT Question 7/VIII, Contribution COM VIII-No. 1, Study Period 1981-1984, Geneva, 1981.

[2] CCITT Question 8/VIII, Contribution COM VIII-No. 1, Study Period 1981-1984, Geneva, 1981.

Recommendation T.1

STANDARDIZATION OF PHOTOTELEGRAPH APPARATUS

(former CCIT Recommendation D.1; amended at New Delhi, 1960, Geneva, 1964, and Mar del Plata, 1968)

The CCITT,

considering

that the transmission of pictures is possible only if certain characteristics of the transmitting and receiving equipments are identical,

unanimously declares the view

that phototelegraph apparatus and the associated modulating and demodulating equipment should be constructed and employed according to the following standards:

1 Scanning track

At the transmitting apparatus the message area should be scanned in a "negative" direction. The orientation of the document in relation to the scanning plane will depend upon its dimensions and is of no consequence.

At the receiving apparatus scanning takes place in a "negative" direction for "positive" reception and in a "positive" direction for "negative" reception.

2 Index of cooperation

The normal index is 352 (corresponds to a factor of cooperation of 1105).

The preferred alternative index, for use when less dense scanning is required, or when the characteristics of circuits (and particularly combined radio and metallic circuits) so demand, is 264 (a factor of cooperation of 829). The admissible tolerances on the above-mentioned values are ± 1%.

3 Dimensions of apparatus

3.1 *Apparatus with drum scanning*

The most currently used drum diameters are 66, 70 and 88 mm.

The drum factor of the sending apparatus shall not be more than 2.4.

The drum factor of the receiving apparatus shall not be less than 2.4.

The width of the picture-retaining device (dead sector) may not exceed 15 mm. An allowance of 3% of the total length of a scanning line is also made for phasing. Thus, since the total circumference of a drum of the diameter of 66 mm is about 207 mm, the usable circumference will be at least 186 mm.

3.2 *Apparatus with flat-bed scanning*

The total lengths of the most current scanning lines are 207, 220 and 276 mm of which 15 mm are not used for effective transmission, because of the possibility that the receiving station may use a drum apparatus.

Before transmitting a picture to a receiving station using a drum apparatus, it is necessary to ensure that the value of ratio:

$$\frac{\text{Length of document to be transmitted}^{1)}}{\text{total length of a scanning line}} \times \pi$$

is less or at most equal to the drum factor of the receiver used.

3.3 Table 1/T.1 gives corresponding values of index of cooperation *M*, factor of cooperation *C*, drum diameter *D*, total length of scanning line *L*, scanning pitch *P* and scanning density *F* for apparatus in most common use.

TABLE 1/T.1

M	*C*	*D* (mm)	*L* (mm)	*P* (mm)	*F* (lines/mm)
264	829	66	207	1/4	4
264	829	70	220	1/3.77	3.77
264	829	88	276	1/3	3
350	1099	70	220	1/5	5
352	1105	66	207	3/16	16/3
352	1105	88	276	1/4	4

Note – The maximum dimensions of the pictures to be transmitted result from the parameters given in the table.

4 Reproduction ratio

In the case where apparatus working with different lengths of scanning line (but with the same index of cooperation) are interconnected, there will be a slight change in size and the reproduction will bear the same proportion as the original, the ratio being that of the total lengths of the scanning lines.

5 Drum rotation speed – scanning line frequency

5.1 Table 2/T.1 gives the normal and approved alternative combinations of drum rotation speeds or of scanning line frequencies and indices of cooperation.

TABLE 2/T.1

	Drum rotation speed in rpm or scanning line frequency	Index of cooperation	
		Metallic circuits	Combined metallic and radio circuits
Normal conditions	60 90	352	352 264
Alternatives for use when the phototelegraph apparatus and metallic circuits are suitable	90 120 150	264 and 352 264 and 352 264	

Note 1 – In the case of transmitters operating on metallic circuits, the index 264 is not intended to be used with an 88-mm drum. In the case of transmitters operating on combined metallic and radio circuits, the index 264 associated with a drum diameter of 88 mm is intended to be used only exceptionally.

Note 2 – The provisions given in the table are not intended to require the imposition of such standards on users who use their own equipment for the transmission of pictures over leased circuits. However, the characteristics of the apparatus used should be compatible with the characteristics of the circuits used.

1) Measured in the direction perpendicular to the scanning line.

5.2 The speed of transmitters must be maintained as nearly as possible to the nominal speed and in any case within ± 10 parts in 10^6 of the nominal speed. The speed of receivers must be adjustable and the range of adjustment should be at least ± 30 parts in 10^6 from the nominal speed. After regulation, the speeds of the transmitting and receiving sets should not differ by more than 10 parts in 10^6.

6 Judder

The stability of the speed during one rotation should be such that the maximum shift of the drum surface from the average position should not exceed one quarter of the scanning pitch P at normal index 352, which means that the maximum angle of the oscillations should not exceed 0.08 degree measured from the average position.

7 Synchronization

When phototelegraph stations have available a standard of frequency which is better than ± 5 parts in 10^6, verification of the synchronism between the two stations may be dispensed with. In view of the saving of time, this method should be adopted wherever possible.

To compare the speeds of a transmitter and a receiver, an alternating current whose frequency bears an unvarying relationship to the transmitter speed and has a nominal value of 1020 Hz is used.

Where there is the possibility that the transmitter and receiver may be connected by a circuit liable to introduce frequency drifts, for example, by a carrier telephone circuit, the use of the simple 1020-Hz synchronizing tone is unsatisfactory. The preferred method of overcoming this difficulty is to transmit the phototelegraph carrier (of about 1900 Hz) modulated by the 1020-Hz synchronizing tone.

At the receiving end, the 1020-Hz synchronizing frequency is restored by detection and can then be used in the normal manner.

8 Phasing

Phasing is performed after the speeds of the transmitter and receiver drums have been equalized.

For phasing purposes, the transmitter sends a series of alternating white and black signals in such a way that the black lasts 95% and the white 5% of the total scanning line period (admissible tolerance: ± 0.5% of the total duration of a scanning line). The apparatus must be so adjusted that the pulses corresponding to the signal for white are transmitted:

- during scanning of the "dead sector", when drum apparatus is used,
- during "lost time", when flat-bed apparatus is used,

and that they are placed at the middle of the dead sector (or of the interval corresponding to the lost time).

(Tolerance admitted in the position of the "white" pulses: $\Delta_E = \pm 1\%$ of a "total scanning line length".)

At the receiving station, phasing signals are used to start the apparatus so that short white pulses occur in the middle of the "lost time" (tolerance admitted: $\Delta_R = \pm 2\%$ of a "total scanning line length").

Note – These tolerances allow for the fact that the restitution of the original may deviate from its nominal position by 3% of a "total scanning line length", when the sending and receiving stations are operating with the maximum authorized drift in the same direction.

9 Contrast

The transmitter must transmit the original document without changing the contrast of the tone scales of the picture to be transmitted.

10 Modulation and demodulation equipment

10.1 *Amplitude modulation*

Phototelegraph equipment shall normally provide for transmission and reception of an amplitude-modulated audio-frequency carrier, which is the normal mode of transmission for international metallic circuits.

The level of the output signal of the transmitter shall be greatest for white and least for black. It is desirable that the ratio of nominal white signal to nominal black signal should be approximately 30 decibels.

To simplify multi-destination operation and AM/FM conversion for radio operation it is desirable that the amplitude of the transmitted signal should vary linearly with the photocell voltage and that no corrections for tone scale should be made at the phototelegraph transmitting station.

For audio-frequency telephone circuits, the frequency of the picture carrier-current is fixed at about 1300 Hz. This frequency gives the least delay distortion on lightly loaded underground cables.

In the case of carrier telephone circuits providing a transmission band from 300 to 3400 Hz, a carrier-current frequency of about 1900 Hz is recommended.

10.2 *Frequency modulation*

Preferably phototelegraph apparatus should also provide for transmission and reception of a frequency-modulated audio-frequency carrier for use when necessary:

a) on combined metallic and radio circuits;

b) on wholly metallic circuits.

In such a case, the characteristics of the frequency-modulated output should be:

mean frequency . . . . 1900 Hz
white frequency . . . . 1500 Hz
black frequency . . . . 2300 Hz

The deviation of frequency should vary linearly with photocell voltage or, in the case of conversion from amplitude modulation to frequency modulation, with the amplitude of the amplitude-modulated carrier.

The stability of the transmission must be such that the frequency corresponding to a given tone does not vary by more than 8 Hz in a period of 1 second and by more than16 Hz in a period of 15 minutes.

The receiving apparatus must be capable of operating correctly when the drift of black and white frequencies received does not exceed their nominal value by more than ± 32 Hz.

11 Positive or negative reception

Selection of positive or negative reception should be made by adjustment at the receiver. The adaptation of the transmitted signals to the characteristics of the photographic materials must also be effected at the receiving end according to the type of reproduction, negative or positive.

Recommendation T.2

STANDARDIZATION OF GROUP 1 FACSIMILE APPARATUS FOR DOCUMENT TRANSMISSION

(Mar del Plata, 1968; amended at Geneva, 1972 and 1976)

The CCITT,

considering

(a) that there is a requirement for Group 1 facsimile apparatus which enables an ISO A4 document to be transmitted over a telephone-type circuit in approximately six minutes;

(b) that document facsimile transmission may be requested alternately with telephone conversation or when either or both stations are unattended; in both cases the facsimile operation should conform to Recommendation T.30, *unanimously declares the view*

that Group 1 facsimile apparatus for use on the general switched telephone network and international leased circuits should be designed and operated according to the following standards:

1 Scanning track

The message area should be scanned in the same direction in the transmitter and receiver. Viewing the message area in a vertical plane, the scanning direction should be from left to right, and subsequent scans should be adjacent and below the previous scan.

2 Index of cooperation

The nominal index of cooperation is 264. In cases where a lower vertical resolution is acceptable, and by agreement between the users, an optional index of cooperation of 176 may be used.

These values should be observed with a nominal tolerance of ± 1% for each equipment.

3 Dimensions of apparatus

3.1 The apparatus should accept documents up to a minimum of ISO A4 size (nominally 210 mm × 297 mm).

3.2 The total scanning line length (active sector plus dead sector) should be nominally 215 mm. Nominally 200 mm should be available for scanning or recording, the remainder being the dead sector.

3.3 For any one document the nominal number of scans should be 1144 for an index of cooperation of 264 (762 scans for an index of 176). The receiver should be capable of recording nominally 1144 scans per document for an index of cooperation of 264 (or 762 scans for an index of 176).

3.4 Apparatus with other dimensions may be used provided that the index of cooperation is respected, that the total scanning line length lies between 210 and 250 mm and the usable recording line length retains the same ratio to the total scanning line length.

4 Scanning density

Scanning density is normally 3.85 lines per mm.

5 Scanning line frequency

In the subscriber-to-subscriber service via the general switched telephone network, the scanning line frequency should be 180 lines per minute (see Note).

For leased circuits operation the best line frequency, which may be higher or lower than 180 lines per minute, may be chosen according to the circuit characteristics.

The scanning line frequency during the transmission should be kept within ± 10 parts in 10^6 of the nominal value.

Note – With manual control at the two ends of connection set up over the general switched telephone network, another scanning line frequency (e.g. 240 per minute) may be chosen by agreement between the two operators.

6 Phasing

The duration of the phasing signal for transmitters should be 15 ± 1 seconds.

In a preferred method of phasing (see Note 1), the transmitter sends a series of alternating white and black signals in such a way that the white pulse (phasing pulse) is 4 to 6% of the total scanning line length and the leading edge is 2 to 3% in advance of the middle of the dead sector.

Receiving apparatus should synchronize the middle of its dead sector 0.5 to 4.5% lagging the leading edge of the received phasing pulse (see Note 2).

Note 1 – In a permitted method of phasing for present generation machines, the transmitter sends a series of white and black signals in such a way that the white pulse is 2 to 12% of the total scanning line length and the leading edge is 2 to 3% in advance of the middle of the dead sector.

Note 2 – Maximum reduction of recorded scanning line length due to synchronizing misalignment should not exceed 3% of total scanning line length. Maximum reduction of recorded scanning line length due to the combined effect of deviations of the transmitter and receiver scanning line frequencies should not exceed 4% of total scanning line length. The effect of these reductions of recorded scanning line length may cause it to be less than the nominal 200 mm.

7 Modulation and demodulation equipments

7.1 *Amplitude modulation* (for leased circuits only)

The facsimile signal level is higher for black and lower for white.

The carrier frequency should range between 1300 and 1900 Hz and will depend upon the characteristics of the circuits used.

7.2 *Frequency modulation* (for leased circuits and for switched connections)

The frequency corresponding to black will normally be f_0 + 400 Hz and the frequency corresponding to white will normally be f_0 – 400 Hz (see Note).

For switched connections f_0 = 1700 Hz (provisional). For leased circuits f_0 should range between 1300 and 1900 Hz: the choice of the centre frequency f_0 will depend upon the circuit characteristics. However, if the user, in some cases, wishes to use the apparatus on switched connections, f_0 = 1700 Hz.

The stability of the transmitter must be such that the significant frequencies do not vary by more than 32 Hz from their nominal value in a period of 15 minutes.

Note – Attention is drawn to the fact that there are some equipments currently in operation for which black and white elements are represented in the opposite sense, but the preferred standard for new equipment is as indicated above.

7.3 *Power at the transmitter output*

When amplitude modulation is used, the power of black at the transmitter output must be able to be adjusted between –7 dBm and 0 dBm. The white level must be approximately 15 dB below the black level.

In frequency-modulated systems, the level at the output of the facsimile apparatus must be able to be adjusted between –15 dBm and 0 dBm.

The equipment should be so designed that there is no possibility of this adjustment being tampered with by an operator.

7.4 *Power at the receiver input*

The facsimile receiver must be so designed that it functions correctly when the input power ranges between 0 dBm and –40 dBm, the latter value being considered provisional. In the case of amplitude modulation, this concerns the power of the black signal. No control of receiver sensitivity should be provided for operator use.

STANDARDIZATION OF GROUP 2 FACSIMILE APPARATUS FOR DOCUMENT TRANSMISSION

(Geneva, 1976; amended at Geneva, 1980)

The CCITT,

considering

(a) that Recommendation T.2 refers to Group 1 type apparatus for ISO A4 document transmission in approximately six minutes;

(b) that there is a demand for Group 2 apparatus which enables an ISO A4 document to be transmitted over a telephone-type circuit in approximately three minutes;

(c) that the Group 2 apparatus reproduces document quality similar to Group 1 apparatus;

(d) that such a service may be requested either alternatively with telephone conversation, or when either or both stations are not attended; in both cases, the facsimile operation will follow Recommendation T.30;

(e) interconnection between two machines of different designs, both conforming to Recommendation T.3 as published in the Orange Book [1] may give a lower guaranteed reproducible area in certain cases;

unanimously declares the view

that Group 2 facsimile apparatus for use on the general switched telephone network and international leased circuits shall, in future, be designed and operated in accordance with this Recommendation. Apparatus conforming to Recommendation T.3 of the Orange Book [1] may continue in service.

1 Scanning track

The message area should be scanned in the same direction in the transmitter and receiver. Viewing the message area in a vertical plane, the scanning direction should be from left to right and subsequent scans should be adjacent and below the previous scan.

In order to avoid loss of information, users should insert documents so that the scanning direction is from the wider to the narrower margin.

2 Dimensions of apparatus

The following dimensions are recommended but apparatus with other dimensions may be used provided that the factor of cooperation is respected and that the total scanning line length lies between 215 and 222 mm.

Factor of cooperation (FOC)	829 ± 1%
Total scanning line-length (TLL)	215 mm
Usable scanning line-length (ULL) The end of ULL shall lie between 0 and 1 mm within the nominal position of the right hand edge of an ISO A4 size document.	205 mm minimum
Input document size	Up to a minimum of ISO A4 size (nominally 210 × 297 mm)

The foregoing dimensions give rise to the following approximate secondary dimensions.

Index of cooperation (IOC)	264
Scanning density	3.85 line/mm
Number of scanning lines in a document 297 mm long	1145

3 Scanning line frequency

3.1 The scanning line frequency should be 360 lines per minute.

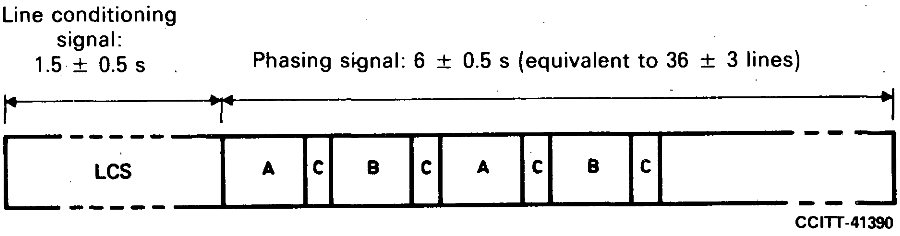
Note – Another scanning line frequency (e.g. 300 lines per minute) may be chosen by agreement between the two stations.

3.2 The scanning line frequency during the transmission should be kept within ± 5 parts in 10^6 of the nominal value.

4 Phasing

For phasing prior to transmission of document information the transmitter sends a signal as shown in Figure 1/T.3. The start of the carrier indicates the end of the lost time. The accuracy of the adjustment at the transmitter of the end of lost time to the start of carrier should be ± 0.5% of TLL. The receiver should phase its reference point with an accuracy of ± 1% of TLL to this start of the carrier. The reference point should be 209 mm before the end of ULL (see Figure 2/T.3).

Note – In the case of the multiple page transmission the phasing procedure may need to be repeated between pages.



LCS Line conditioning signal: 1100 ± 50 Hz. Transmission of this signal is optional
A Carrier in 0° phase for 94-96% of total scanning line length
B As A but may be in 180° phase
C No signal (at least 26 dB below the carrier) for the remaining 6-4% of TLL

FIGURE 1/T.3

Structure of line conditioning and phasing signal

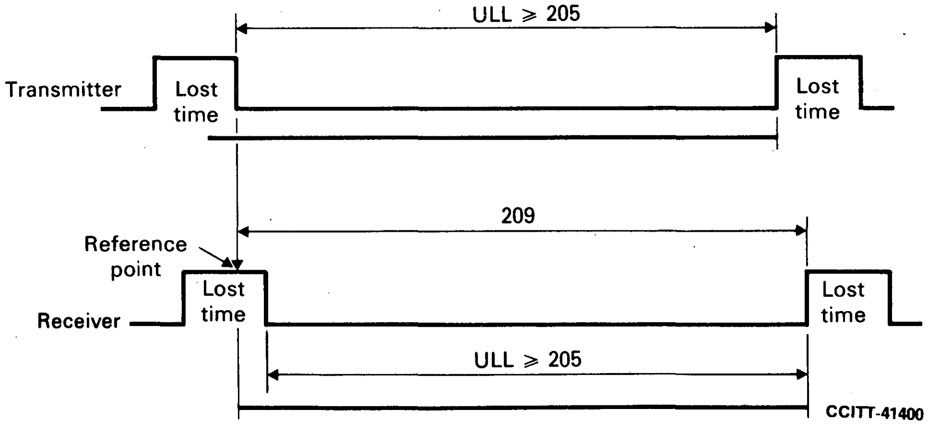


FIGURE 2/T.3

5 Document transmission

5.1 During transmission of document information the transmitter should transmit full amplitude carrier during the lost time for at least 4% of the transmission time for TLL. The phase of the carrier may be reversed at the end of this signal.

Following the lost time the information transmitted to the receiver is the one contained in ULL. The value of ULL is defined in § 2.

The receiver must be able to reproduce at least ULL on the reproduction media after the end of the lost time.

5.2 This signal may be used at the receiver as an amplitude reference independent of the document signal and also to indicate to the receiver that document transmission is still in progress.

6 Paper alignment

All types of apparatus should be designed to ensure that paper is positioned within ± 1.5 mm of nominal in the horizontal direction. In the vertical direction it must be ensured that paper is positioned in such a way that scanning and recording start not more than 4 mm down the document from the top edge.

7 Modulation and demodulation

7.1 Equivalent modulated waveforms with vestigial sideband amplitude modulation – phase modulation characteristics should be used for Group 2 apparatus operated on leased circuits and on the general switched telephone network. The carrier frequency should be 2100 ± 10 Hz (see Note). A white signal should be represented by maximum carrier and a black signal by minimum (at least 26 dB below white) or no carrier. The phase of the carrier representing white may be reversed after each transition through black.

Note – It should be noted that there are equipments in service using, inter alia, a carrier frequency of 2048 Hz.

7.2 The facsimile transmission could contain a limited range of half-tones represented by a carrier amplitude less than that sent during the lost time.

7.3 A vestigial sideband filter symmetrical about the 2100-Hz carrier frequency should be provided at the transmitter. The response of this filter should conform to Figure 3/T.3. The accuracy of this filter is not critical but the relative transmittance at the carrier frequency should be 0.5 with a tolerance of ± 0.05 and the characteristic should be sensibly symmetrical about the carrier frequency.

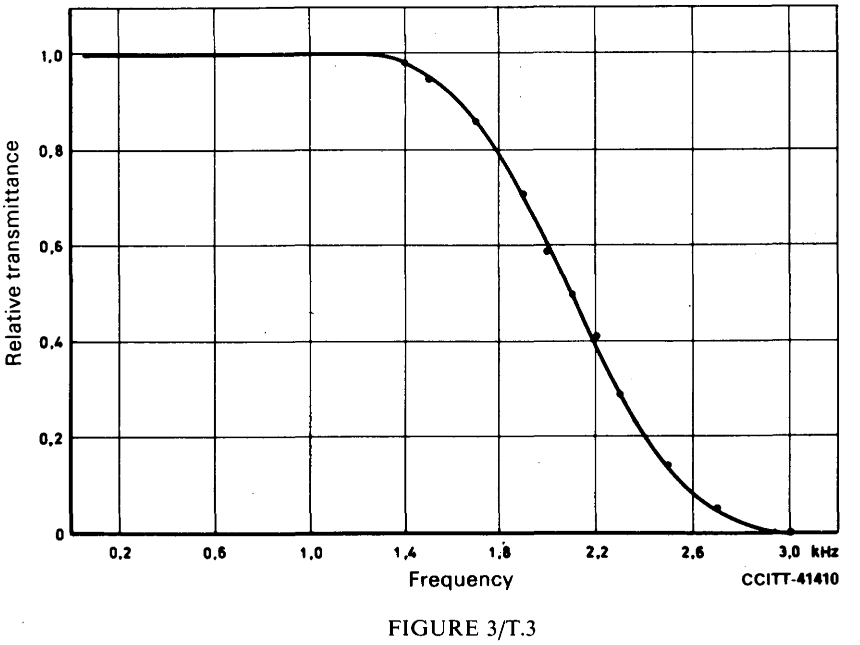


FIGURE 3/T.3

Frequency response of the vestigial sideband filter

7.4 The receiving apparatus must be capable of operating correctly when the drift of carrier frequency does not exceed its nominal value by more than ± 16 Hz.

7.5 A fixed compromise equalizer, an automatic equalizer or an adaptive equalizer may be provided in the receiver but this should be a matter for further study.

8 Power at the transmitter output

The power of the white signal should be adjustable from −15 dBm to 0 dBm but the equipment should be so designed that there is no possibility of this adjustment being tampered with by an operator. The black level should be at least 26 dB below the white level.

9 Power at the receiver input

The receiving apparatus should be capable of functioning correctly when the received signal level for white is within the range 0 dBm to −40 dBm, the latter value being considered provisional. No control of receiver sensitivity should be provided for operator use.

APPENDIX I

(to Recommendation T.3)

Guaranteed reproducible area for Group 2 machines conforming to Recommendation T.3

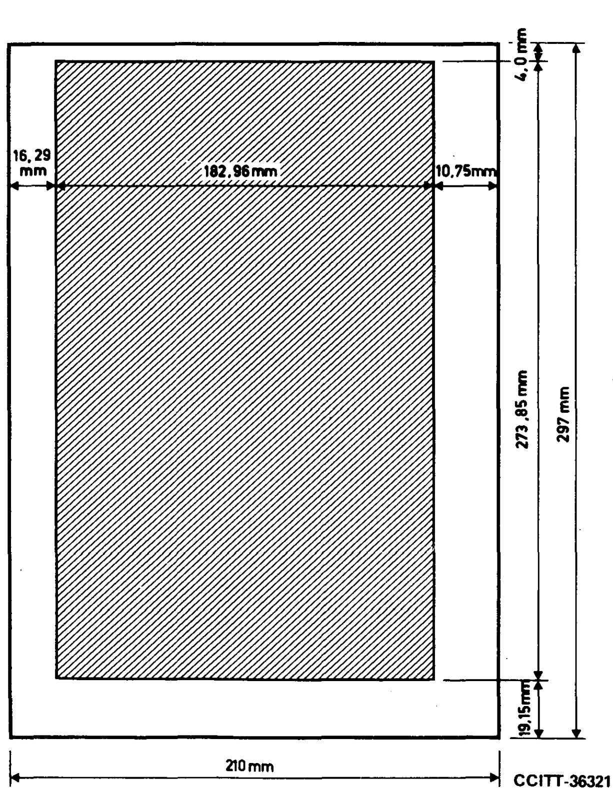
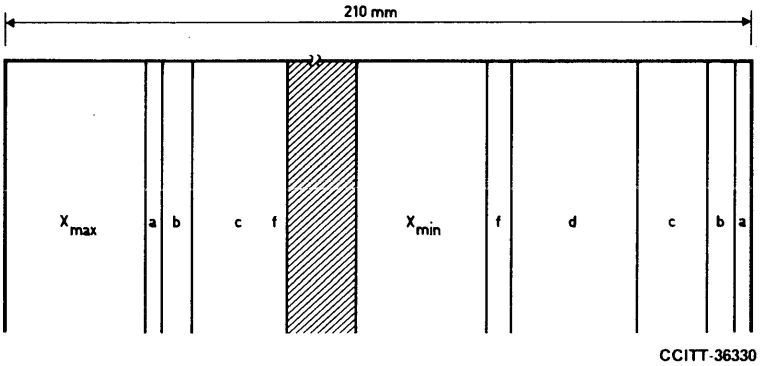


FIGURE I-1/T.3

Guaranteed reproducible area for Group 2 machines for use on facsimile services referring to ISO A4 paper size

I.1 *Horizontal loss*



a Phasing loss at the transmitter (± 0.5%)

b Phasing loss at the receiver (± 1.0%)

c Losses by skew (at the bottom of the page) (± 10^{-5})

d Loss caused by the enlarging effect in the case when different values of TLL are used. This value applies to ULL and the right and bottom margins only, because the beginning of ULL of the transmitter and receiver are aligned with the same position by the phasing procedure

f Loss caused by incorrect paper insertion allowing for ± 1.5 mm tolerance

x Loss caused by the tolerance allowing ULL to be located relative to the A4 size format

FIGURE I-2/T.3

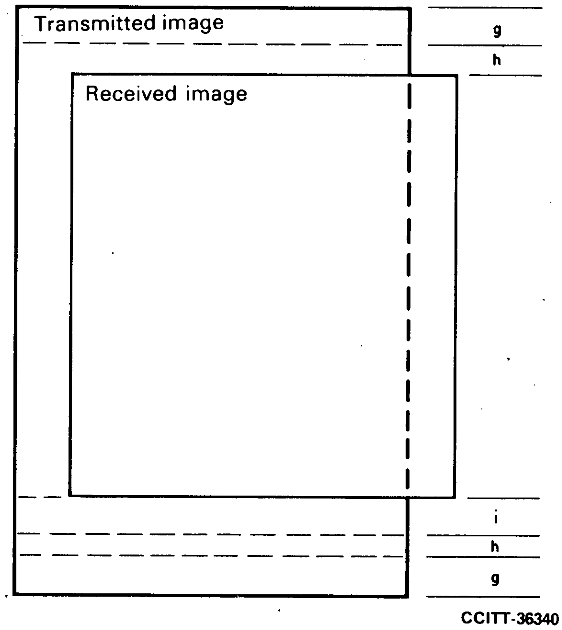
TABLE I-1/T.3

Results

Horizontal losses				Left margin (mm)		Right margin (mm)	
				205	210	205	210
Phasing	Transmitter	a	± 0.5%	1.11	1.11	1.11	1.11
	Receiver	b	± 1.0%	2.22	2.22	2.22	2.22
Skew		c	± 5 × 10^{-6}	2.46	2.46	2.46	2.46
Enlarging		d		–	–	6.46	6.62
Paper insertion		f		1.50	1.50	1.50	1.50
Lost time	Min.	x		–	–	1.00	1.00
	Max.	x		5.00	–	–	–
			Total	12.29	7.29	14.75	14.91
			Shifted value	16.29	3.29	10.75	10.91

TLL: 215 to 222 mm
ULL: 205 to 210 mm

I.2 *Vertical loss*



g Gripping loss caused by paper feed mechanism (at the top of the document: 4.00 mm)

h Loss caused by inserting the paper incorrectly

i Loss caused by the enlarging effect plus FOC tolerance (59 lines lost)

FIGURE I-3/T.3

TABLE I-2/T.3

<table>
<tr><th></th><th></th><th>Top
mm</th><th>Bottom
mm</th></tr>
<tr><td>Gripping loss</td><td>g</td><td rowspan="2">4.0</td><td rowspan="2">4.0</td></tr>
<tr><td>Paper insertion</td><td>h</td></tr>
<tr><td>Enlarging + FOC</td><td>i</td><td>–</td><td>15.15</td></tr>
<tr><td></td><td>Total</td><td>4.0</td><td>19.15</td></tr>
</table>

Reference

[1] CCITT Recommendation *Standardization of group 2 facsimile apparatus for document transmission*, Orange Book, Vol. VII, Rec. T.3, ITU, Geneva, 1977.

STANDARDIZATION OF GROUP 3 FACSIMILE APPARATUS FOR DOCUMENT TRANSMISSION

(Geneva, 1980)

The CCITT,

considering

(a) that Recommendation T.2 refers to Group 1 type apparatus for ISO A4 document transmission over a telephone-type circuit in approximately six minutes;

(b) that Recommendation T.3 refers to Group 2 type apparatus for ISO A4 document transmission over a telephone-type circuit in approximately three minutes;

(c) that there is a demand for Group 3 apparatus which enables an ISO A4 document to be transmitted over a telephone-type circuit in approximately one minute;

(d) that for a large number of applications black and white reproduction is sufficient;

(e) that such a service may be requested either alternatively with telephone conversation, or when either or both stations are not attended; in both cases, the facsimile operation will follow Recommendation T.30;

unanimously declares the view

that Group 3 facsimile apparatus for use on the general switched telephone network and international leased circuits should be designed and operated according to the following standards:

1 Scanning track

The message area should be scanned in the same direction in the transmitter and receiver. Viewing the message area in a vertical plane, the picture elements should be processed as if the scanning direction were from left to right with subsequent scans adjacent and below the previous scan.

2 Dimensions of apparatus

Note — The tolerances on the factors of cooperation are subject to further study.

2.1 The following dimensions should be used:

a) A standard resolution and an optional higher resolution of 3.85 line/mm ±1% and 7.7 line/mm ±1% respectively in vertical direction.

b) 1728 black and white picture elements along the standard scan line length of 215 mm ±1%.

c) Optionally, 2048 black and white picture elements along a scan line length of 255 mm ±1%.

d) Optionally, 2432 black and white picture elements along a scan line length of 303 mm ± 1%.

2.2 Input documents up to a minimum of ISO A4 size should be accepted.

3 Transmission time per total coded scan line

The total coded scan line is defined as the sum of DATA bits plus any required FILL bits plus the EOL bits.

For the optional two-dimensional coding scheme as described in § 4.2, the total coded scan line is defined as the sum of DATA bits plus any required FILL bits plus the EOL bits plus a tag bit.

To handle various printing methods, several optional minimum total coded scan line times are possible in addition to the 20 milliseconds standard.

3.1 The minimum transmission times of the total coded scan line should conform to the following:

1) Alternative 1, where the minimum transmission time of the total coded scan line is the same both for the standard resolution and for the optional higher resolution:

   a) 20 milliseconds recommended standard,

   b) 10 milliseconds recognized option with a mandatory fall-back to the 20 milliseconds standard,

   c) 5 milliseconds recognized option with a mandatory fall-back to the 10 milliseconds option and the 20 milliseconds standard,

   d) 0 millisecond recognized option with a mandatory fall-back to the 5 milliseconds option, the 10 milliseconds option and the 20 milliseconds standard, and an optional fall-back to the 40 milliseconds option,

   e) 40 milliseconds recognized option.

2) Alternative 2, where the minimum transmission time of the total coded scan line for the optional higher resolution is half of that for the standard resolution (see Note). These figures refer to the standard resolution:

   a) 10 milliseconds recognized option with a mandatory fall-back to the 20 milliseconds standard,

   b) 20 milliseconds recommended standard,

   c) 40 milliseconds recognized option.

The identification and choice of this minimum transmission time is to be made in the pre-message (phase B) portion of Recommendation T.30 control procedure.

Note – Alternative 2 applies to equipment with printing mechanisms which achieve the standard vertical resolution by printing two consecutive, identical higher resolution lines. In this case, the minimum transmission time of the total coded scan line for the standard resolution is double the minimum transmission time of the total coded scan line for the higher resolution.

3.2 The maximum transmission time of any total coded scan line should be less than 5 seconds. When this transmission time exceeds 5 seconds, the receiver must proceed to disconnect the line.

4 Coding scheme

4.1 *One-dimensional coding scheme*

The one-dimensional run length coding scheme recommended for Group 3 apparatus is as follows:

4.1.1 *Data*

A line of Data is composed of a series of variable length code words. Each code word represents a run length of either all white or all black. White runs and black runs alternate. A total of 1728 picture elements represent one horizontal scan line of 215 mm length.

In order to ensure that the receiver maintains colour synchronization, all Data lines will begin with a white run length code word. If the actual scan line begins with a black run, a white run length of zero will be sent. Black or white run lengths, up to a maximum length of one scan line (1728 picture elements or pels) are defined by the code words in Tables 1/T.4 and 2/T.4. The code words are of two types: Terminating code words and Make-up code words. Each run length is represented by either one Terminating code word or one Make-up code word followed by a Terminating code word.

Run lengths in the range of 0 to 63 pels are encoded with their appropriate Terminating code word. Note that there is a different list of code words for black and white run lengths.

Run lengths in the range of 64 to 1728 pels are encoded first by the Make-up code word representing the run length which is equal to or shorter than that required. This is then followed by the Terminating code word representing the difference between the required run length and the run length represented by the Make-up code.

TABLE 1/T.4

Terminating codes

White run length	Code word	Black run length	Code word
0	00110101	0	0000110111
1	000111	1	010
2	0111	2	11
3	1000	3	10
4	1011	4	011
5	1100	5	0011
6	1110	6	0010
7	1111	7	00011
8	10011	8	000101
9	10100	9	000100
10	00111	10	0000100
11	01000	11	0000101
12	001000	12	0000111
13	000011	13	00000100
14	110100	14	00000111
15	110101	15	000011000
16	101010	16	0000010111
17	101011	17	0000011000
18	0100111	18	0000001000
19	0001100	19	00001100111
20	0001000	20	00001101000
21	0010111	21	00001101100
22	0000011	22	00000110111
23	0000100	23	00000101000
24	0101000	24	00000010111
25	0101011	25	00000011000
26	0010011	26	000011001010
27	0100100	27	000011001011
28	0011000	28	000011001100
29	00000010	29	000011001101
30	00000011	30	000001101000
31	00011010	31	000001101001
32	00011011	32	000001101010
33	00010010	33	000001101011
34	00010011	34	000011010010
35	00010100	35	000011010011
36	00010101	36	000011010100
37	00010110	37	000011010101
38	00010111	38	000011010110
39	00101000	39	000011010111
40	00101001	40	000001101100
41	00101010	41	000001101101
42	00101011	42	000011011010
43	00101100	43	000011011011
44	00101101	44	000001010100
45	00000100	45	000001010101
46	00000101	46	000001010110
47	00001010	47	000001010111
48	00001011	48	000001100100
49	01010010	49	000001100101
50	01010011	50	000001010010
51	01010100	51	000001010011
52	01010101	52	000000100100
53	00100100	53	000000110111
54	00100101	54	000000111000
55	01011000	55	000000100111
56	01011001	56	000000101000
57	01011010	57	000001011000
58	01011011	58	000001011001
59	01001010	59	000000101011
60	01001011	60	000000101100
61	00110010	61	000001011010
62	00110011	62	000001100110
63	00110100	63	000001100111

TABLE 2/T.4

Make-up codes

White run lengths	Code word	Black run lengths	Code word
64	11011	64	0000001111
128	10010	128	000011001000
192	010111	192	000011001001
256	0110111	256	000001011011
320	00110110	320	000000110011
384	00110111	384	000000110100
448	01100100	448	000000110101
512	01100101	512	0000001101100
576	01101000	576	0000001101101
640	01100111	640	0000001001010
704	011001100	704	0000001001011
768	011001101	768	0000001001100
832	011010010	832	0000001001101
896	011010011	896	0000001110010
960	011010100	960	0000001110011
1024	011010101	1024	0000001110100
1088	011010110	1088	0000001110101
1152	011010111	1152	0000001110110
1216	011011000	1216	0000001110111
1280	011011001	1280	0000001010010
1344	011011010	1344	0000001010011
1408	011011011	1408	0000001010100
1472	010011000	1472	0000001010101
1536	010011001	1536	0000001011010
1600	010011010	1600	0000001011011
1664	011000	1664	0000001100100
1728	010011011	1728	0000001100101
EOL	000000000001	EOL	000000000001

Note — It is recognized that machines exist which accommodate larger paper widths whilst maintaining the standard horizontal resolution. This option has been provided for by the addition of the Make-up code set defined as follws:

Run length (black and white)	Make-up codes
1792	00000001000
1856	00000001100
1920	00000001101
1984	000000010010
2048	000000010011
2112	000000010100
2176	000000010101
2240	000000010110
2304	000000010111
2368	000000011100
2432	000000011101
2496	000000011110
2560	000000011111

4.1.2 *End-of-line (EOL)*

This code word follows each line of Data. It is a unique code word that can never be found within a valid line of Data; therefore, resynchronization after an error burst is possible.

In addition, this signal will occur prior to the first Data line of a page.

Format: 000000000001

4.1.3 *Fill*

A pause may be placed in the message flow by transmitting Fill. Fill may be inserted between a line of Data and an EOL, but never within a line of Data. Fill must be added to ensure that the transmission time of Data, Fill and EOL is not less than the minimum transmission time of the total coded scan line established in the pre-message control procedure.

Format: variable length string of 0s.

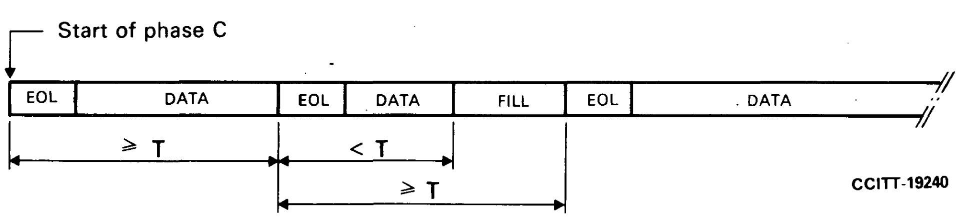
4.1.4 *Return to control (RTC)*

The end of a document transmission is indicated by sending six consecutive EOLs. Following the RTC signal, the transmitter will send the post message commands in the framed format and the data signalling rate of the control signals defined in Recommendation T.30.

Format: 000000000001 000000000001
(total of 6 times)

Figures 1/T.4 and 2/T.4 clarify the relationship of the signals defined herein. Figure 1/T.4 shows several scan lines of data starting at the beginning of a transmitted page. Figure 2/T.4 shows the last coded scan line of a page.

The identification and choice of either the standard code table or the extended code table is to be made in the pre-message (phase B) portion of Recommendation T.30 control procedures.



T Minimum transmission time of a total coded scan line

FIGURE 1/T.4

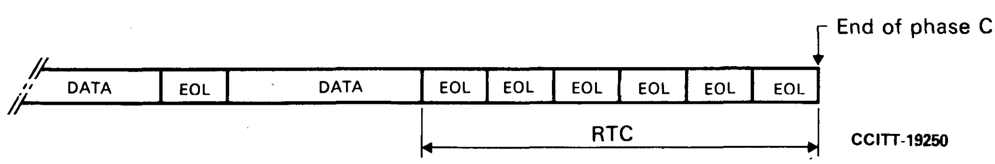


FIGURE 2/T.4

4.2 *Two-dimensional coding scheme*

The two-dimensional coding scheme is an optional extension of the one-dimensional coding scheme specified in § 4.1 and is as follows:

4.2.1 *Data*

4.2.1.1 *Parameter K*

In order to limit the disturbed area in the event of transmission errors, after each line coded one-dimensionally, at most *K*-1 successive lines shall be coded two-dimensionally. A one-dimensionally coded line may be transmitted more frequently than every *K* lines. After a one-dimensional line is transmitted, the next series of *K*-1 two-dimensional lines is initiated. The maximum value of *K* shall be set as follows:

Standard vertical resolution: $K = 2$

Optional higher vertical resolution: $K = 4$.

Note 1 – Some Administrations pointed out that for the optional higher vertical resolution *K* may optionally be set to a lower value.

Note 2 – Some Administrations reserve the right to approve only such apparatus for use in the facsimile service in their respective countries which will be able to produce a visible sign on its received facsimile message indicating that two-dimensional coding has been used in the transmission process.

4.2.1.2 *One-dimensional coding*

This conforms with the description of Data in § 4.1.1.

4.2.1.3 *Two-dimensional coding*

This is a line-by-line coding method in which the position of each changing picture element on the current or coding line is coded with respect to the position of a corresponding reference element situated on either the coding line or the reference line which lies immediately above the coding line. After the coding line has been coded it becomes the reference line for the next coding line.

4.2.1.3.1 *Definition of changing picture elements (see Figure 3/T.4)*

A changing element is defined as an element whose "colour" (i.e. black or white) is different from that of the previous element along the same scan line.

a_0 The reference or starting changing element on the coding line. At the start of the coding line a_0 is set on an imaginary white changing element situated just before the first element on the line. During the coding of the coding line, the position of a_0 is defined by the previous coding mode. (See § 4.2.1.3.2.)

a_1 The next changing element to the right of a_0 on the coding line.

a_2 The next changing element to the right of a_1 on the coding line.

b_1 The first changing element on the reference line to the right of a_0 and of opposite colour to a_0.

b_2 The next changing element to the right of b_1 on the reference line.

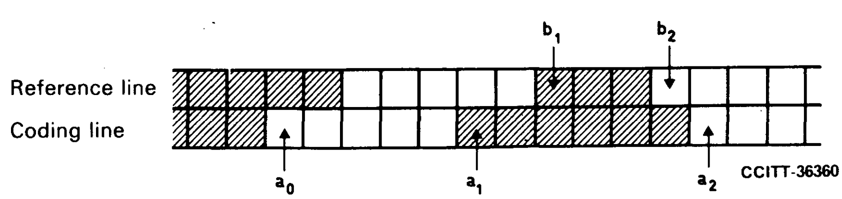


FIGURE 3/T.4

Changing picture elements

4.2.1.3.2 *Coding modes*

One of the three coding modes are chosen according to the coding procedure described in § 4.2.1.3.3 to code the position of each changing element along the coding line. Examples of the three coding modes are given in Figures 4/T.4, 5/T.4 and 6/T.4.

a) *Pass mode*

This mode is identified when the position of b_2 lies to the left of a_1.

When this mode has been coded, a_0 is set on the element of the coding line below b_2 in preparation for the next coding (i.e. on a'_0).

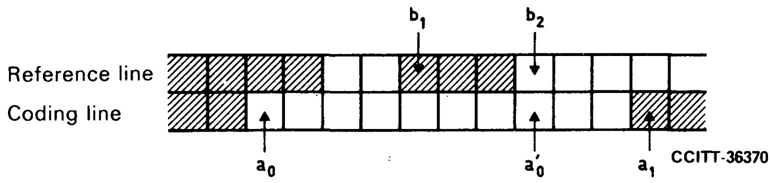


FIGURE 4/T.4
Pass mode

However, the state where b_2 occurs just above a_1, as shown in Figure 5/T.4 is not considered as a pass mode.

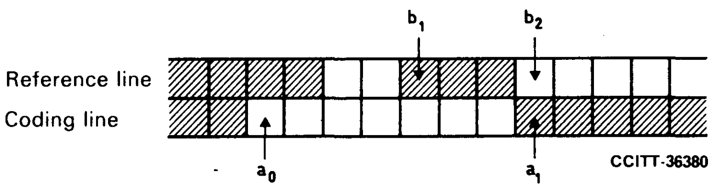


FIGURE 5/T.4
An example not corresponding to a Pass mode

b) *Vertical mode*

When this mode is identified, the position of a_1 is coded relative to the position of b_1. The relative distance a_1b_1 can take on one of seven values V(0), $V_R(1)$, $V_R(2)$, $V_R(3)$, $V_L(1)$, $V_L(2)$ and $V_L(3)$, each of which is represented by a separate code word. The subscripts R and L indicate that a_1 is to the right or left respectively of b_1, and the number in brackets indicates the value of the distance a_1b_1. After vertical mode coding has occurred, the position of a_0 is set on a_1, (see Figure 6/T.4).

c) *Horizontal mode*

When this mode is identified, both the run-lengths a_0a_1 and a_1a_2 are coded using the code words H + $M(a_0a_1)$ + $M(a_1a_2)$. H is the flag code word 001 taken from the two-dimensional code table (Table 3/T.4). $M(a_0a_1)$ and $M(a_1a_2)$ are code words which represent the length and "colour" of the runs a_0a_1 and a_1a_2 respectively and are taken from the appropriate white or black one-dimensional code tables (Tables 1/T.4 and 2/T.4). After a horizontal mode coding, the position of a_0 is set on a_2 (see Figure 6/T.4).

4.2.1.3.3 *Coding procedure*

The coding procedure identifies the coding mode that is to be used to code each changing element along the coding line. When one of the three coding modes has been identified according to Step 1 or Step 2 mentioned below, an appropriate code word is selected from the code table given in Table 3/T.4. The coding procedure is as shown in the flow diagram of Figure 7/T.4.

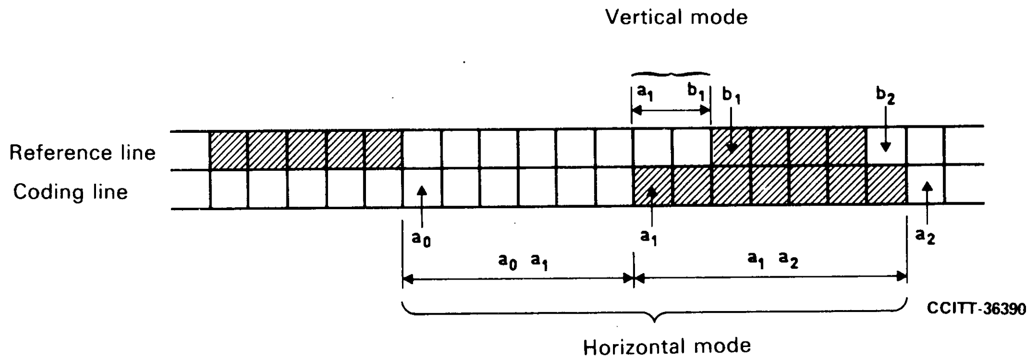


FIGURE 6/T.4

Vertical mode and Horizontal mode

Note – It does not affect compatibility to restrict the use of pass mode in the encoder to a single pass mode. Variations of the algorithm which do not affect compatibility should be the subject of further study.

Step 1

i) If a pass mode is identified, this is coded using the word 0001 (Table 3/T.4). After this processing, picture element a'_0 just under b_2 is regarded as the new starting picture element a_0 for the next coding. (See Figure 4/T.4.)

ii) If a pass mode is not detected then proceed to Step 2.

Step 2

i) Determine the absolute value of the relative distance a_1b_1.

ii) If $|a_1b_1| \leqslant 3$, as shown in Table 3/T.4, a_1b_1 is coded by the vertical mode, after which position a_1 is regarded as the new starting picture element a_0 for the next coding.

iii) If $|a_1b_1| > 3$, as shown in Table 3/T.4, following horizontal mode code 001, a_0a_1 and a_1a_2 are respectively coded by one-dimensional coding. After this processing position a_2 is regarded as the new starting picture element a_0 for the next coding.

4.2.1.3.4 *Processing the first and last picture elements in a line*

a) *Processing the first picture element*

The first starting picture element a_0 on each coding line is imaginarily set at a position just before the first picture element, and is regarded as a white picture element (see § 4.2.1.3.1).

The first run length on a line a_0a_1 is replaced by $a_0a_1 - 1$. Therefore, if the first run is black and is deemed to be coded by horizontal mode coding, then the first code word $M(a_0a_1)$ corresponds to a white run of zero length (see Figure 10/T.4, Example 5).

b) *Processing the last picture element*

The coding of the coding line continues until the position of the imaginary changing element situated just after the last actual element has been coded. This may be coded as a_1 or a_2. Also, if b_1 and/or b_2 are not detected at any time during the coding of the line, they are positioned on the imaginary changing element situated just after the last actual picture element on the reference line.

4.2.2 *Line synchronization code word*

To the end of every coded line is added the end-of-line (EOL) code word 000000000001. The EOL code word is followed by a single tag bit which indicates whether one- or two-dimensional coding is used for the next line.

TABLE 3/T.4

Two-dimensional code table

Mode	Elements to be coded		Notation	Code word
Pass	b_1, b_2		P	0001
Horizontal	a_0a_1, a_1a_2		H	001 + $M(a_0a_1)$ + $M(a_1a_2)$ (see Note 1)
Vertical	a_1 just under b_1	$a_1b_1 = 0$	V(0)	1
	a_1 to the right of b_1	$a_1b_1 = 1$	$V_R(1)$	011
		$a_1b_1 = 2$	$V_R(2)$	000011
		$a_1b_1 = 3$	$V_R(3)$	0000011
	a_1 to the left of b_1	$a_1b_1 = 1$	$V_L(1)$	010
		$a_1b_1 = 2$	$V_L(2)$	000010
		$a_1b_1 = 3$	$V_L(3)$	0000010
Extension	2-D (extensions) 1-D (extensions)			0000001xxx 000000001xxx (see Note 2)

Note 1 — Code M( ) of the horizontal mode represents the code words in Tables 1/T.4 and 2/T.4.

Note 2 — It is suggested the uncompressed mode is recognized as an optional extension of the two-dimensional coding scheme for Group 3 apparatus. The bit assignment for the xxx bits is 111 for the uncompressed mode of operation whose code table is given in Table 4/T.4.

Note 3 — Further study is needed to define other unspecified xxx bit assignments and their use for any further extensions.

Note 4 — If the suggested uncompressed mode is used on a line designated to be one-dimensionally coded, the coder must not switch into the uncompressed mode following any code word ending in the sequence 000. This is because any code word ending in 000 followed by a switching code 000000001 will be mistaken for an end-of-line code.

TABLE 4/T.4

Uncompressed mode code words

Entrance code to uncompressed mode	On one-dimensionally coded line: 000000001111 On two-dimensionally coded line: 0000001111	
Uncompressed mode code	*Image pattern* 1 01 001 0001 00001 00000	*Code word* 1 01 001 0001 00001 000001
Exist from uncompressed mode code	 0 00 000 0000	0000001T 00000001T 000000001T 0000000001T 00000000001T

T denotes a tag bit which tells the colour of the next run (black = 1, white = 0).

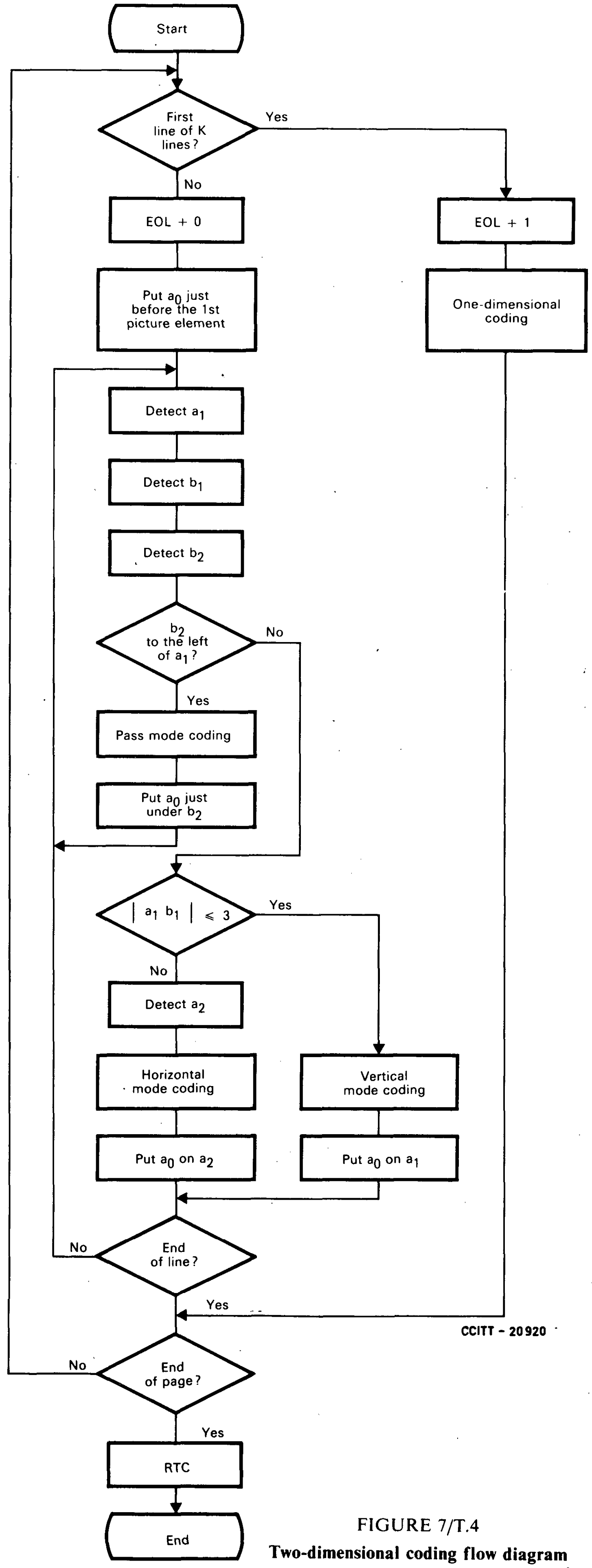


FIGURE 7/T.4

Two-dimensional coding flow diagram

In addition, EOL plus the tag bit 1 signal will occur prior to the first Data line of a page.

Format:

EOL + 1: one-dimensional coding of next line

EOL + 0: two-dimensional coding of next line

4.2.3 *Fill*

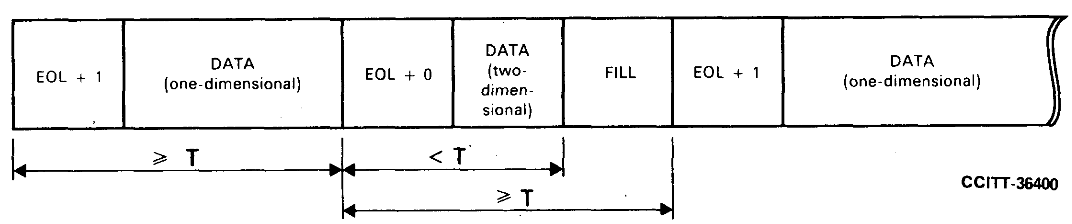
Fill is inserted between a line of Data and the line synchronization signal, EOL + tag bit, but is not inserted in Data. Fill must be added to ensure that the transmission time of Data, Fill and EOL plus tag bit is not less than the minimum transmission time of the total coded scan line.

Format: variable length string of 0 s.

4.2.4 *Return to control (RTC)*

The format used is six consecutive line synchronization code words, i.e., 6 × (EOL + 1).

To further clarify the relationship of the signals defined herein, Figures 8/T.4 and 9/T.4 are offered in the case of K = 2. Figure 8/T.4 shows several scan lines of data starting at the beginning of a transmitted page. Figure 9/T.4 shows the last several lines of a page.



T Minimum transmit time of a total coded scan line

FIGURE 8/T.4

Message transmission (first part of page)

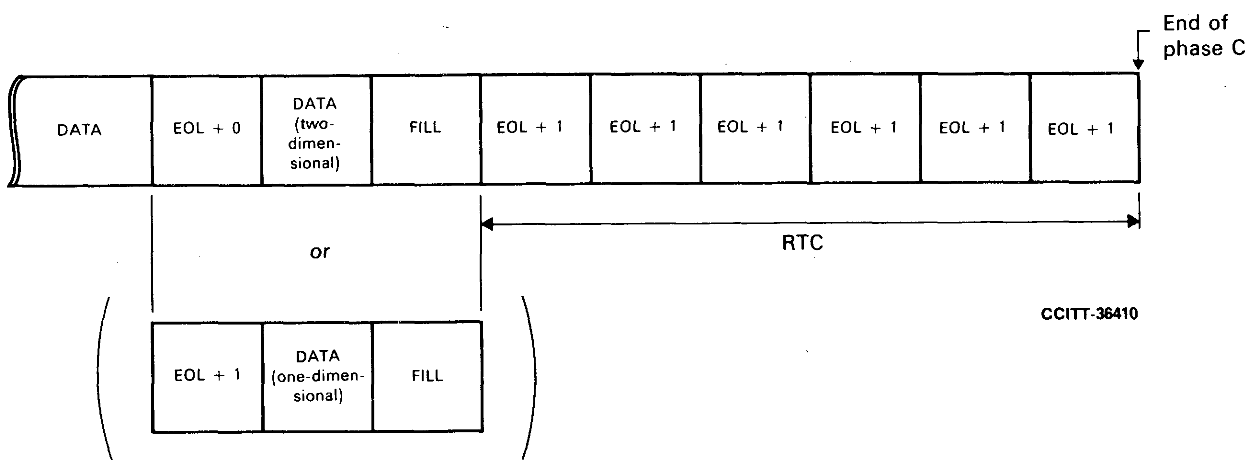


FIGURE 9/T.4

Message transmission (last part of page)

4.2.5 *Coding examples*

Figure 10/T.4 shows coding examples of the first part of scan lines and Figure 11/T.4 coding examples of the last part, while Figure 12/T.4 shows other coding examples. The notations P, H and V in the figures are, as shown in Table 3/T.4, the symbols for pass mode, horizontal mode and vertical mode respectively. The picture elements marked with black spots indicate the changing picture elements to be coded.

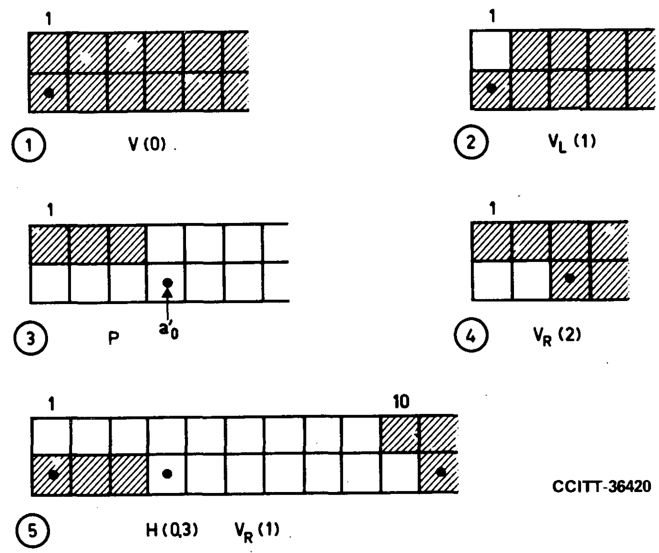


FIGURE 10/T.4

Coding examples: first part of scan line

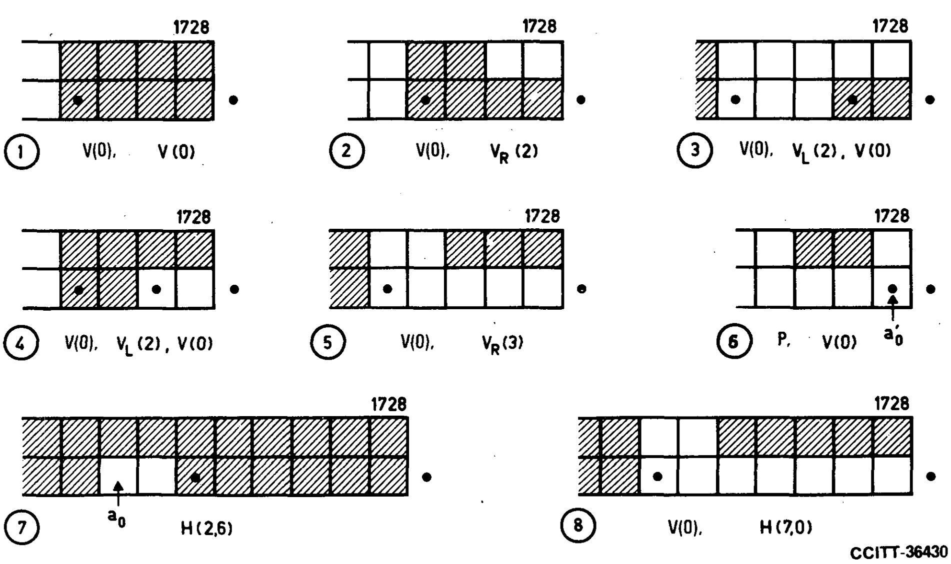


FIGURE 11/T.4

Coding examples: last part of scan line

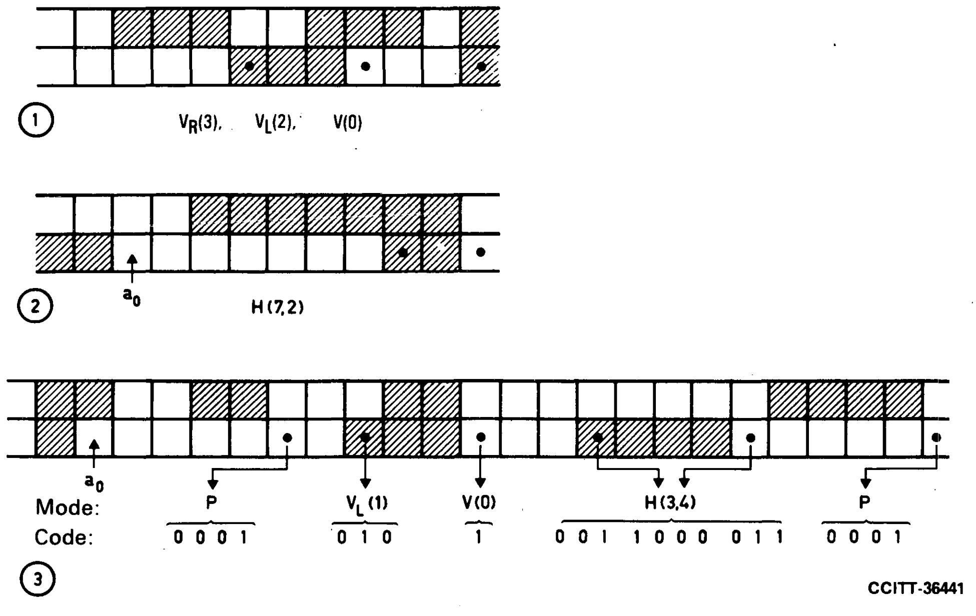


FIGURE 12/T.4
Coding examples

5 Modulation and demodulation

Group 3 apparatus operating on the general switched telephone network shall utilize the modulation, scrambler, equalization and timing signals defined in Recommendation V.27 *ter* [1], specifically the sections cited in [2].

5.1 The training signal to be used shall be the long training sequence with protection against talker echo. (Reference [3].)

5.2 The data signalling rates to be used are 4800 bit/s and 2400 bit/s as defined in Recommendation V.27 *ter* [1].

Note 1 – Some Administrations pointed out that it would not be possible to guarantee the service at a data signalling rate higher than 2400 bit/s.

Note 2 – It should be noted that there are equipments in service using, inter alia, other modulation methods.

Note 3 – Where quality of communication service can successfully support higher speed operation, such as may be possible on leased circuits or high-quality switched circuits, Group 3 apparatus may optionally utilize the modulation, scrambler, equalization and timing signals defined in Recommendation V.29 [4], specifically the sections cited in [5]. Under this option the data should be non-multiplexed and limited to the data signalling rates of 9600 bit/s and 7200 bit/s.

6 Power at the transmitter output

The average power should be adjustable from −15 dBm to 0 dBm but the equipment should be so designed that there is no possibility of this adjustment being tampered with by an operator.

Note – The power levels over the international circuits will conform to Recommendation V.2 [6].

7 Power at the receiver input

The receiving apparatus should be capable of functioning correctly when the received signal level is within the range of 0 dBm to −43 dBm. No control of receiver sensitivity should be provided for operator use.

References

[1] CCITT Recommendation *4800/2400 bits per second modem standardized for use in the general switched telephone network*, Vol. VIII, Fascicle VIII.1, Rec. V.27 *ter.*

[2] *Ibid.*, Preamble, §§ 2, 3, 7, 8, 9, 11 and the Appendix.

[3] *Ibid.*, § 2.5.1, Table 3/V.27 *ter.*

[4] CCITT Recommendation *9600 bits per second modem standardized for use on point-to-point 4-wire leased telephone-type circuits*, Vol. VIII, Fascicle VIII.1, Rec. V.29.

[5] *Ibid.*, §§ 1, 2, 3, 4, 7, 8, 9, 10 and 11.

[6] CCITT Recommendation *Power levels for data transmission over telephone lines*, Vol. VIII, Fascicle VIII.1, Rec. V.2.

Recommendation T.10

DOCUMENT FACSIMILE TRANSMISSIONS ON LEASED TELEPHONE-TYPE CIRCUITS

(Geneva, 1964; amended at Mar del Plata, 1968,
at Geneva, 1972, 1976 and 1980)

1 Type of circuits to be used

The telephone-type circuits used should have characteristics as recommended in Recommendation H.12 [1].

Note – If the leased circuit is used alternately for telephone conversation and facsimile transmission and if the latter is unidirectional, it is not necessary to provide for disabling echo suppressors located on the long-distance leased circuit. However, when such a circuit is used for the simultaneous operation in both directions appropriate measures should be taken to disable echo suppressors before the actual facsimile transmission takes place.

2 Modulation

Equipment conforming to Recommendation T.2 or Recommendation T.3 may be used. In the case of Recommendation T.2 equipment, either amplitude or frequency modulation may be chosen.

3 Power

The maximum power output of the transmitting apparatus into the line shall not exceed 1 mW whatever the frequency.

For frequency-modulation equipment conforming to Recommendation T.2, the level at the transmitter output shall be so adjusted that the level of the facsimile and control signals on the trunk circuit does not exceed −13 dBm0 regardless of the type of operation (duplex or simplex).

For amplitude-modulation equipment conforming to Recommendation T.2, higher black levels may be used provided the mean power in any hour, in one direction of transmission, does not exceed 32 microwatts (−15 dBm0) at the zero relative level point of the trunk circuit.

For equipment conforming to Recommendation T.3, higher white levels may be used provided the mean power in any hour, in one direction of transmission, does not exceed 32 microwatts (−15 dBm0) at the zero relative level point of the trunk circuit.

4 Multipoint transmission

If facsimile transmissions take place simultaneously from a transmitting station to several receiving stations, arrangements shall be made at the junction points so that, on the circuits following the junction points, the same power levels are maintained as those prescribed for individual transmissions.

5 Phase distortion

Equipment conforming to Recommendation T.2 should not require any special treatment. However, equipment conforming to Recommendation T.3 may require phase distortion correction in some cases.

Reference

[1] CCITT Recommendation *Characteristics of telephone-type leased circuits*, Vol. III, Fascicle III.4, Rec. H.12.

Recommendation T.10 *bis*

DOCUMENT FACSIMILE TRANSMISSIONS IN THE GENERAL SWITCHED TELEPHONE NETWORK

(Mar del Plata, 1968; amended at Geneva, 1972, 1976 and 1980)

1 Type of circuits to be used

Since circuits of the general telephone network and the station lines of telephone subscribers should be capable of being used for document facsimile transmissions on the general network, the circuits to be used are those of the general switched network which have 2-wire terminals at both ends of the facsimile station.

Note – For the actual document transmission, which is one-way, there is no need to cater for the disabling of echo suppressors. Compandors do not seem detrimental to document facsimile transmission.

2 Overall loss

The conditions for overall transmission loss are the same as those for circuits of the general switched telephone network.

3 Modulation

Equipment conforming to Recommendation T.2 or Recommendation T.3 may be used. In the case of Recommendation T.2 equipment, frequency modulation shall be used.

4 Power

In order to avoid the risk that facsimile signals be disturbed, e.g. by dial pulses transmitted over adjacent channels or by noise, it is important that the sending level should be as high as possible, provided, however, that it shall not exceed −13 dBm0 on the trunk circuit for frequency-modulation equipment conforming to Recommendation T.2 or that the mean power in any hour, in one direction of transmission, shall not exceed 32 microwatts (−15 dBm0) at the zero relative level point of the trunk circuit for equipment conforming to Recommendation T.3.

The maximum power output of the transmitting apparatus into the line shall not exceed 1 mW whatever the frequency.

5 Amplitude and phase distortion

Equipment conforming to Recommendation T.2 should not require any special treatment. However, equipment conforming to Recommendation T.3 may require both amplitude and phase distortion correction on certain connections.

Recommendation T.11

PHOTOTELEGRAPH TRANSMISSIONS ON TELEPHONE-TYPE CIRCUITS [1)]

(former CCIT Recommendation D.3; amended at New Delhi, 1960, Geneva, 1964, 1972 and 1980)

Note – In the case of carrier circuits, this Recommendation applies only to systems established on the basis of 12-channel group links. Systems using 16-channel group links will be the subject of subsequent study.

The CCITT,

considering

(a) that both audio-frequency telephone circuits and carrier circuits can be used for phototelegraphy;

(b) that when normal audio-frequency circuits or carrier circuits are used, amplitude modulation offers some advantages over frequency modulation [2)] and is therefore to be preferred for phototelegraph transmissions on circuits set up from end to end on cable or line-of-sight radio-relay links [3)].

However, in the case of circuits subject to sudden level variations or to noise, frequency modulation may be preferable to amplitude modulation; Administrations could in this case come to an agreement to use frequency modulation for phototelegraph calls over such circuits; the provisions of Recommendation T.1 relative to the frequency-modulation characteristics should then be applied.

Note – Study Group XV/Joint Working Party LTG mention in [2] that when carrier circuits are used, frequency modulation offers advantages over amplitude modulation in that it does not overload carrier systems and avoids the influence of sudden level variations or noise. It is therefore to be preferred. However, this point should be studied further from the facsimile transmission point of view.

unanimously declares the view

that phototelegraph transmissions over telephone circuits require that the following conditions be observed, according to the way in which the circuits are used for phototelegraphy:

1 Circuits permanently used for phototelegraphy

It seems that these circuits are few. In any case, they should even more easily meet the characteristics given in § 2 below.

2 Circuits used normally (and preferentially) for phototelegraphy

2.1 *Types of circuit to be used*

Two-wire circuits have no practical value for phototelegraphy because of feedback phenomena.

For the same reason, 4-wire circuits should be extended to the phototelegraph stations on a 4-wire basis at the appropriate amplifier stations, the terminating units and echo-suppressors always being disconnected.

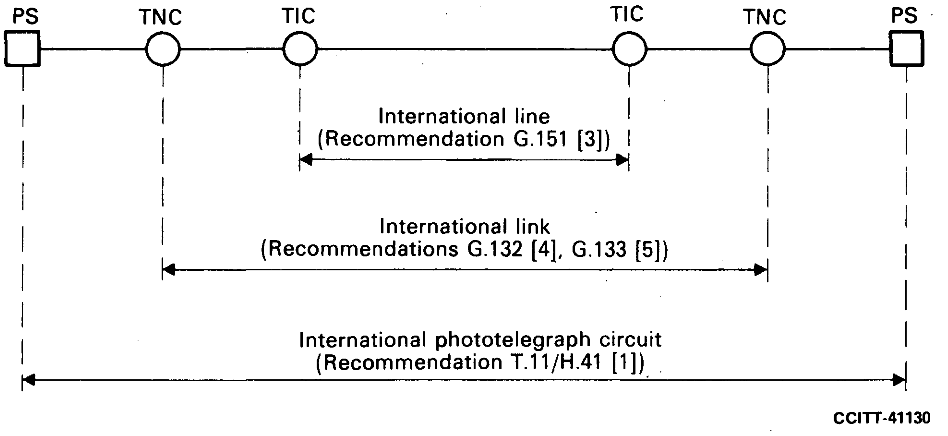
The configuration of a phototelegraph circuit is given in Figure 1/T.11.

---

1) Recommendation T.11 corresponds to Recommendation H.41 [1].

2) In particular, with the same index of cooperation and speed, frequency-modulation necessitates a wider frequency range than that of amplitude-modulation to obtain a picture of the same quality.

3) See Recommendation T.15 for phototelegraph transmissions over combined radio and metallic circuits.



PS Phototelegraph station
TIC Terminal international centre
TNC Terminal national centre

Note — The phototelegraph circuit is set up on lines according to the terminology used by Study Group IV, in Recommendations M.1010 [6] and M.1015 [7].

FIGURE 1/T.11

Constitution of a phototelegraph circuit

2.2 *Overall loss*

The same conditions apply to the overall transmission loss of 4-wire circuits used for phototelegraphy as apply, in general, for telephony.

2.3 *Sent signal power*

The emission voltage for the phototelegraph signal corresponding to maximum amplitude should be so adjusted that the maximum power level of the signal at the zero relative level point is −13 dBm0 for frequency modulation phototelegraph transmissions and that the peak signal power level for amplitude-modulation phototelegraph transmissions in principle should be −3 dBm0. In the case of amplitude-modulation, the level of the signal corresponding to black is usually about 30 dB lower than that of the signal corresponding to white.

Note — The levels of −3 and −13 dBm0 specified above are provisional and need further study from the facsimile transmission point of view.

2.4 *Relative levels*

If phototelegraph transmissions take place simultaneously from a transmitting station to several receiving stations, arrangements shall be made at the junction point so that, on the circuits following the junction point, the same power levels are maintained as those prescribed for individual transmissions.

2.5 *Attenuation distortion*

The limits for attenuation distortion on international circuits used for phototelegraphy are given in Recommendation G.151 [3] concerning telephone circuits. The attenuation distortion between two terminal national centres shall therefore not exceed the limits indicated in Recommendation G.132 [4] and it will not normally be necessary to compensate the distortion of the lines linking the phototelegraph stations to the terminal national centres in order to obtain, for amplitude-modulated phototelegraph transmission, an attenuation distortion between phototelegraph stations of less than 8.7 dB in the wanted band.

2.6 *Variation of circuit overall loss with time* (See Notes 1 and 2)

2.6.1 The objective is that:

2.6.1.1 The difference between the mean value and the nominal value of the transmission loss value should not exceed 0.5 dB.

2.6.1.2 The standard deviation from the mean value should not exceed 1 dB.

However, in the case of circuits set up wholly or partly on older-type equipment, where the international line consists of two or more circuit sections, a standard deviation not exceeding 1.5 dB may be admitted.

2.6.2 The method for achieving the above objective values is left to the discretion of Administrations (better maintenance, fitting of automatic regulators, etc.).

2.6.3 The assumption is made that these limits for the variation of loss with time of a single circuit may be compared to limits for loss measurements made on a set of circuits at a given time. Experience indicates that such a comparison has a practical validity although it has not been fully demonstrated at this time. Administrations are encouraged to use this Recommendation as giving currently practical limits for sets of circuits. This does not preclude the application of these limits to single circuits, should this prove practical at any time.

Note 1 – See Recommendation M.160 [8] and Reference [9].

Note 2 – The provisions specified in § 2.6 are provisional and need further study from the facsimile transmission point of view.

2.7 *Phase distortion* (see also Recommendation T.12)

Phase distortion limits the range of satisfactory phototelegraph transmissions. Differences between the group delays of a telephone circuit, in the interval of the phototelegraph transmission, should not exceed

$$\Delta t \leqslant \frac{1}{2 f_p}$$

f_p = maximum modulation frequency corresponding to the definition and scanning speed.

2.8 *Interference*

Interfering currents, whatever their nature, should not exceed the CCITT recommended limits for telephone circuits.

3 Telephone circuits rarely used for phototelegraphy

3.1 *Transmission characteristics*

It seems that the majority of the characteristics specified by the CCITT for modern telephone circuits are sufficient to permit phototelegraph transmissions on a circuit chosen at random in a group of circuits normally used for telephone working. However, it is not certain that such a circuit would have a sufficiently low phase distortion for such use, particularly channels 1 and 12 of a 12-circuit group, use of which is not advised. The influence of phase distortion is more noticeable in frequency modulation.

With amplitude modulation there is a further risk that phototelegraph transmissions will be subject to faulty modulation because the special precautions applied to circuits regularly used for phototelegraphy (see § 2.6 above) cannot be applied to circuits taken at random.

3.2 *Precautions concerning signalling*

As long as automatic switching for phototelegraph circuits is not envisaged, the signal receiver can be disconnected so that no signalling disturbances can occur even when frequency modulation is used. However, if frequency modulation is used for phototelegraph transmission and if it is impracticable to disconnect the signal receiver, then it would be desirable, in the case of the single-frequency system, that a blocking signal be transmitted along with the picture signal to operate the guard circuit and render the receiver inoperative.

It is also apparent that the frequency of such a blocking signal should lie well outside the range of frequencies involved in the picture transmission.

The frequency and the level of the blocking signal must depend on the characteristics of the VF receiver (or receivers in the case of a tandem international connection), as designed by different Administrations to meet the specification to be prescribed for international signalling.

In the case of the two-frequency international signalling system, the CCITT has indicated its view that no interference will take place.

References

[1] CCITT Recommendation *Phototelegraph transmission on telephone-type leased circuits*, Vol. III, Fascicle III.4, Rec. H.41.

[2] *Ibid.*, Preamble.

[3] CCITT Recommendation *General performance objectives applicable to all modern international circuits and national extension circuits*, Vol. III, Fascicle III.1, Rec. G.151.

[4] CCITT Recommendation *Attenuation distortion*, Vol. III, Fascicle III.1, Rec. G.132.

[5] CCITT Recommendation *Group-delay distortion*, Vol. III, Fascicle III.1, Rec. G.133.

[6] CCITT Recommendation *Constitution and nomenclature of international leased circuits*, Vol. IV, Fascicle IV.2, Rec. M.1010.

[7] CCITT Recommendation *Types of transmission on leased circuits*, Vol. IV, Fascicle IV.2, Rec. M.1015.

[8] CCITT Recommendation *Stability of transmission*, Vol. IV, Fascicle IV.1, Rec. M.160.

[9] *Statistical theory requirements*, Green Book, Vol. IV.2, Supplement No. 1.6, ITU, Geneva, 1973.

Recommendation T.12

RANGE OF PHOTOTELEGRAPH TRANSMISSIONS ON A TELEPHONE-TYPE CIRCUIT

(former CCIT Recommendation D.3; amended at New Delhi, 1960 and Geneva, 1964)

Note – In the case of carrier circuits, this Recommendation applies only to systems established on the basis of 12-channel group links. Systems using 16-channel group links will be the subject of subsequent study.

The CCITT,

considering

(a) that the differences between the delays of the various frequencies and the width of the transmission band actually usable on a circuit for telephony give rise, when phototelegraph signals are started or stopped, to transient phenomena which limit the phototelegraph transmission speed;

(b) that the range of phototelegraph calls of satisfactory quality, for a given transmission speed, depends especially on the constitution of the circuit, i.e. on:

– the loading and length, in the case of audio-frequency circuits;

– the number of 12-channel group links used in tandem in the case of carrier circuits,

and on the choice of the carrier frequency for amplitude-modulated photograph transmission, or on the mean frequency in the case of frequency modulation;

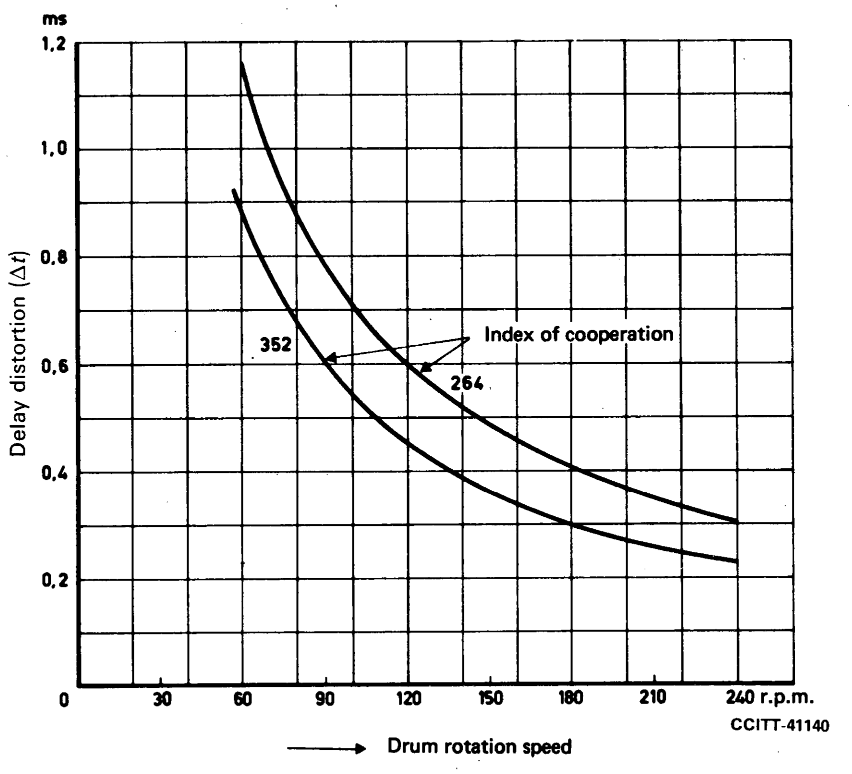
(c) that phototelegraph transmission of satisfactory quality requires that the limits of differences between the group delays in the transmitted frequency band, as shown in Figure 1/T.12, are not to be exceeded;

(d) that the CCITT has recommended the following for international telephone circuits:

the permissible differences for a worldwide chain of twelve circuits, each set up on a single group link between the minimum group delay throughout the frequency band transmitted and the group delay at the upper and lower limits of this band are those given in Table 1/T.12;

unanimously declares the view

that, as regards the effect of phase distortion on phototelegraph transmission quality, the carrier frequency (where amplitude modulation is used) or the mean frequency (when frequency modulation is used) must be chosen in such a way that it is as near as possible to the frequency which has the minimum group delay on the telephone circuit.



Note — The scanning spot is assumed to have the same dimensions in both directions (square or circular).

FIGURE 1/T.12

Permissible delay distortion in the transmitted frequency band as a function of the phototelegraph transmission speed

TABLE 1/T.12

	Lower limit of the frequency band	Upper limit of the frequency band
International chain	30 ms	15 ms
Each of the national 4-wire extensions	15 ms	7.5 ms
On the whole 4-wire chain	60 ms	30 ms

1 Circuits permanently used for phototelegraphy

1.1 It will generally be possible, by agreement between Administrations, to choose a circuit satisfying stricter limits than those specified above from the point of view of phase distortion.

1.2 Moreover, it will be possible to compensate phase distortions by inserting phase equalizers and to effect phototelegraph transmissions occupying the whole nominal band of the circuit.

2 Circuits used normally (or preferentially) for phototelegraphy

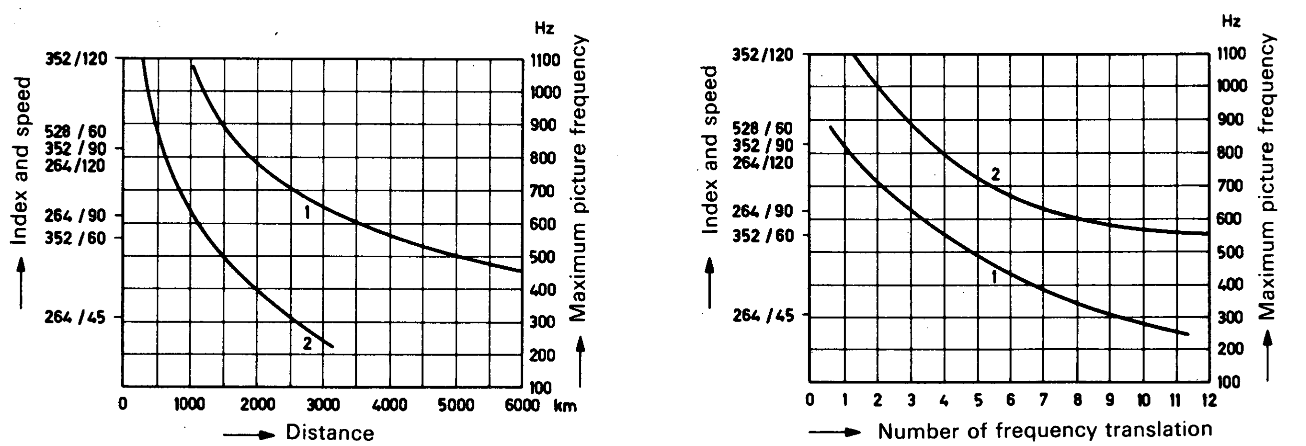
2.1 The greater the differences between the delays in the transmission intervals, the narrower should be the bandwidth chosen (leading to a lower phototelegraph definition or transmission speed).

2.2 Hence, audio-frequency circuits should in any case be lightly loaded circuits.

2.3 Phase distortion is well within the limits indicated above, in the case of carrier circuits, if a single modern-type carrier system is considered (and considering especially the telephone channels in the middle of a 12-channel group of such a system).

2.4 Nevertheless, it would be unjustifiable from the financial point of view to make the aforementioned recommendation concerning phase distortion stricter simply with a view to the occasional use of only a few circuits for high-speed phototelegraph transmissions.

2.5 The curves of Figure 2/T.12 give information on the relative performances of amplitude- and frequency-modulated phototelegraph transmissions on audio-frequency and carrier telephone circuits.



a) Audio-frequency circuits

b) Carrier frequency channels

CCITT-41150

Curve 1: AM carrier = 1300 Hz
Curve 2: FM = 1900 ± 400 Hz
AM carrier = 1900 Hz

FIGURE 2/T.12

Range of phototelegraph transmission

3 Telephone circuits rarely used for phototelegraphy

If phototelegraph connections are set up on circuits selected at random from modern-type groups of telephone circuits (for example, by automatic switching), a circuit may be taken which has too high a degree of phase distortion, particularly if it has been set up on channels 1 or 12 of a 12-channel group, use of which is deprecated. It is impossible, in this case, to draw up general information on the range of phototelegraph transmissions; however, it will be possible to meet the conditions for a transmission of adequate quality if the phototelegraph connection comprises only one 12-channel group link and if transmission is effected in normal conditions as outlined in Recommendation T.1.

Recommendation T.15

PHOTOTELEGRAPH TRANSMISSION OVER COMBINED RADIO AND METALLIC CIRCUITS [1]

(former CCIT Recommendation D.4; amended at New Delhi, 1960 at Geneva, 1964, Mar del Plata, 1968 and Geneva, 1976)

The CCITT,

considering

(a) that, to facilitate interworking, it is desirable to standardize the characteristics of systems employed for phototelegraph transmission over long-distance HF (decametric) circuits [2];

(b) that it is desirable to standardize certain characteristics of the systems in such a way as to make them equally suitable for transmission over metallic circuits;

(c) that the transmission system using direct amplitude modulation is generally unsatisfactory over HF (decametric) radio circuits, because of the intolerable fading ratio usually encountered;

(d) that the system of sub-carrier frequency modulation has proved satisfactory, but requires standardization in respect of the centre frequency and shift frequencies, taking into account the values of the picture-modulation frequencies to be transmitted;

(e) that, when a direct frequency-modulation system is employed, the terminal equipment normally used for a sub-carrier modulation system should be usuable without serious modifications;

(f) that, taking into account the quality necessary for reproduction of the picture received, the effect of multipath echoes on long-distance HF (decametric) radio circuits normally limits the maximum admissible picture-modulation frequency to approximately 600 Hz,

unanimously declares the view

that phototelegraph transmissions over combined radio and metallic circuits should conform to the following provisions:

1 Characteristics of radio circuits

1.1 When a sub-carrier frequency-modulation system is used, the following characteristics should be observed:

centre frequency	1900 Hz
frequency corresponding to white	1500 Hz
frequency corresponding to black	2300 Hz

(the 1500-Hz frequency is also used for the phasing signal)

---

1) This Recommendation corresponds to CCIR Recommendation 344-2 [1].

2) The transmission over communication-satellite systems will be the subject of later study.

1.2 When a direct frequency-modulation system is employed, the following characteristics should be observed:

centre frequency (corresponding to assigned frequency)	f_0
frequency corresponding to white	f_0 – 400 Hz
frequency corresponding to black	f_0 + 400 Hz

(the frequency f_0 – 400 Hz is also used for the phasing signal)

1.3 In both systems the stability of frequencies should be such that the variations are less than:

8 Hz during a period of 1 second,
16 Hz during a period of 15 minutes.

2 Characteristics of equipment and metallic circuits

The standards for phototelegraph apparatus and the specifications for transmission on metallic circuits are given in Recommendations T.1 and T.11.

On the metallic sections connected to both ends of the radio path, frequency modulation can be used whatever type of modulation is used over the radio circuits. However, amplitude modulation should preferably be used (see Recommendation T.11 on this subject).

3 Typical circuit

In principle, a worldwide hypothetical connection consisting of combined radio and wire channels may involve a maximum of two radio circuits with two metallic circuits at either end. Another metallic circuit may be required in the radio channel link if, in a country, the receiving and transmitting radio stations are at a distance from each other or if the two radio circuits terminate in neighbouring countries. The typical circuit for this connection is shown in Figure 1/T.15.

The frequency tolerances on each of the various sections of this connection should be no greater than those proposed by the CCITT (see Recommendations G.225 [2] and T.1) as shown in Figure 1/T.15.

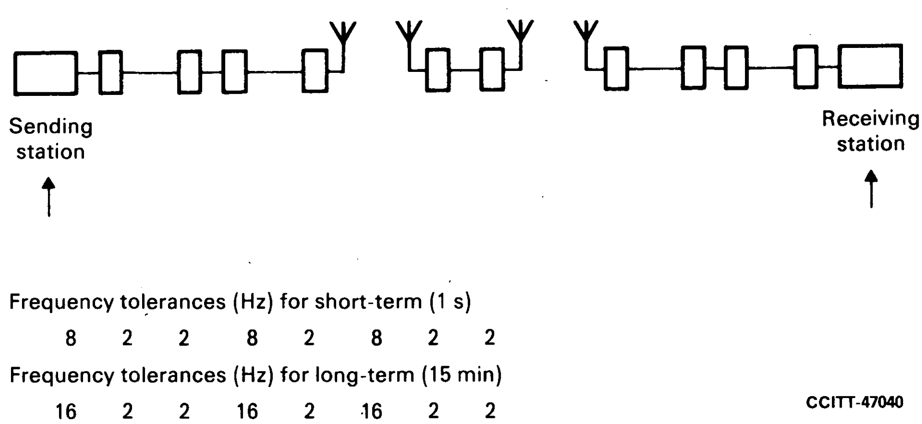


FIGURE 1/T.15

Typical circuit in a worldwide phototelegraph connection

If it is assumed that these deviations are distributed at random and if we take the standard deviation, we shall obtain the values 15 and 28 Hz respectively, which are not harmful for satisfactory reception, since CCITT Recommendation T.1 admits a maximum deviation of 32 Hz.

4 Modulation conversion

When conversion from amplitude modulation to frequency modulation (or vice versa) is required, the conversion should be such that the deviation of the frequency-modulated carrier varies linearly with the amplitude of the amplitude-modulated carrier.

Each Administration will decide, when the question arises, on the location of modulation converters. They may be placed either at the terminal phototelegraph station or at the control station associated with the radio station, to facilitate speech on the circuit used for phototelegraphy, if the radio channel will carry speech.

References

[1] CCIR Recommendation *Standardization of phototelegraph systems for use on combined radio and metallic circuits*, Vol. III, Rec. 344-2, ITU, Geneva, 1978.

[2] CCITT Recommendation *Recommendations relating to the accuracy of carrier frequencies*, Vol. III, Fascicle III.2, Rec, G.225.

Recommendation T.20

STANDARDIZED TEST CHART FOR FACSIMILE TRANSMISSIONS [1)]

(New Delhi, 1960; amended at Geneva, 1964, and Mar del Plata, 1968)

The CCITT,

considering

that it will be a great advantage to use a standardized test chart to check the quality of facsimile transmissions and that such a chart would provide the receiving office with a reliable and rapid means of checking the quality of test transmissions according to uniform principles and of making comparisons between different transmission results in a precise way. The chart has been designed for measuring the quality of both picture and black-and-white transmissions and it enables the apparatus used and the communication channels to be judged by means of objective measurements, the results of which may be expressed in code.

unanimously declares the view

(1) that tests of facsimile transmission quality will be carried out in the international service with the aid of the "CCITT standardized test chart".

(2) that this test chart is made by the ITU under the supervision of the CCITT and should be offered for sale by the ITU. There are two editions:

- test charts sold before the IVth Plenary Assembly of the CCITT (October 1968) are of the first edition;
- test charts sold since the IVth Plenary Assembly of the CCITT are of the second edition.

These test charts are described in the annex to this Recommendation; the specimens printed in the annex cannot be used for measurements.

(3) that these two test charts are compatible and a test chart of either the first edition or the second can be used in the international service.

1) With the standardization of two test charts for document facsimile transmission (Test charts Nos. 2 and 3) in Recommendation T.21, this chart will be designated as "Test chart No. 1".

ANNEX A

(to Recommendation T.20)

Description of the standardized test chart No. 1

A.1 The test chart No. 1 has the following dimensions:

- length: 250 mm,
- width: 110 mm.

The lateral margin is some 10 mm wide on either side. The margin at top and bottom is 20 mm wide, approximately. The chart is divided into sections marked on the transparent paper delivered with every chart.

A.2 Sections 1 and 2 contain two tone scales, each having 15 density steps, varying from black and white and vice versa. Nos. 1, 4, 8, 11, and 15 bear their numbers on them, the number 1 always betokens white and the number 15 black.

A.3 Section 3 is occupied by a group of black lines on a white background, in the form of hyperbolae. The thickness of the lines and the distances between them diminish regularly from left to right, from 1 mm to 1/6 mm.

If a vertical line be drawn through the hyperbolae, the lines therein will subtend distances on the vertical line equal to the inverse of the figures on the scale graduated from 1 to 6 at the bottom of Section 3.

A.4 Section 4 contains two groups of hyperbolae similar to those of Section 3 but limited to the scanning densities lying between 3 and 6. One group is made up of grey lines on a white ground, the other by grey lines on a black ground.

A.5 Section 5 contains three patterns.

a) *First edition*

The first pattern is made up of five black lines on a white background, the lines being 0.25 mm thick, arranged in one group of two lines and another of three lines. These lines are 0.25 mm apart, and the two groups are separated by 1.5 mm.

The second pattern is the same as the first, but the lines are white on a black background.

The third pattern consists of two similar groups of black lines on a white background, as follows:

– line, thickness	1 mm
– separation	0.25 mm
– line, thickness	0.25 mm
– separation	1 mm
– line, thickness	0.25 mm
– separation	0.25 mm
– line, thickness	1 mm

The two groups are separated by 1 mm.

b) *Second edition*

The first pattern is made up of eight black lines on a white background, separating into three groups:

- one group of two black lines being 0.25 mm thick and 0.25 mm apart;
- one group of three black lines being 0.25 mm thick and 0.25 mm apart;
- one group of three black lines being 0.1 mm thick and 0.25 mm apart.

These groups are separated by 1.5 mm.

The second and third patterns are respectively the same as those of Section 5 of the first edition.

A.6 Section 6 contains a tapering black line on a white background, and a tapering white line on a black background. The maximum width of the tapering lines is 0.7 mm.

At the top of the section is a scale in millimetres, showing the width of the tapering lines.

A.7 Section 7 contains a strip of tone equivalent to that in Section 1, step 11, on a background of Section 1, step 5.

A.8 In the first edition, Section 8 accommodates a photograph of UNESCO House in Paris.

In the second edition, Section 8 accommodates a portrait of an Argentine boy.

A.9 Section 9 contains two concentric circles, the radii of which differ by 1 mm. A square, with its diagonals, is inscribed in the inner circle.

In the second edition the radii of the two circles are bigger than those of the first edition and the exterior circle is osculating with the limits of Section 9.

A.10 There are two Sections numbered 10 which contain adjustment lines.

In the first edition, these lines are numbered from 1 to 6 and these figures are placed in the central part of the left half of Section 10.

In the second edition, only the even adjustment lines are numbered and these figures are placed at the left of the prolongation of the line separating Sections 3 and 12, 7 and 12 respectively.

A.11 Section 11 contains a pattern of lines, with a spacing of 2.5 mm. It is divided into two equal parts by a vertical line. The column on the right contains white rectangles, while that on the left contains alternate white and black rectangles.

In the second edition Section 11 is so cut that the parts adjacent to Sections 10 are kept in white. These parts are used for extension of the adjustment lines of Sections 10.

To indicate the centre of the test charts of the second edition, a line in the right column of Section 11 which is the prolongation of the line separating the density steps 8 and 9 of Section 1 is 0.5 mm thick.

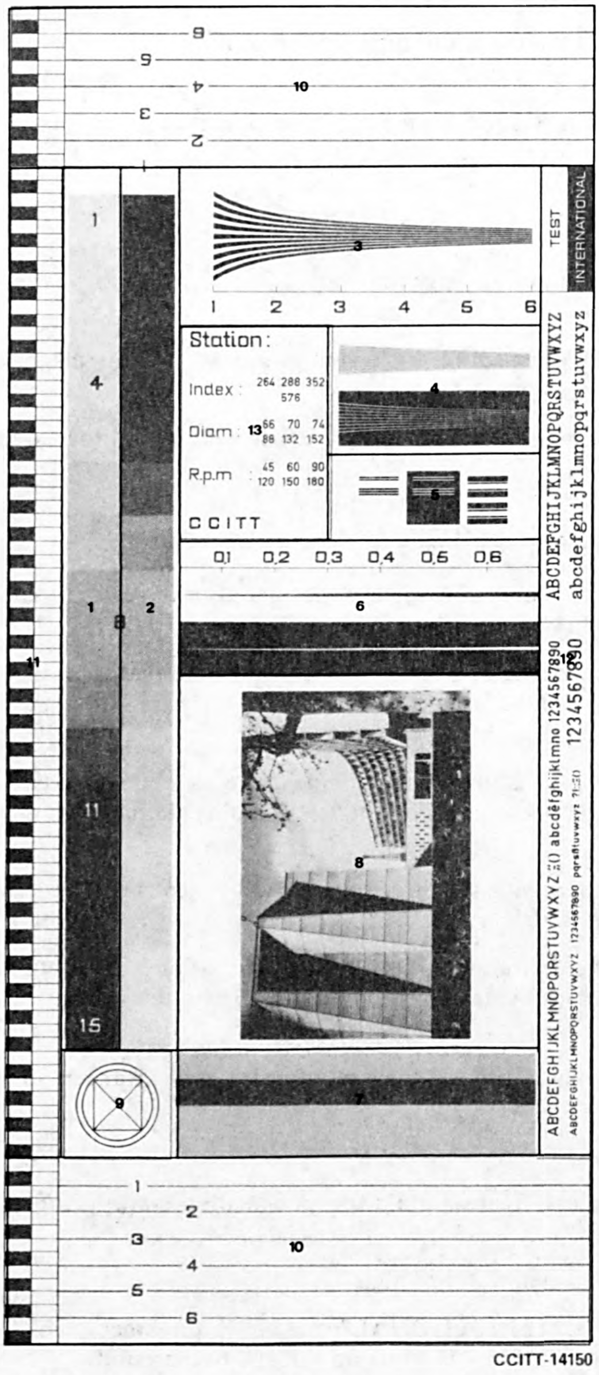
A.12 Section 12 contains letters, digits, and punctuation marks printed in various styles, and arranged so that they can be read sideways.

Section 12 is divided into three parts:

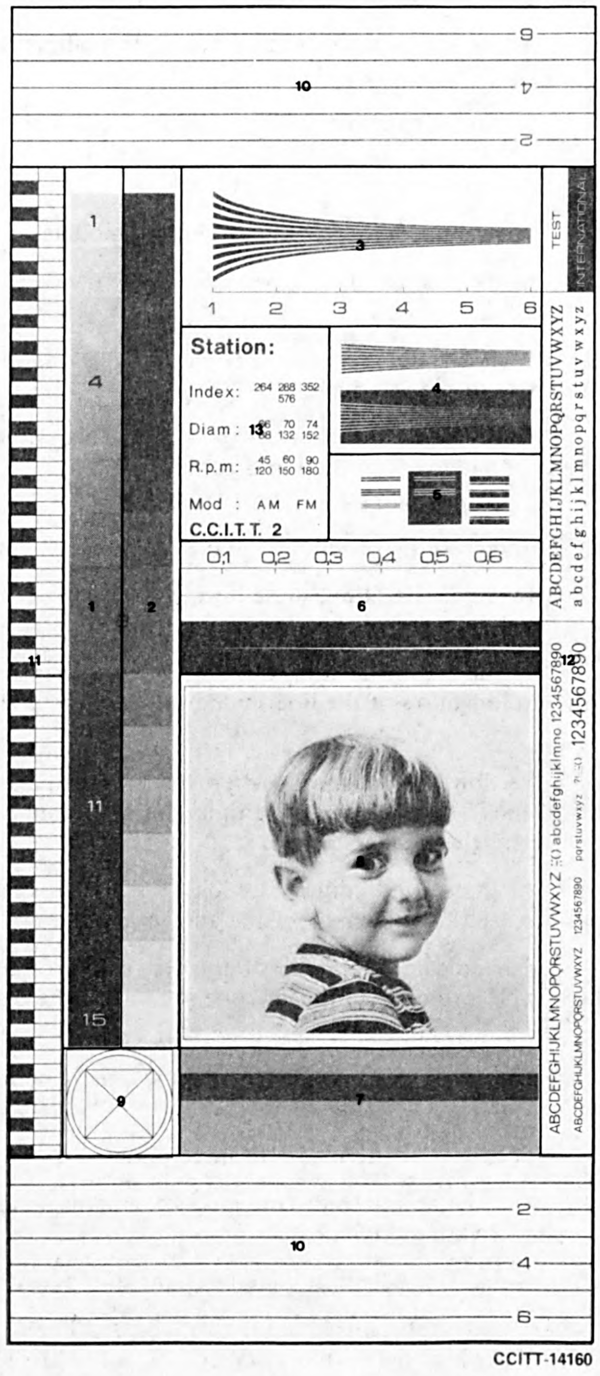
- the bottom part contains typographical signs (letters, figures, and a few punctuation marks), printed in various styles.
- the middle part contains signs in typewritten characters 2.3 mm high.
- the top part contains two words: "TEST" and "INTERNATIONAL" one above the other. "TEST" is black on a white background, while "INTERNATIONAL" is white on a black background.

A.13 Section 13 contains

- space for the name of the transmitting station;
- the cooperation indices most often used;
- the diameters in millimetres of the drums most often used;
- the r.m.p. of the drums;
- "Mod.: AM FM" to indicate either amplitude modulation or frequency modulation (the second edition only);
- the indication "CCITT" in the test charts of the first edition is replaced by "CCITT 2" for the test charts of the second edition.



Test chart No. 1 (first edition)



Test chart No. 1 (second edition)

STANDARDIZED TEST CHARTS FOR DOCUMENT FACSIMILE TRANSMISSIONS

(Geneva, 1980)

The CCITT,

considering

(a) that a standardized test chart to check the quality of document facsimile transmissions will have great advantages. Owing to the development of international document facsimile transmission services, a great variety of characters and symbols, including ideographic symbols, are involved and must be taken into consideration.

(b) that the many different reasons for conducting the test has led to the definition of two test charts:

– one, "transmission test chart" for evaluating the make-up of the page and the legibility of the text in the various languages used by the ITU;

– the other, "characterization test chart" for the evaluation of the technical quality parameters enabling the technicians to detect any faults;

unanimously adopts the view

(1) that tests of document facsimile transmission quality should be carried out in the international service using the CCITT standardized test charts;

(2) that these test charts should be produced by the ITU under the supervision of the CCITT and should be offered for sale by the ITU. There are two types of charts:

– "Test chart No. 2: Transmission test" intended for the general evaluation of legibility,

– "Test chart No. 3: Characterization test" intended to check the quality parameters of apparatus.

The charts are described in Annex A; the specimens printed in Annex A cannot be used for measurements;

(3) that the charts should be used with facsimile apparatus in accordance with Recommendations T.2, T.3 and T.4.

ANNEX A

(to Recommendation T.21)

Description of the standardized document facsimile test charts

1 Dimensions of the test charts

– length: 297 mm

– width: 210 mm

They are divided into sections marked:

– 2.1 - 2.16 on the Test chart No. 2 for transmission test,

– 3.1 - 3.23 on the Test chart No. 3 for characterization test.

These section markings are also used to designate the following paragraphs which describe the given section.

The characterization test chart is prepared by a process using a small frame in order to simplify production.

2 Test chart No. 2: Transmission test

This test chart contains elements permitting quantitative evaluations of distortion and character groups intended for evaluation of the readability of the facsimile document.

2.1 *4 groups of arrows and lines*

These groups permit evaluation of framing distortions of the facsimile document appearing as lost margins.

2.2 *Alternating black-white lines, thickness 0.5 mm*

The black lines on the facsimile document must be separated: this is the test of minimum acceptable definition.

2.3 *2 sets of 1 black band and 1 white band*

Limits of horizontal resolution for isolated black and white lines. The numbers placed between the two bands indicate thicknesses in microns.

2.4 *Diagonal line*

This line permits evaluation of sweep uniformity over the entire test-pattern surface.

2.5-2.6 *Black circles and concentric circles with two perpendicular diameters*

Flattening of circles along either diameter indicates differences between the transmitting and receiving devices, either in the selection of horizontal and vertical definitions or in the index of cooperation.

2.7 *Horizontal band*

Permits evaluation of vertical definition.

2.8 *Random characters*

The characters are in "Univers 8 points" and "English Times 8 points".

Certain characters are arranged in a vertical line. These groups must be reproduced legibly by all facsimile machines.

2.9 to 2.14 *Texts in English - French - Spanish - Chinese - Arabic - Russian*

They permit evaluation of the overall quality of the transmitter-receiver system by examination of the limits of readability for the small characters.

2.15 *Empty box*

Special typed or handwritten texts may be entered in this box, as required by users.

2.16 *4 scales with millimetre graduations*

These scales permit determination of distortions in length on horizontal and vertical lines by direct measurement with a graduated rule.

3 Test chart No. 3: Characterization test

This test chart permits a definition of the quantizeable limits in the performance of facsimile machines (half-tone, framing, definition, etc.).

This is a reference for the drafting of lists of characteristics for CCITT Recommendations or of technical specifications.

As such, this test chart is intended for facsimile-machine adjustment and maintenance operations.

3.1 *Band of alternating black and white lines, thickness 5 mm*

Permits measurement of scanning distortion and adjustment of the black and white levels.

3.2 *2 density level bands in complementary order*

These scales permit measurement of the scanners' analogue response curves and definition of the white/black decision threshold level in digital transmission devices.

The two bands, covering nearly the width of the page, are reversed for verification of the uniformity of the scanner's response over the entire length of the horizontal line.

The densities, varying between 0.2 and 1.5, are indicated in the margin of each of the bands.

3.3 *Black band covering the entire page width*

Permits adjustment of characteristic "black" signals through the entire sequence of the electronic devices.

3.4-3.5 *Isolated black and white lines, variable thickness, 2 complementary bands*

Using this group, it is possible to define the limits of resolution for isolated black and white lines.

Line thicknesses are indicated in microns.

3.6 *Band of alternating lines, 8 lines per mm (black and white line thickness 125 microns)*

Obliqueness: 2°

This band permits verification of the optical definition of integrated 1728-point scanners.

Obliqueness is required in order to obtain, during test pattern advance, a situation in which the points of the image are perfectly centred on the detector's photosensitive cells where the modulation depth is at a maximum.

3.7-3.8 *Strips of alternating lines, 6 lines per mm (black and white line thickness 166.6 microns)*

Zone 3.7 consists of lines with an obliqueness of 3°.

Zone 3.8 consists of vertical lines.

Zone 3.7 has the same purpose as zone 3.6, but less severe.

Zone 3.8 permits examination of limits of definition.

3.9 *Alternating lines, 4 lines per mm (black and white line thickness 250 microns)*

Permits verification of standardized facsimile-machine definition.

The black lines on the received copy must be separated.

3.10 *Alternating lines, 2 lines per mm (black and white line thickness 500 microns)*

This scale represents the minimum permittable definition for a facsimile machine. The black lines on the facsimile document must be clearly separated.

3.11 *Vertical and horizontal bundles (converging patterns)*

This group of 3 bundles of converging lines permits quantization of the limits of horizontal and vertical definitions.

The numbers shown along the bundles indicate the thickness of black and white lines in microns.

3.12 *Diagonal line*

This line is designed for evaluation of sweep uniformity over the entire test chart surface.

3.13 *Black lines, thickness 250 microns, spaced 750 microns*

3.14 *Black lines, thickness 250 microns, spaced 1000 microns*

The two scales of 3.13 and 3.14 simulate character downstrokes. They must be faithfully reproduced by facsimile.

3.15 *Black spindle and white spindle*

Permits quantization of the limits of horizontal resolution for isolated black and white lines. The numbers shown along the band indicate line thicknesses in microns.

3.16 *2 vertical lines, thickness 250 microns, spacing 1000 microns*

The purpose of this group of 2 lines is the evaluation of longitudinal jitter effect. The value of the jitter effect may be quantized by measurement of the minimum dimension reached at the spacing between the two lines.

3.17 *Decreasing-density character set*

This group of characters permits examination of the limits of reproducible density. Results obtained yield information on the effectiveness of adaptive thresholds. They also permit definition of unusable document types, due either to insufficient relative density of characters (e.g., hard pencils), or to inadequate character size, or to a combination of these two parameters.

3.18 *ISO characters* (cf NFZ 43006 - June 1965)

Correct identification of the ISO character is a guarantee of satisfactory imaging of comparable typographic characters. They therefore permit completely objective readability tests.

3.19 *Random characters*

Some of the characters are in "Univers 6 point" font.

The characters are arranged in two groups:

– a first group along horizontal lines, positioned in the lower part of the test pattern;

– a second group along vertical lines, positioned in the centre of the test pattern.

These characters permit qualitative evaluation of readability.

3.20 *Group of Chinese, Russian and Arabic characters*

This group completes the group of 3.11 and 3.19 for evaluations of readability of Chinese, Russian and Arabic characters.

3.21 *4 scales, graduation in millimetres*

These scales permit determination of distortions in length of horizontal and vertical lines by direct measurement with a graduated rule.

3.22 *4 groups of arrows and lines*

These groups permit quantization of framing defects of the facsimile document.

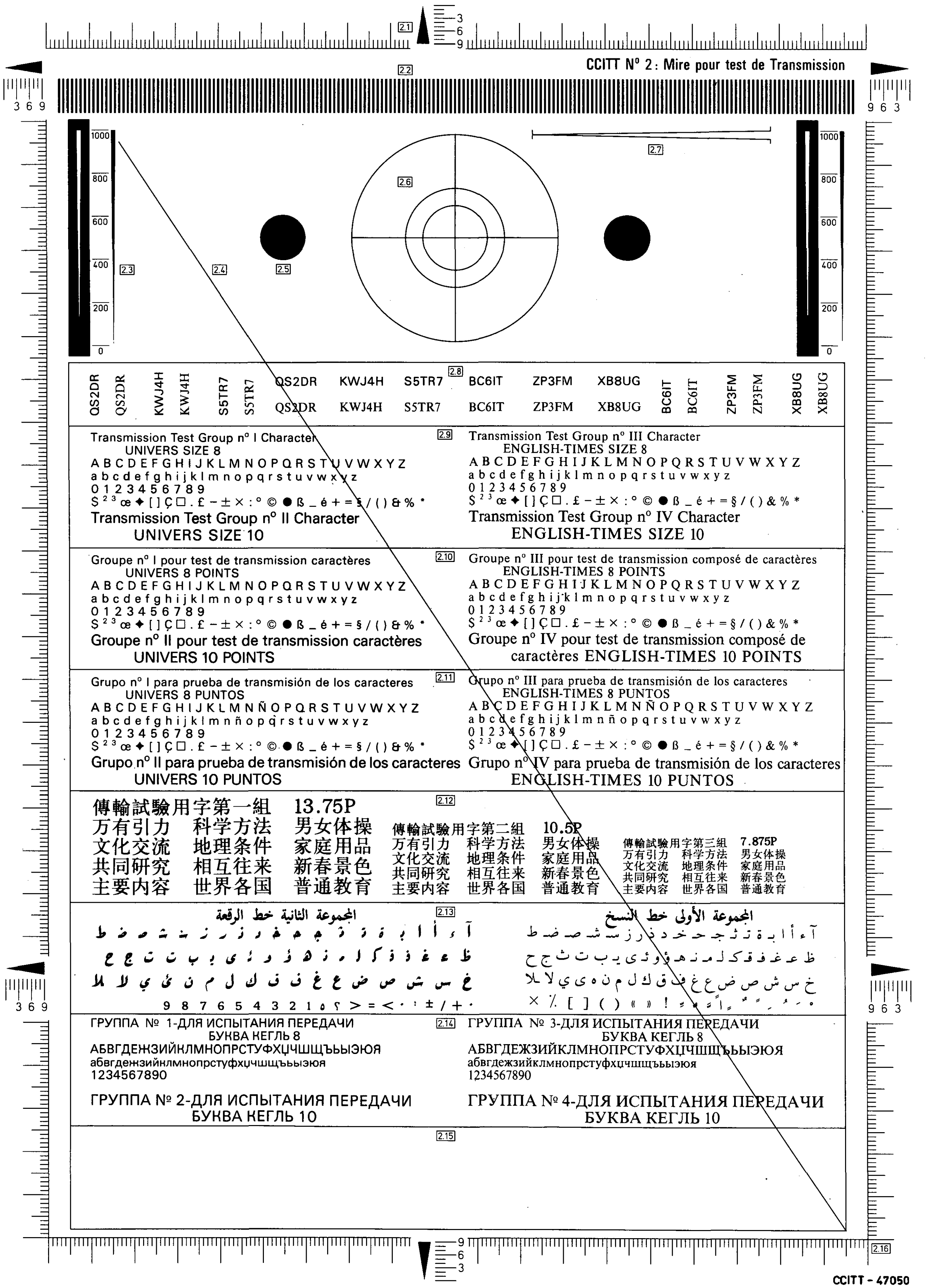
The numbers indicate distances in millimetres measured from the edge of the test pattern.

3.23 *Frame A′ A B B′*

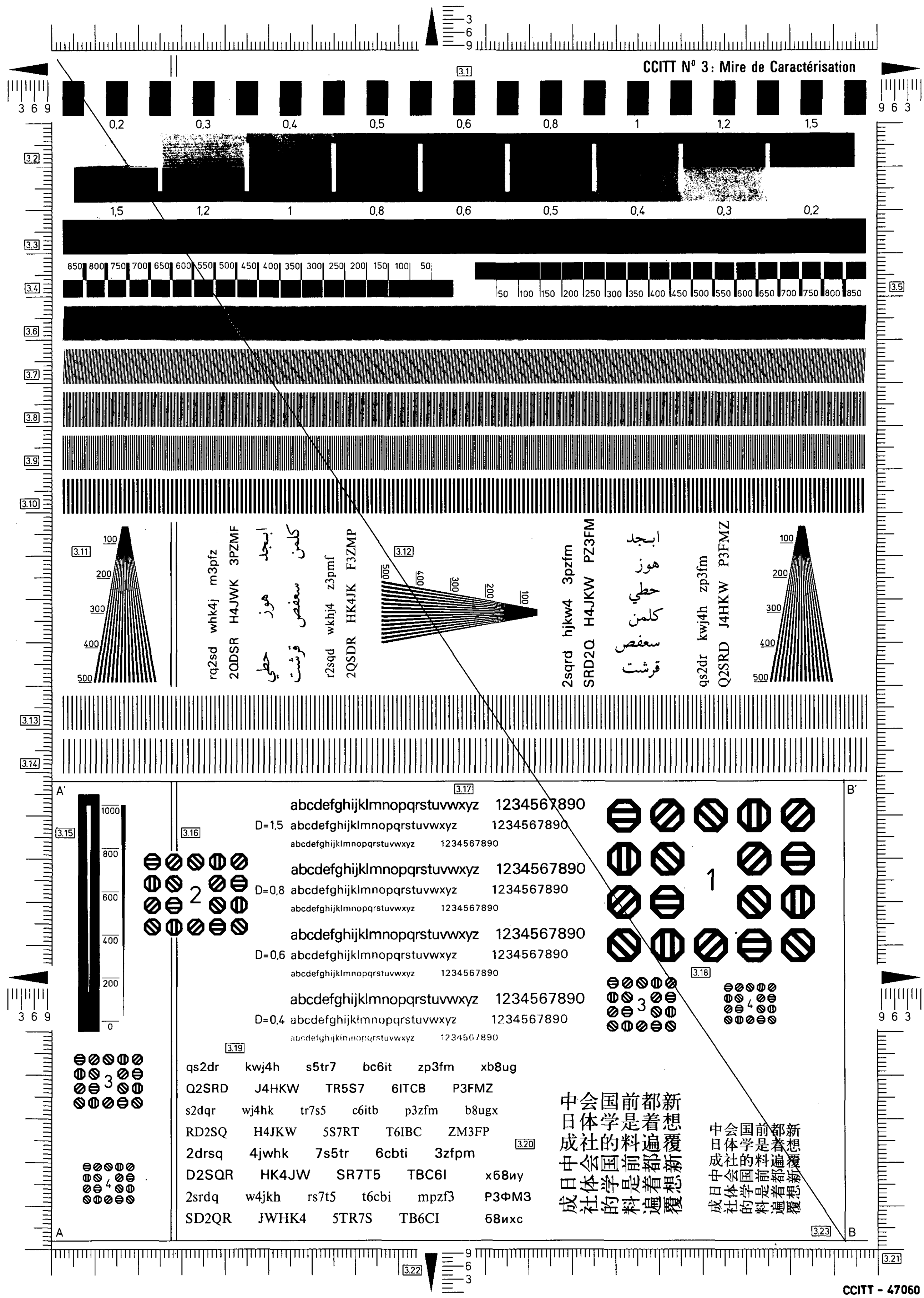
This frame permits measurement of parallelogram deformation of the image caused by time-base frequency differences.

A square placed on A B B′, with one side aligned with AB, intercepts line A′ B′ at a point B″.

Quantization may take the form of a value in millimetres for the distance B′ B″.



Test chart No. 2



Test chart No. 3

PROCEDURES FOR DOCUMENT FACSIMILE TRANSMISSION IN THE GENERAL SWITCHED TELEPHONE NETWORK [1)]

(former Recommendation T.4, Mar del Plata, 1968; amended and renumbered at Geneva, 1976 and 1980)

Introduction

i) This Recommendation is intended to apply to document facsimile apparatus covered by CCITT Recommendations T.2, T.3 and T.4. It describes the procedures and signals to be used where facsimile equipments are operated over the general switched telephone network. When existing equipments are operating in a non-CCITT manner, they shall not interfere with equipments operating in accordance with the Series T Recommendations.

ii) Arrangements for automatic calling/answering on the general switched telephone network have been aligned as closely as possible with those described in the Series V Recommendations for data terminal equipment.

iii) While there are eight possible operating methods (see Table 1/T.30) each may be described by five separate and consecutive phases:

Phase A Call set up

Phase B Pre-message procedure for identifying and selecting the required facilities

Phase C Message transmission (includes phasing and synchronization where appropriate)

Phase D Post-message procedure including end-of-message and confirmation and multi-document procedures

Phase E Call release

iv) Two separate signalling systems are described: first a simple system using single frequency tones and second a binary coded system which offers a wide range of signals for more complex operational procedures. Thus tonal signalling is restricted to manual operation at both stations or where a manually operated station intends to transmit to a called station equipped as an automatic answering receiver. Facsimile machines conforming to Recommendations T.2 and T.3 will normally use the tonal signalling system although the binary coded system may be provided in addition where complex procedures are required, e.g. comprehensive automatic functions.

v) For digital document facsimile apparatus conforming to Recommendation T.4 it is intended that the binary coded system shall be the standard signalling arrangement, but additionally a tonal signalling capability may be provided when the digital facsimile apparatus has a fallback capability to apparatus conforming to Recommendations T.2 and T.3. The binary coded signalling has priority and should be tried first; if this fails to elicit a response, tonal signalling should be attempted.

vi) The binary coded signalling system is based on a high level data link control (HDLC) format developed for data transmission procedures. The basic HDLC structure consists of a number of frames each of which is subdivided into a number of fields. It provides for frame labelling, error checking and confirmation of correctly received information and the frames can be easily extended if this should be required in the future.

vii) The transmission of the facsimile message itself (phase C) will be according to the modulation system described in the appropriate Recommendation for the facsimile apparatus.

---

1) Facsimile apparatus referred to as Groups 1, 2 or 3 in this Recommendation are those conforming to Recommendation T.2, T.3 or T.4 respectively.

CONTENTS

The CCITT,

considering

(a) that facilities exist for facsimile transmission over the general switched telephone network;

(b) that such facsimile transmission may be requested either alternatively with telephone conversation or when either or both stations are not attended;

(c) that for this reason the operations involved in establishing and/or releasing a facsimile call should be capable of automatic operation;

unanimously declares the view

that the facsimile apparatus should be designed and operated according to the following standards:

1 Scope

1.1 *General*

1.1.1 This Recommendation is concerned with the procedures which are necessary for document transmission between two facsimile stations in the general switched telephone network.

These procedures essentially comprise the following:

- call establishment and call release,
- compatibility checking, status and control command,
- checking and supervision of line conditions,
- control functions and facsimile operator recall.

1.1.2 Only the procedures with their corresponding signals are specified in this Recommendation.

1.2 *Classification of operating methods*

1.2.1 This Recommendation regulates the operational sequence of manually operated facsimile stations as well as of automatic stations.

The automatic facsimile station is understood to be a station which is capable of performing all procedures (listed in § 1.1 above) automatically. In this case, an operator is not necessary.

If, however, an operator is required for any of these procedures, the station must be regarded as a manually operated station.

1.2.2 Based upon all combinations which may result from the fact that there are manually operated stations and automatic facsimile stations, the operating methods shown in Table 1/T.30 are possible.

TABLE 1/T.30

Method No.	Description of operating method	Direction of facsimile transmission	Overall designation
1	*Manual* operation at calling station and *Manual* operation at called station	Calling station *transmits to* called station	1-T
		Calling station *receives from* called station	1-R
2	*Manual* operation at calling station and *Automatic* operation at called station	Calling station *transmits to* called station	2-T
		Calling station *receives from* called station	2-R
3	*Automatic* operation at calling station and *Manual* operation at called station	Calling station *transmits to* called station	3-T
		Calling station *receives from* called station	3-R
4	*Automatic* operation at calling station and *Automatic* operation at called station	Calling station *transmits to* called station	4-T
		Calling station *receives from* called station	4-R

Note – There may also be operating methods which will allow messages to be received by more than one station (multipoint connection).

1.3 *Station identification*

1.3.1 For the purpose of classifying an automatic facsimile station as a non-speech terminal, a tone must be transmitted to line. As both automatic calling and called facsimile stations transmit tones to line during call establishment, a normal telephone user who becomes inadvertently connected to one will receive tone signals for a period of sufficient duration to indicate clearly to him that he is incorrectly connected.

1.3.2 Additionally an automatic verbal announcement may be used which can provide station identification.

1.4 *General provisions*

1.4.1 The control signals specified in this Recommendation have been chosen in such a way that the telephone service is not affected.

1.4.2 If any malfunction of the facsimile procedures described in this Recommendation is detected, the call should be released.

1.4.3 Where the called station has automatic facsimile apparatus which is not ready or not able to operate, the call should not be answered automatically.

1.4.4 This Recommendation includes procedures for switching from facsimile to speech. However, speech facilities may be omitted if this is permitted by the regulations of the Administrations.

1.5 *Optional provisions*

1.5.1 The operator at each station may have the possibility of calling the other station at any time during the progress of the facsimile procedure (see § 2.2 below).

1.5.2 The procedures in this Recommendation allow a facsimile station to transmit and/or receive several documents successively without the aid of an operator.

1.5.3 This Recommendation includes procedures for incorporating a unique station identification command if required to prevent unauthorized stations from demanding a message.

2 Explanation of terms used

2.1 *Facsimile station main functions*

One or more equipments at the end of the line providing three main functions.

2.1.1 *Call establishment and call release*

The establishment and release of a connection according to the normal rules of using the general switched telephone network.

2.1.2 *Procedure*

To identify, to supervise and to control the facsimile transmission according to a protocol.

2.1.3 *Message transmission*

To transmit and/or receive the facsimile message.

2.2 *Time sequence of a facsimile call* (see Figure 1/T.30)

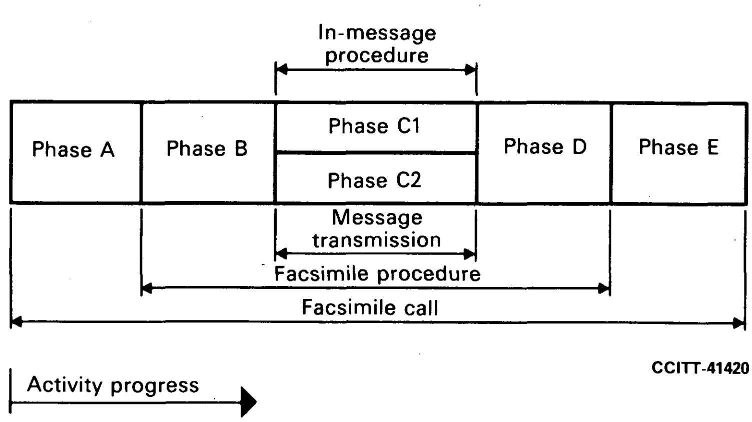


FIGURE 1/T.30

2.3 *Description of phases*

2.3.1 *Phase A – Call establishment*

Call establishment can be realized manually and/or automatically.

2.3.2 *Phase B – Pre-message procedure*

The pre-message procedure consists of the identification of capabilities and the commanding of the chosen conditions as well as the confirmation of acceptable conditions.

When connection is established between apparatus operating in accordance with this Recommendation and apparatus operating in a non-CCITT manner, the equipments should disconnect before the in-message procedure unless both equipments include optional, compatible, procedures.

2.3.2.1 *Identification section*

- group identification,
- confirmation for reception,
- subscriber identification (option),
- non-standard facilities identification (option).

2.3.2.2 *Command section*

- group command,
- phasing/training,
- synchronization,
- as well as the following optional commands:
  - non-standard facilities command,
  - subscriber identification command,
  - polling (send) command,
  - line conditioning,
  - echo suppressor disabling.

2.3.3 *Phase C1 – In-message procedure*

The in-message procedure takes place at the same time as message transmission and controls the complete signalling for in-message procedure, e.g., in-message synchronization, error detection and correction and line supervision.

2.3.4 *Phase C2 – Message transmission*

Message transmission procedure is covered by the appropriate Recommendation for the equipment.

2.3.5 *Phase D – Post-message procedure*

The post-message procedure includes information regarding:

- end-of-message signalling,
- confirmation signalling,
- multipage signalling,
- end-of-facsimile procedure signalling.

2.3.6 *Phase E – Call release*

Call release shall be realized manually and/or automatically.

3 Description of a facsimile call

3.1 *Phase A – Call establishment* [1)]

The establishment of a facsimile call may be realized either manually, if an operator is in attendance, or automatically. To accomplish this, four operating methods have been defined.

---

1) See Appendix II for abbreviations used in this Recommendation.

3.1.1 *Operating method 1*

Manual operation at both the calling and called station. Figure 2/T.30 indicates the operators' actions required to establish a call.

Call event No.	Calling station	Called station
1	Operator hears dial tone and dials desired number	
2	Operator hears ringing tone	Call rings and operator answers the call
3	Verbal identification	Verbal identification
4	Facsimile machine is switched to line	Facsimile machine is switched to line
5	Begin facsimile procedure (see §§ 4 and/or 5 of this Recommendation)	Begin facsimile procedure (see §§ 4 and/or 5 of this Recommendation)

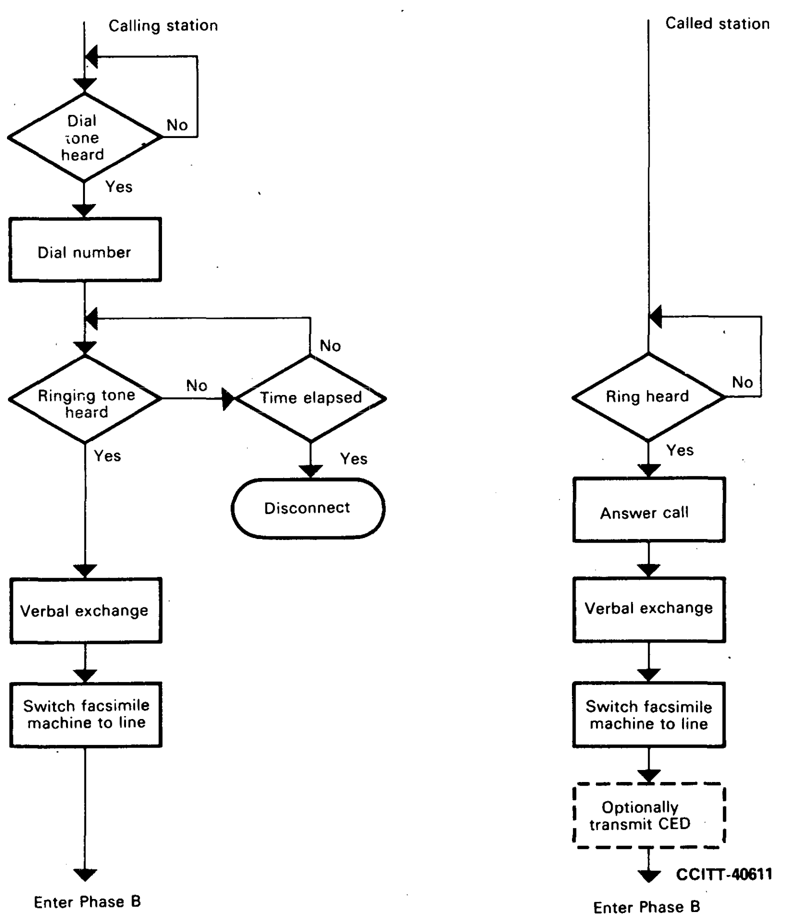


FIGURE 2/T.30

Call establishment, operating method 1

3.1.2 *Operating method 2*

Manual operation at the calling station and automatic operation at the called station. Figure 3/T.30 indicates the operator's and apparatus actions required to establish a call.

Call event No.	Calling station	Called station
1	Operator hears dial tone and dials desired number	
2	Operator hears ringing tone	Equipment detects ring and answers the call
3		Optionally, a recorded verbal announcement may be transmitted
4	Operator hears CED and facsimile machine is switched to line	Transmit CED
5	Begin facsimile procedure (see §§ 4 and/or 5 of this Recommendation)	Begin facsimile procedure (see §§ 4 and/or 5 of this Recommendation)

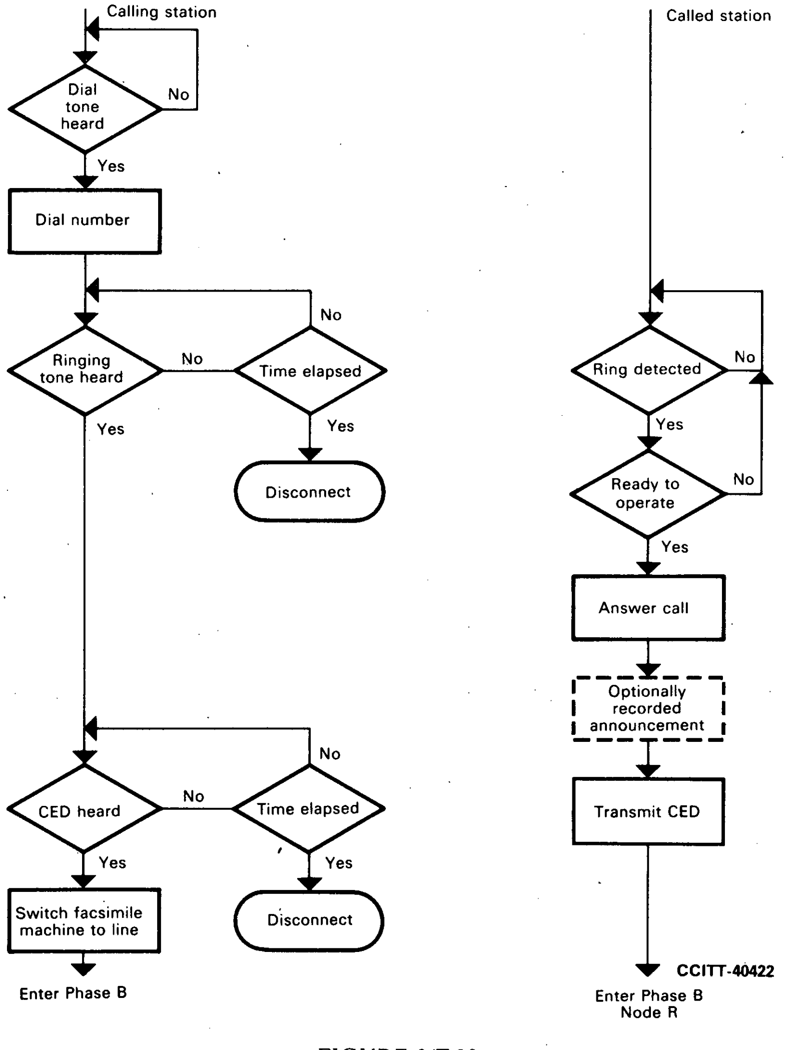


FIGURE 3/T.30

Call establishment, operating method 2

3.1.3 *Operating method 3*

Automatic operation at the calling station and manual operation at the called station. Figure 4/T.30 indicates the operator's and apparatus actions required to establish a call.

Call event No.	Calling station	Called station
1	Equipment detects dial tone and dials desired number (see Note). To clearly indicate to a called operator that he is connected to a facsimile machine or to a normal telephone user that he is inadvertently connected, CNG will be transmitted to line during the time that signals are attempted to be detected *Note* — An alternative procedure may be specified by Administrations	
2		Call rings and operator answers the call
3		Operator detects CNG and switches facsimile machine to line (optionally CED may be generated)
4	Begin facsimile procedure (see § 5 of this Recommendation)	Begin facsimile procedure (see § 5 of this Recommendation)

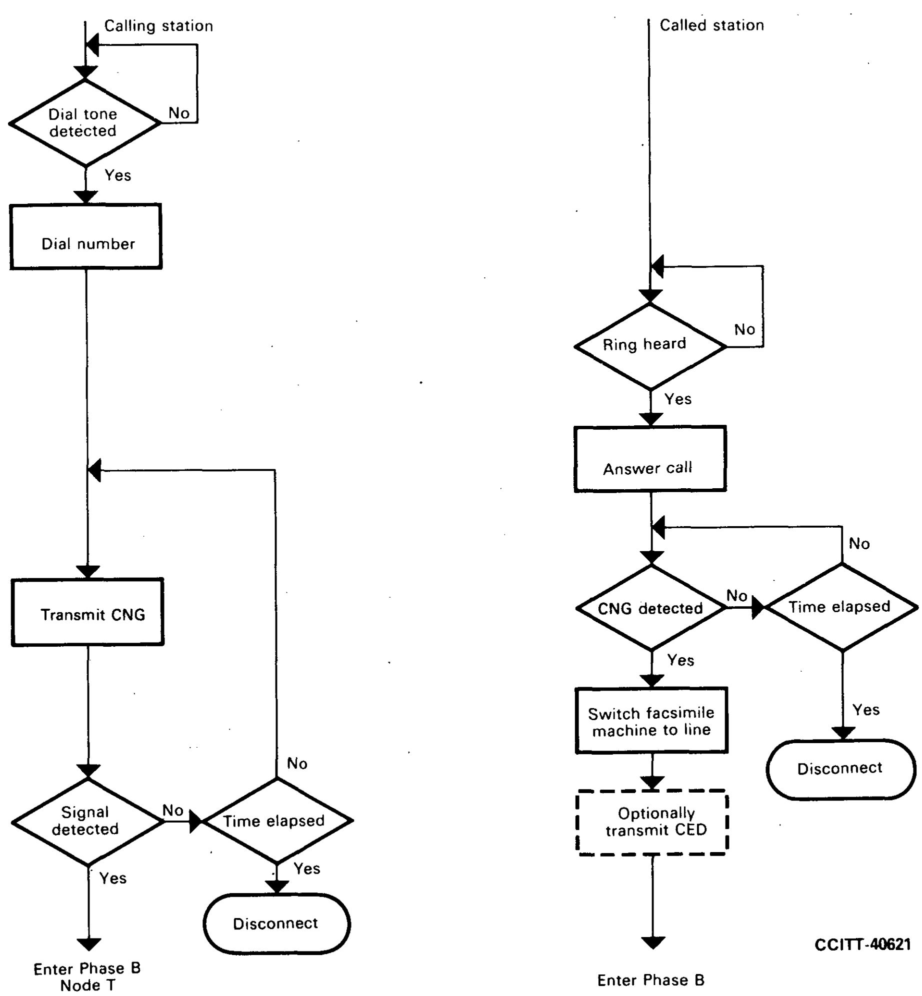


FIGURE 4/T.30
Call establishment, operating method 3

3.1.4 *Operating method 4*

Automatic operation at both the calling and called stations. Figure 5/T.30 indicates the actions required by the apparatus to establish a call.

Call event No.	Calling station	Called station
1	Equipment detects dial tone and dials desired number (see Note). To clearly indicate to a normal telephone user that he is inadvertently connected, CNG will be transmitted to line during the time that signals are attempted to be detected. *Note* – An alternative procedure may be specified by Administrations	
2		Equipment detects ring and answers the call
3		Optionally, a recorded verbal announcement may be transmitted
4		Transmit CED
5	Begin facsimile procedure (see § 5 of this Recommendation)	Begin facsimile procedure (see § 5 of this Recommendation)

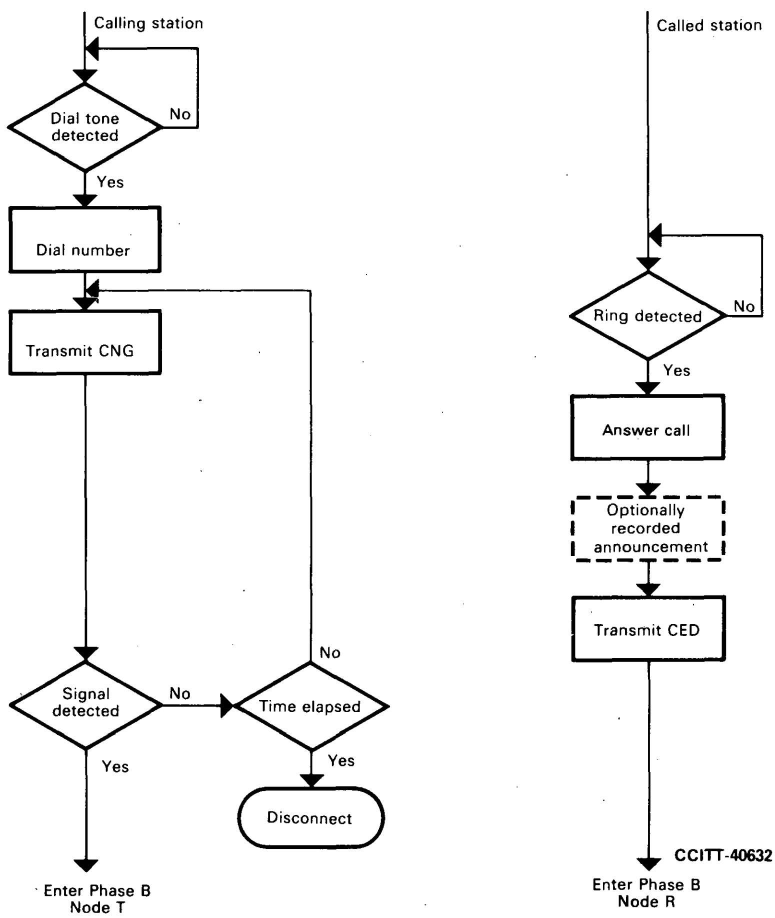


FIGURE 5/T.30
Call establishment, operating method 4

3.2 *Phases B, C and D – Facsimile procedure*

When entering phase B, the following rules should be adhered to:

All manual receivers and all auto-answering units must enter phase B by identifying their capabilities (i.e. Node R of the flow diagram in § 4.2 or 5.2). All manual transmitters and all auto-calling units must enter phase B prepared to detect the capabilities and issue the appropriate mode setting command (i.e. Node T of the flow diagram in § 5.2). To allow for operating method 2-R, the delay between the transmission of the digital identification signals shall be 4.5 seconds ± 15% when sent from a manual facsimile receiver.

The detailed information pertaining to the tonal and binary coded facsimile procedures is contained in §§ 4 and 5 below. The relationship between these two procedures and an overview regarding the total system operation is given in the following:

3.2.1 *The interaction between tonal and binary coded procedures*

Facsimile procedures, as described in this Recommendation, may be realized in two different ways:

– tonally, with a limited number of tones for simple procedures (see § 4 below) and

– binary coded, for more comprehensive procedures (see § 5 below).

Binary coded signalling is especially desirable for machines which use:

– comprehensive automatic functions;

– digital concepts internally (e.g. redundancy reduction techniques);

– fast transmission rates (in order to keep pre- and post-message time short compared to total transmission time);

– special security features.

Recommendations concerning the interaction between tonal and binary coded signalling recognize the principle of the priority of coded procedures such that, when available, binary coded signalling shall be tried first. The interaction steps are as follows:

– The unattended called station shall answer a call with the CED signal.

– The unattended calling station shall indicate a call with the CNG signal.

– Whenever it is capable of binary coded signalling, the called station will start with binary coded signalling.

– Facsimile stations being capable of tonal signalling only will start tonally.

– Facsimile stations being capable of both binary coded and tonal signalling will send a sequence of signals, the first being a binary coded signal and the second and all following signals being a composite of tonal and binary coded information.

– If the calling station reacts binary coded then the binary coded signalling goes on through all control procedures.

– If the calling station reacts tonally, then the tonal signalling goes on through all procedures.

An example of a station having both binary-coded and tonal capabilities is shown in Figure 6/T.30 for further clarification.

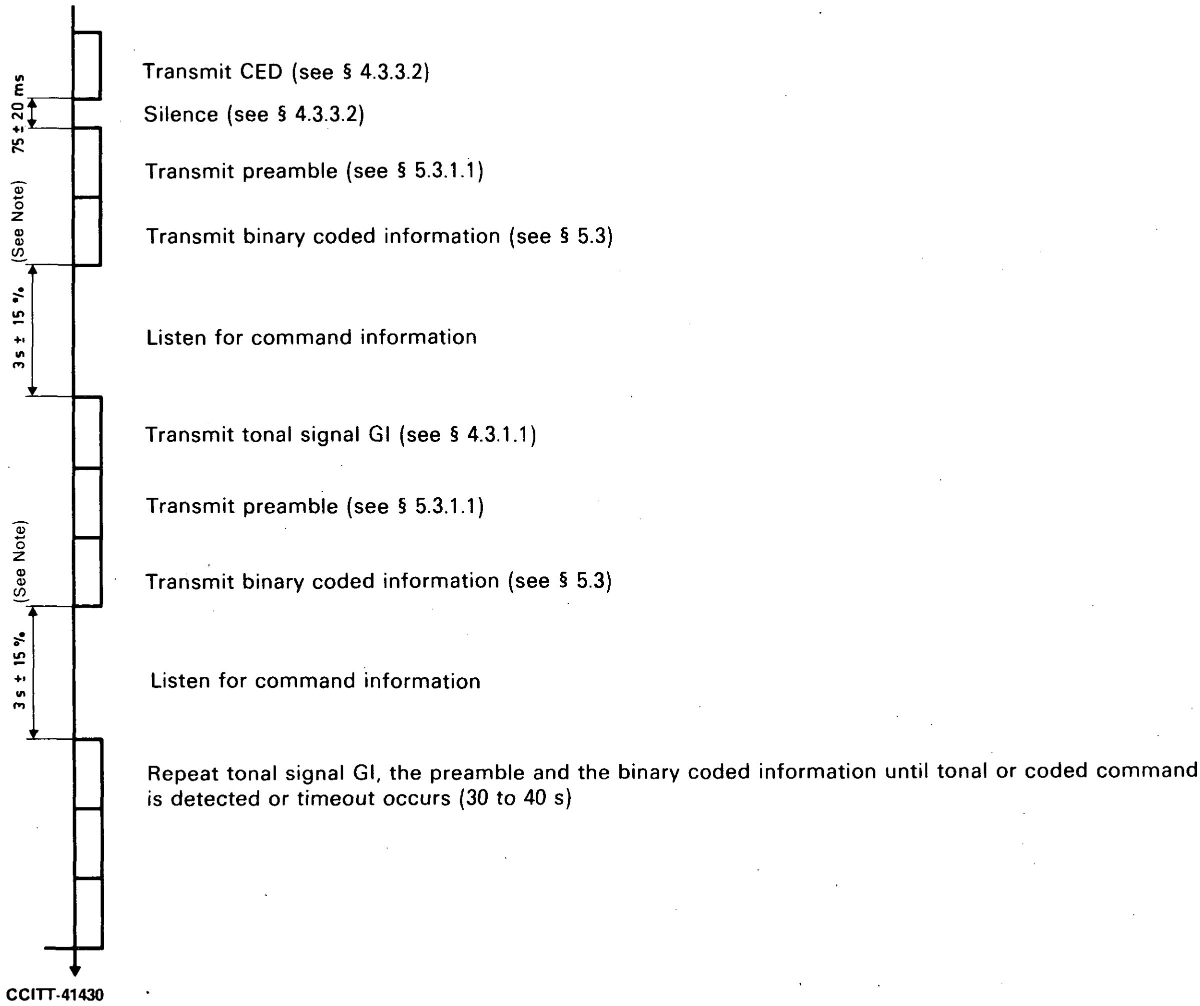
3.2.2 *Signal sequences*

The recommended system utilizes the interchange of signals between the two equipments to verify compatibility and assure operation. To do this, the called station identifies its capabilities tonally (in the simplest configuration) and/or binary coded. The calling station responds to this accordingly with a command tonally or binary coded. Now the transmitter continues phase B.

Following the transmission of the message, the transmitter sends an end-of-message signal and the receiver confirms reception. Multiple documents can then be transmitted by the repetition of this procedure.

The flow of signals is shown in Figure 7/T.30 for the configuration where the calling station is transmitting. These signals may be tonal or binary coded, subject to the conditions of § 3.2.1 above.

Called station procedure



Note – For manual receivers using the binary coded procedure, this delay should be 4.5 s ± 15%.

FIGURE 6/T.30

Binary-tonal identification signal

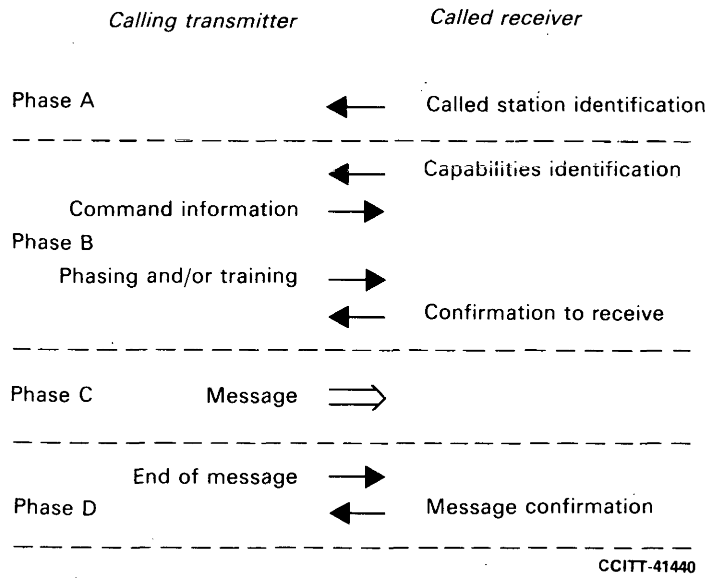


FIGURE 7/T.30
Calling station is transmitting

The condition where the calling station is to receive documents is shown in Figure 8/T.30. The simple tonal systems do not provide this capability.

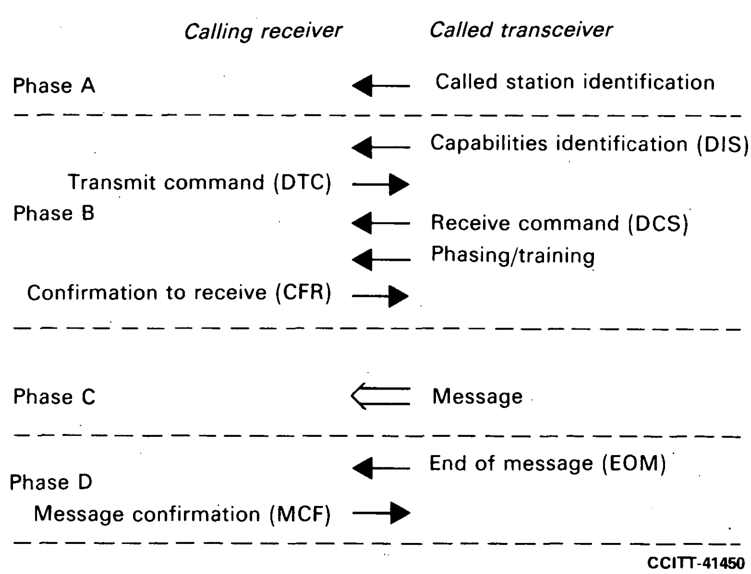


FIGURE 8/T.30
Calling station is receiving

3.3 *Phase E – Call release*

Call release occurs after the last post-message signal of the procedure or under certain conditions, e.g.:

3.3.1 *Time out*

When a signal as specified by the facsimile procedure is not received within the specified time-out period, the apparatus may signal to the operator (if one is in attendance) or disconnect the telephone connection. The appropriate time-out periods are specified in §§ 4 and 5 below.

3.3.2 *Procedural interrupt*

The facsimile procedure may be interrupted by sending a procedural interrupt signal, by notifying the attending operator or by disconnecting the connection. The signal is defined in §§ 4 and 5 below.

3.3.3 *Command*

In the case where binary coded procedures are utilized, the call may be immediately terminated by the binary coded system commands, as specified in § 5 below.

4 **Tonal signalling for facsimile procedure**

This signalling system covers operating methods 1-T and 2-T and has to be implemented for apparatus operating according to Recommendations T.2 and T.3.

4.1 *Description*

Phases B and C

Transmitter	Receiver
	1. Transmit GI
2. GI detected	
3. Select appropriate group	
4. Transmit GC	
5. Transmit phasing	
	6. Detect GC and phasing Select group and phase
	7. Transmit CFR
8. Detect CFR	
9. Transmit message	

Phase D

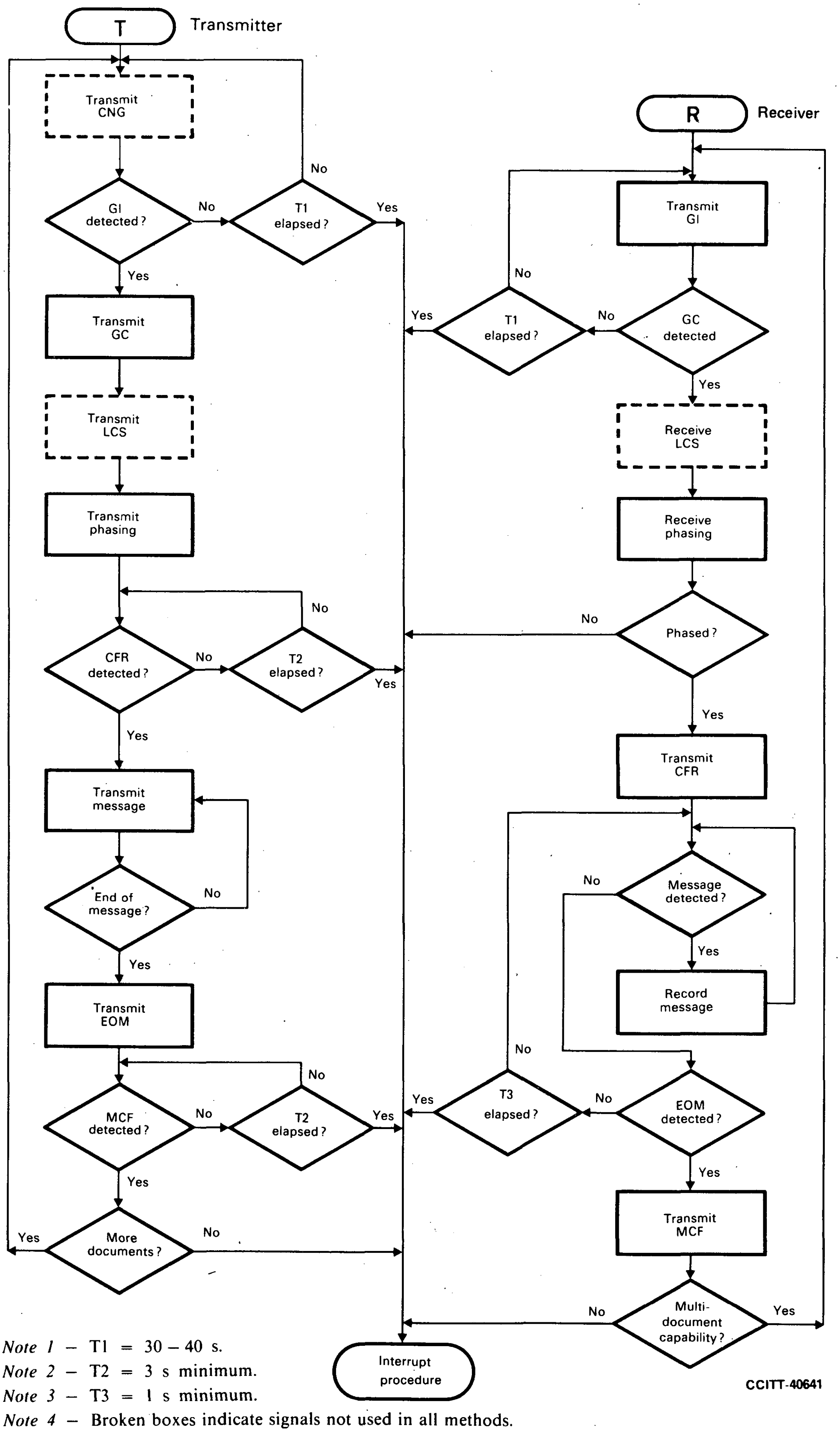
Single-document transmitter	Multi-document receiver
1. Transmit EOM	
	2. Detect EOM
	3. Transmit MCF
	4. Prepare for next document
5. Detect MCF Switch back to telephone Operator loads document	
	6. When ready to receive transmit GI
7. Operator hears GI and switches machine to line	
8. Detect GI	
9. Transmit GC	
Continue phases B and C	

Multi-document transmitter	Single-document receiver
1. Transmit EOM	
	2. Detect EOM
	3. Transmit MCF
	4. Switch back to telephone Operator loads paper
5. Detect MCF and prepare for next document	
6. When ready to transmit, transmit CNG (optional)	
	7. Operator hears CNG and switches machine to line
	8. Transmit GI
9. Detect GI	
10. Transmit GC	
Continue phases B and C	

Multi-document transmitter to multi-document receiver and single document facsimile apparatus operate accordingly.

Note – It is acknowledged that there are existing equipments in the field that may not conform in all aspects to this Recommendation. Therefore, the decision may be made to go to a mode of operation other than specified herein. The diagram of Appendix I describes, as an example, one of these conditions. Other methods may be possible as long as they do not interfere with the recommended operation.

4.2 *Flow diagram* (Figure 9/T.30)



Note 1 – T1 = 30 – 40 s.

Note 2 – T2 = 3 s minimum.

Note 3 – T3 = 1 s minimum.

Note 4 – Broken boxes indicate signals not used in all methods.

FIGURE 9/T.30

4.3 *Tonal signal functions and formats*

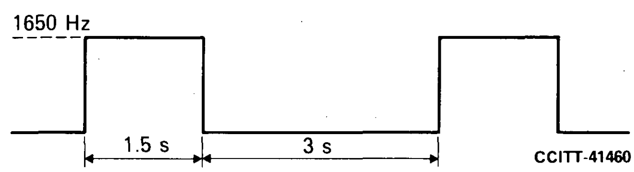
The signals used are single frequencies to line. The equipment used to detect the signal should be capable of functioning correctly with the frequency tolerances quoted plus an additional tolerance of ± 6 Hz due to the line.

4.3.1 *Facsimile receiver signals (signals transmitted by the receiver)*

4.3.1.1 *Group identification (GI) signals*

4.3.1.1.1 *GI 1 (Group 1)*

Format (Figure 10/T.30)



Note – Tolerances: timing ± 15%; frequency ± 6 Hz.

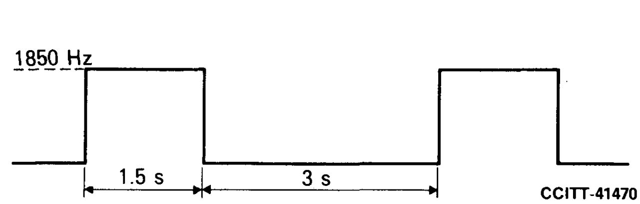
FIGURE 10/T.30

Function

1) To indicate the apparatus is in the receive mode and capable of receiving at least one page in the Group 1 mode.
2) The signal is repeated until detection of GC or time T1 elapses.

4.3.1.1.2 *GI 2 (Group 2)*

Format (Figure 11/T.30)



Note – Tolerances: timing ± 15%; frequency ± 6 Hz.

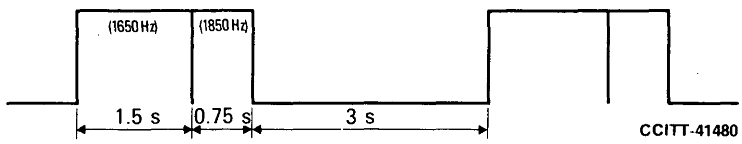
FIGURE 11/T.30

Function

1) To indicate the apparatus is in the receive mode and is capable of receiving at least one page in the Group 2 mode.
2) The signal is repeated until detection of GC or time T1 elapses.

4.3.1.1.3 *GI 1/2 (Group 1/2)*

Format (Figure 12/T.30).



Note – Tolerances: timing ± 15%; frequency ± 6 Hz.

FIGURE 12/T.30

Function

1) To indicate the apparatus is in the receive mode and is capable of receiving at least one page in the Group 1 or Group 2 mode. The apparatus is capable of adjusting automatically to the speed of the transmitting.

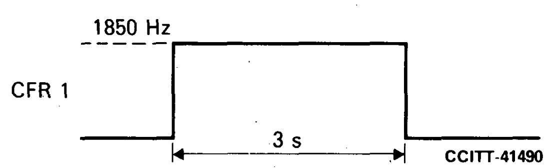
2) The signal is repeated until detection of GC or time T1 elapses.

Note – To prevent confusing the repeating GI signal with the busy tone, it may be required by certain Administrations that a delay be incorporated prior to answering the call.

4.3.1.2 *Confirmation to receive (CFR) signals*

4.3.1.2.1 *CFR 1 (Group 1)*

Format (Figure 13/T.30)



Note – Tolerances: timing ± 15%; frequency ± 6 Hz.

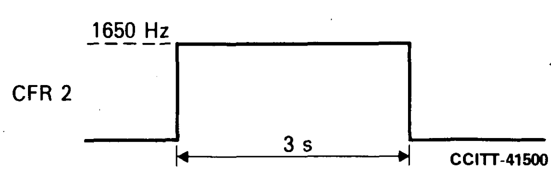
FIGURE 13/T.30

Function

To indicate that the receiver has phased and is ready to receive at least one page in the Group 1 mode. The signal must start after the completion of the phasing signal at the receiver with a maximum delay of one second.

4.3.1.2.2 *CFR 2 (Group 2)*

Format (Figure 14/T.30)



Note – Tolerances: timing ± 15%; frequency ± 6 Hz.

FIGURE 14/T.30

Function

To indicate that the receiver has phased and is ready to receive at least one page in the Group 2 mode. The signal must start after the completion of the phasing signal at the receiver with a maximum delay of one second.

4.3.1.3 *Message confirmation (MCF) signal*

4.3.1.3.1 *MCF 1 (Group 1)*

Format

The same frequency and duration as for CFR 1.

Tolerances: timing ± 15%; frequency ± 6 Hz.

Function

To indicate that the receiver has received one page in Group 1 mode.

4.3.1.3.2 *MCF 2 (Group 2)*

Format

The same frequency and duration as for CFR 2.

Tolerances: timing ± 15%; frequency ± 6 Hz.

Function

To indicate that the receiver has received one page in the Group 2 mode.

Note – The MCF signal must start a maximum of 0.5 second after the completion of the EOM signal (see § 4.3.2.4) at the receiver.

4.3.2 *Facsimile transmitter signals (signals transmitted by the transmitter)*

4.3.2.1 *Group command (GC) signal*

Format

GC1 = 1300 Hz ± 32 Hz for a duration of more than 1.5 seconds and less than 10 seconds.

GC2 = 2100 Hz ± 10 Hz for a duration of more than 1.5 seconds and less than 10 seconds.

Function

To indicate to the receiver the Group that the transmitter has chosen. The GC signal starts at the end of the capabilities identification signal with a maximum delay of 1 second as measured on the line at the transmitter.

4.3.2.2 *Line conditioning signals (LCS)*

Format

As in Recommendation T.3.

Function

1) To enable a receiver to equalize the line.

2) This is an optional signal and non-transmission should not affect compatibility.

4.3.2.3 *Phasing*

Format and function

As defined by Recommendations T.2 and T.3.

4.3.2.4 *End-of-message (EOM) signal*

Format

1100 Hz ± 38 Hz. Timing: 3 seconds ± 15% immediately following the message.

Function

To indicate phase C has been completed.

4.3.3 *Common signals*

4.3.3.1 *Procedure interrupt signal (PIS) (applicable in both directions)*

Format

462 Hz ± 1.5 Hz for 3 seconds minimum.

Function

1) To stop a distant machine.

2) May be used as operator recall.

Note 1 — This is an optional signal.

Note 2 — Some Administrations have in use national telephone signalling systems which may interpret this signal as a clearing signal. This may cause clear down of the connection.

Note 3 — Some machines use this signal as a disconnect signal only when the receiver detects this signal immediately after transmitting MCF or transmitting MCF/GI and, in either case, before a subsequent GI.

Note 4 — The satisfactory operation of the PIS signal cannot be guaranteed in the presence of, for example, echo suppressors.

4.3.3.2 *Called station identification (CED)*

At 1.8 to 2.5 seconds after the called station is connected to the line, it sends a continuous 2100 Hz ± 15 Hz tone for a duration of not less than 2.6 seconds and not more than 4.0 seconds.

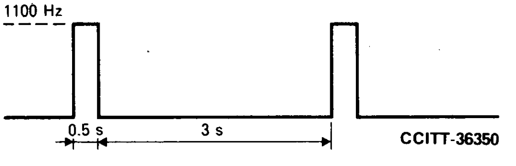
The called station delays for a period of 75 ± 20 milliseconds after terminating the CED tone before transmitting further signals.

Function

To indicate a called non-speech terminal.

4.3.3.3 *Calling tone (CNG)*

Format (Figure 15/T.30)



1100 Hz, ON for 0.5 second, OFF for 3 seconds.

Note — Tolerances: timing ± 15%; frequency 1100 Hz ± 38 Hz.

FIGURE 15/T.30

Function

1) To indicate a calling non-speech terminal. This signal is mandatory for automatic calling units and optional for manual units.

2) To indicate that the apparatus is in the transmit mode and is ready to transmit on receipt of the appropriate GI.

3) Where an apparatus is capable of sending more than one document without the necessity of operator assistance, this signal may be transmitted between documents whilst the transmitter is waiting for the appropriate GI. It would indicate to an operator that the transmitter was still connected to line.

Note — It should generally be assumed that for Group 1 and Group 2 transmissions, echo suppressors may be in the circuit.

5 Binary coded signalling for facsimile procedure

For Group 1 and Group 2 machines that require additional facilities to those provided by the procedures described in § 4 above, the binary coded control procedures should be transmitted in a synchronous mode at 300 bits per second.

For Group 3 machines, 300 bits per second is the standard data signalling rate for the transmission of binary coded procedural data. Additionally, signalling of the binary coded procedural data at 2400 bits per second is allowed as a recognized option.

Except as otherwise noted, the binary coded control procedures should be transmitted in a synchronous mode on the general switched telephone network at 300 bits per second ± 0.01% utilizing the characteristics of the Recommendation V.21 channel No. 2 modulation system. (For the tolerances, see § 3 of Recommendation V.21 [1].) Signal generators should have a distortion not exceeding 1% and the control signal receivers should accept signals with a distortion not exceeding 40%.

Note 1 – For Group 3 machines, the transmission of training, TCF, and all in-message signals, shall be at the data rate of the high-speed message channel.

Note 2 – It is acknowledged that existing equipments may not conform in all aspects to this Recommendation. Other methods may be possible as long as they do not interfere with the recommended operation.

Note 3 – Transmission of signals utilizing the modulation system of Recommendation V.21 [1] channel No. 2 should be followed by a delay of 75 ± 20 milliseconds before the signalling, utilizing a different modulation system commences, (e.g. the delay between DCS and the Recommendation V.27 *ter* [2] or V.29 [3] training sequence).

Note 4 – The transmission of signalling utilizing the modulation systems of Recommendation V.27 *ter* [2] or Recommendation V.29 [3] should be followed by a delay of 75 ± 20 milliseconds before the signalling, utilizing a different modulation system, commences (e.g. the delay between RTC and MPS).

5.1 *Description*

Phases B, C and D

Case 1: Calling station wishes to transmit (see Figure 7/T.30).

Calling station	Called station
	1. Transmit DIS
2. DIS detected	
3. Transmit DCS	
	4. DCS detected
	5. Select mode
6. Transmit phasing/training	
	7. Phasing/training
	8. Transmit CFR
9. Detect CFR	
10. Transmit message	
	11. Receive message
12. At end of message send either: a) EOM or b) EOP or c) MPS or d) PRI-Q	
	13. Detect EOM, EOP, MPS or PRI-Q
	14. Transmit one of the confirmation signals of post-message responses (see § 5.3.6.1.7)

Note – Binary coded signals must be preceded by a preamble (see § 5.3.1 below).

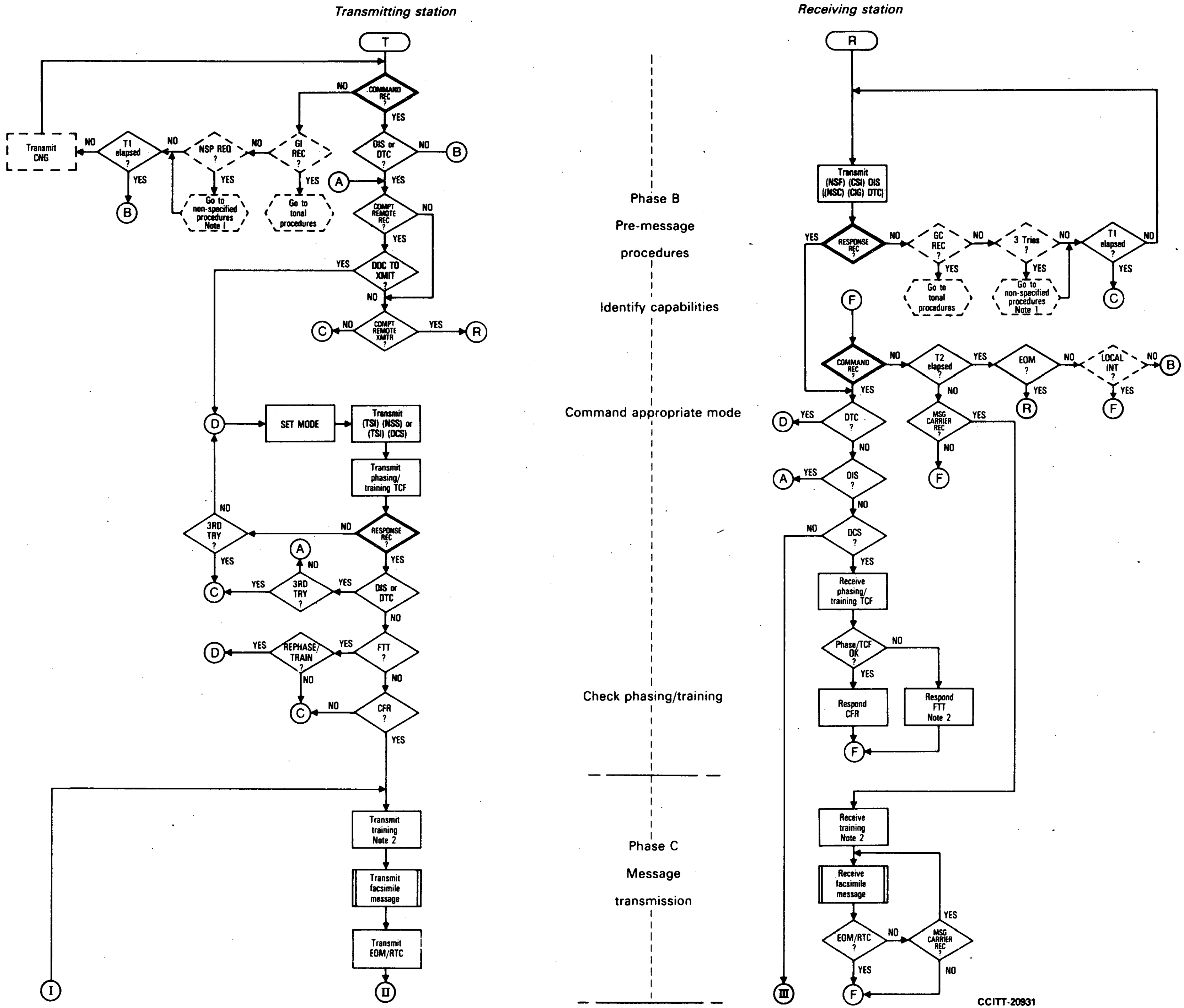
Case 2: Calling station wishes to receive (see Figure 8/T.30).

Calling station	Called station
	1. Transmit DIS
2. DIS detected	
3. Transmit DTC	
	4. DTC detected
	5. Transmit DCS
6. DCS detected	
7. Select mode	
	8. Transmit Training/Phasing
9. Training/Phasing	
10. Transmit CFR	
	11. Detect CFR
	12. Transmit message
13. Receive message	
	14. At end of message send either: a) EOM or b) EOP or c) MPS or d) PRI-Q
15. Detect EOM, EOP, MPS or PRI-Q	
16. Transmit one of the confirmation signals of post-message responses (see § 5.3.6.1.7)	

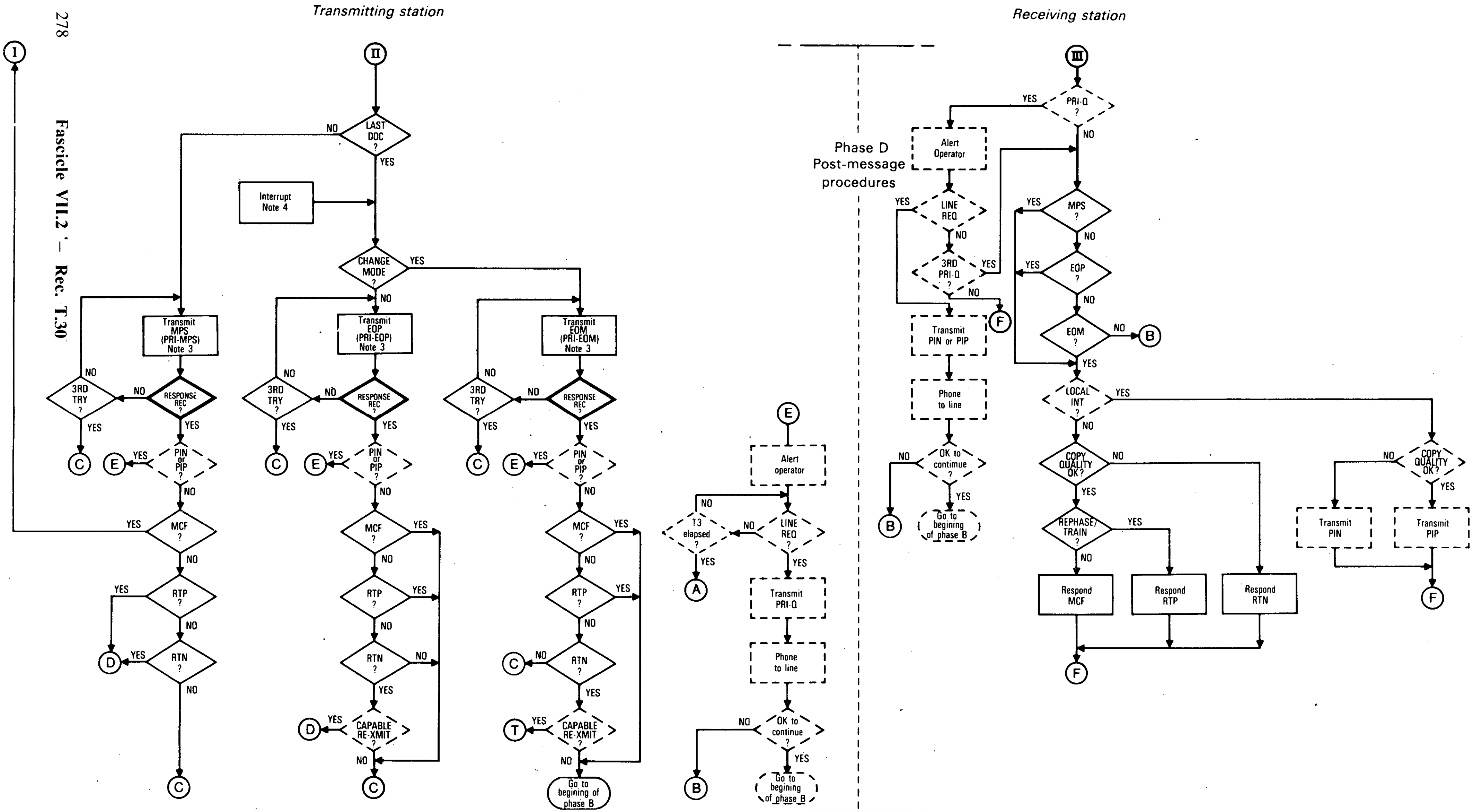
Note – Binary coded signals must be preceded by a preamble (see § 5.3.1 below).

5.2 *Flow diagrams* (see also Appendix IV)

For the Notes and an explanation of terms to the flow diagrams, see § 5.2.1.



(See the following page)

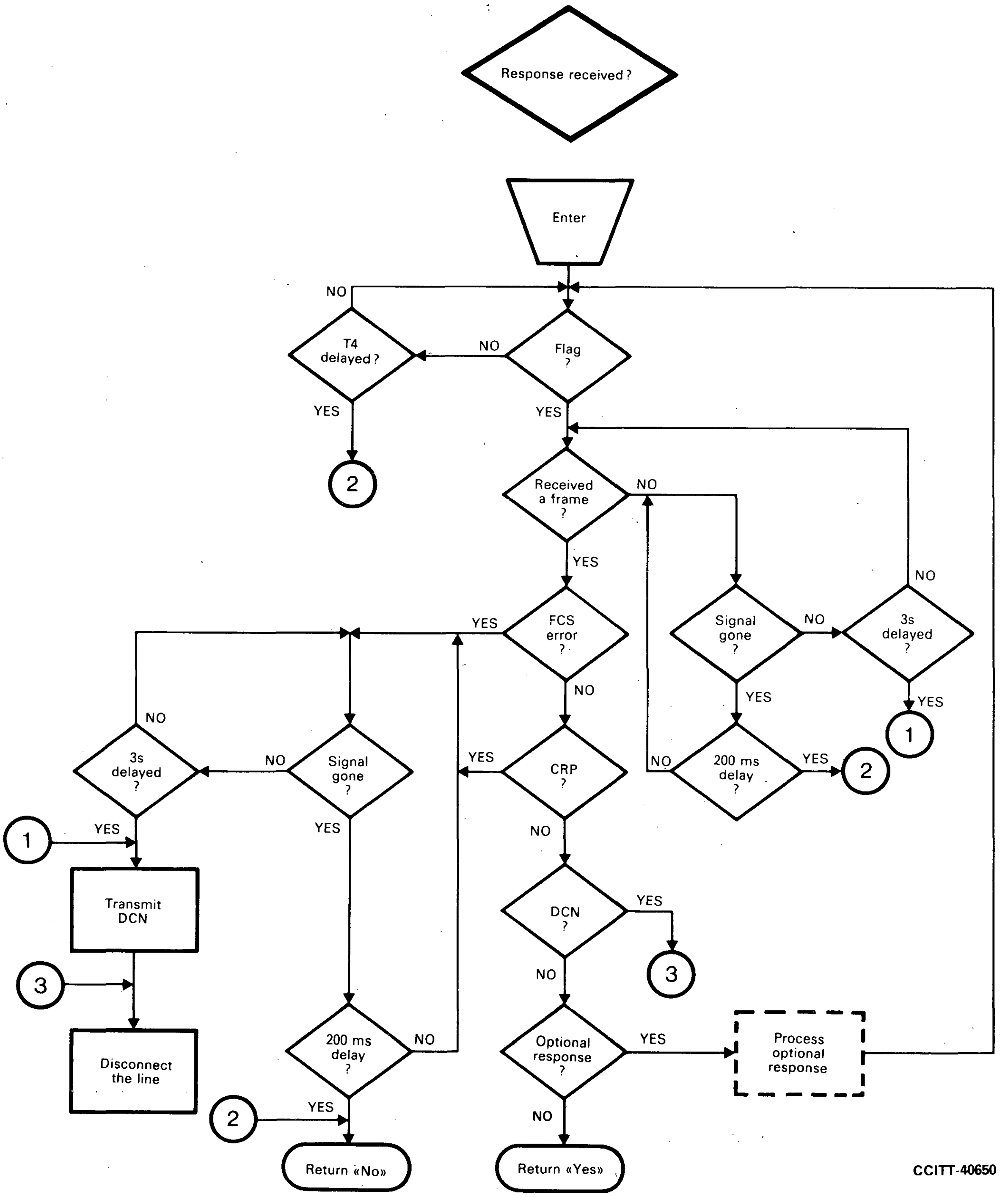


Timers

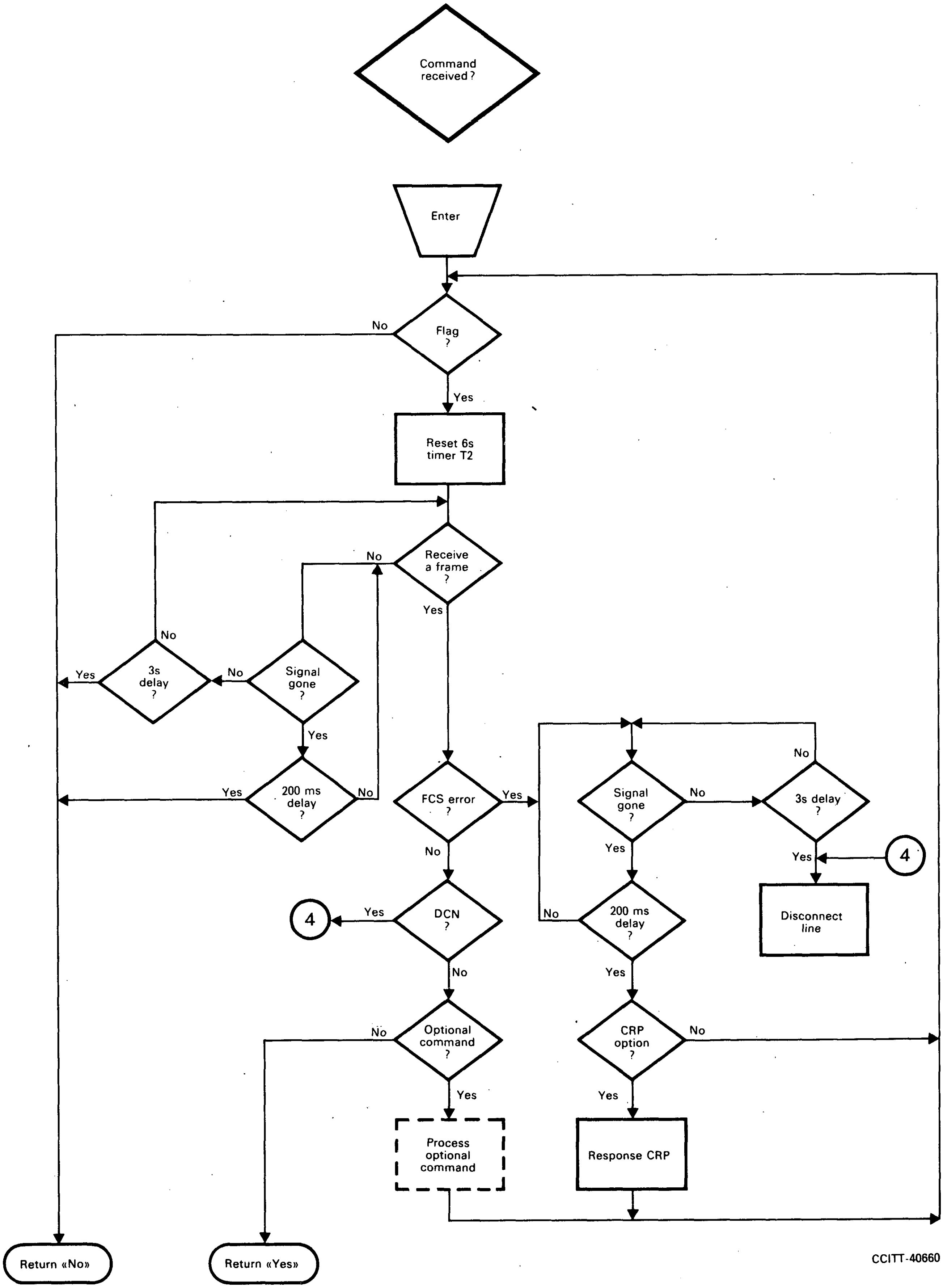
T1 = 35 + 5 s
T2 = 6 + 1 s
T3 = 10 + 5 s

CCITT-20932

(See the preceding page)



T4 = 4.5s ± 15%, for manual units
T4 = 3.0s ± 15%, for automatic units

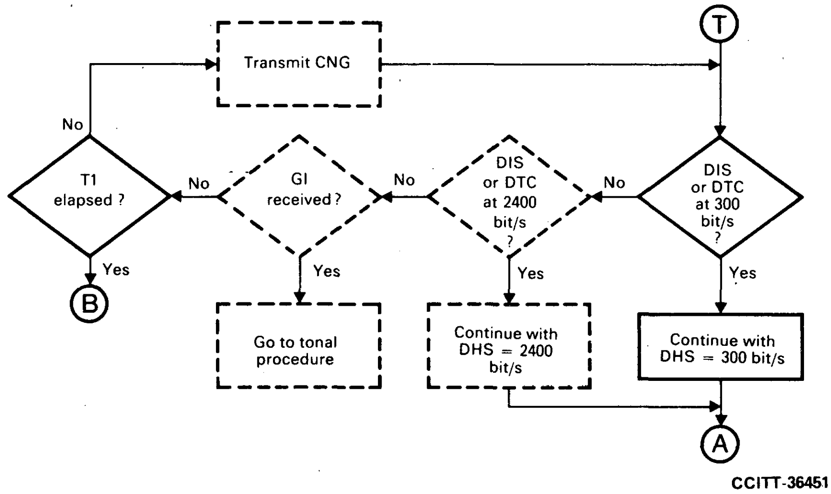


Command received ?
Enter
Flag ?
No
Yes
Reset 6s timer T2
Receive a frame ?
No
Yes
3s delay ?
Yes
No
Signal gone ?
No
Yes
200 ms delay ?
Yes
No
FCS error ?
Yes
No
Signal gone ?
No
Yes
3s delay ?
No
Yes
4
Disconnect line
DCN ?
Yes
No
4
200 ms delay ?
No
Yes
Optional command ?
No
Yes
Process optional command
CRP option ?
No
Yes
Response CRP
Return «No»
Return «Yes»

CCITT-40660

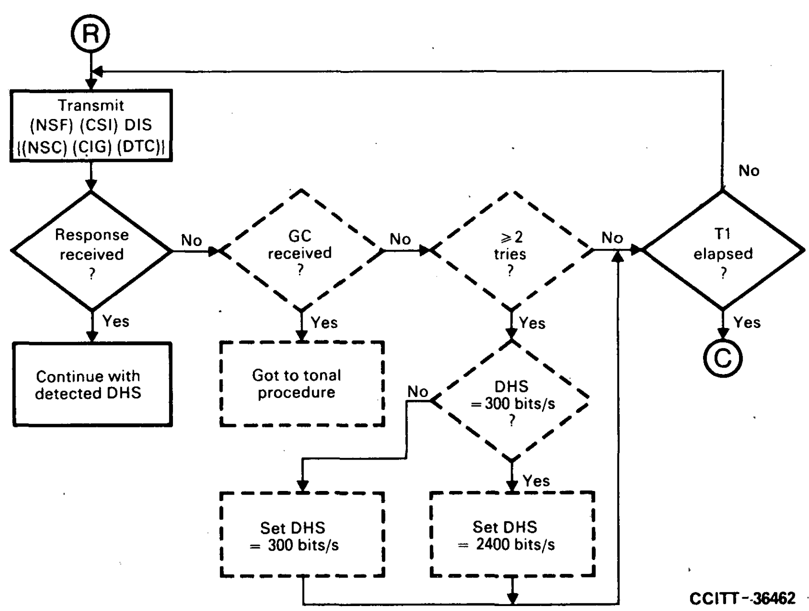
Interworking between the standard mode (300 bit/s) and the recognized optional mode (2400 bit/s) for the binary coded handshaking procedure is provided by an alternating method.

Left-hand side of beginning of phase B of the flow diagram



Note – DHS = Digital handshaking speed Dotted lines = optional

Right-hand side of beginning of phase B of the flow diagram



Note – The station listens to a response at 300 bits/s (2400 bit/s) after transmitting a command at 300 bit/s (2400 bit/s) and continues with the detected DHS.

5.2.1 *Flow diagram key*

COMMAND REC — The "command received" subroutine searches for an error-free standard command. The decision diamonds in the flow diagram refer to the most recent standard command received (e.g., EOM, MPS, etc.).

COMPT REMOTE REC	The FIF associated with the DIS has indicated a "compatible remote receiver".
DOC TO XMIT	The station has "at least one document to be transmitted".
COMPT REMOTE XMTR	The FIF associated with the DIS has indicated a "compatible remote transmitter" which has documents to send.
RESPONSE REC	The "response received" subroutine which searches for an error-free standard response.
LAST DOC	The "last document", for the given operating mode, has been transmitted.
SET MODE	The system controller will "set the appropriate mode" of operation.
3RD TRY	The command has been repeated three times without an appropriate response.
CAPABLE RE-XMIT	The transmitting station is "capable of retransmitting" a document which was not received with acceptable quality.
MSG CARRIER REC	The "message channel carrier has been received". This carrier is 1800 Hz for the Group 3 modulation scheme, and 1700 Hz for the Group 3 optional modulation scheme, 2100 Hz for the Group 2 modulations, and 1300-2100 Hz for the Group 1 modulation scheme.
PHASE/TRAIN OK	The phasing/training-TCF signal has been analyzed and the results of "phasing/training were OK".
CHANGE MODE	The transmitting unit desires to exit from the transmitting mode of operation and reestablish the capabilities.
NSP REQ	A "non-specified procedure" has been "recognized" by a unit compatible with the station initiating that procedure.
COPY QUALITY OK	By some algorithm, the "copy quality was deemed OK".
REPHASE/ TRAIN	By some algorithm, it is deemed desirable to transmit a new phasing/training signal.
FLAG	There has been the detection of a "flag".
RECEIVE A FRAME	The unit has "received one complete HDLC frame".
FCS ERROR	The HDLC frame received contained an "FCS error".
OPTIONAL RESPNS	The HDLC frame received contained one of the listed "optional responses".
OPTIONAL COMMAND	The HDLC frame received contained one of the listed "optional commands".
CRP OPTION	The facsimile unit has the "CRP option" and can, therefore, request an immediate retransmission of the most recent command.
LOCAL INT	Either the "local" machine or the "local" operator wishes to generate an interrupt of the standard facsimile procedures. An operator would use this as a means to request the establishment of voice contact.
LINE	This means that the local operator has "requested" that the telephone line be connected to REQJthe handset for voice contact with the remote end.
PRI-Q	A general term referring to either PRI-EOM, a PRI-MPS, or a PRI-EOP post-message command, i.e., the fifth bit of the standard post-message command is set to 1.

Note 1 – The non-specified procedure, NSP, refers to a procedure which takes 6 seconds or less to complete. It may not necessarily be a definable signal sequence.

Note 2 – This signal pertains to Group 3 apparatus only.

Note 3 – The PRI-EOM, PRI-EOP, PRI-MPS post-message commands are sent when a local interrupt request is pending.

Note 4 – At any time during the operation an interrupt may be generated which would result in a procedural interrupt. It is understood that if this interrupt happens during the transmission of the document, the EOM/RTC signal will be transmitted prior to invoking the procedural interrupt.

Note 5 – Where the symbol / is used, the term to the left of the symbol refers to Groups 1 and 2 equipment, and the term to the right of the symbol refers to Group 3 equipment.

Note 6 – Where the symbols { } are used, the signals within these symbols are a response to DIS from the calling unit wishing to receive.

Note 7 – Where the symbols ( ) are used, the signals within these symbols are optional.

5.3 *Binary coded signal functions and formats*

An HDLC frame structure is utilized for all binary coded facsimile control procedures. The basic HDLC structure consists of a number of frames, each of which is subdivided into a number of fields. It provides for frame labelling, error checking and confirmation of correctly received information.

More specifically, the example in Figure 16/T.30 of a format is used for binary coded signalling. This example shows an initial identification sequence (see § 5.3.6.1.1 below).

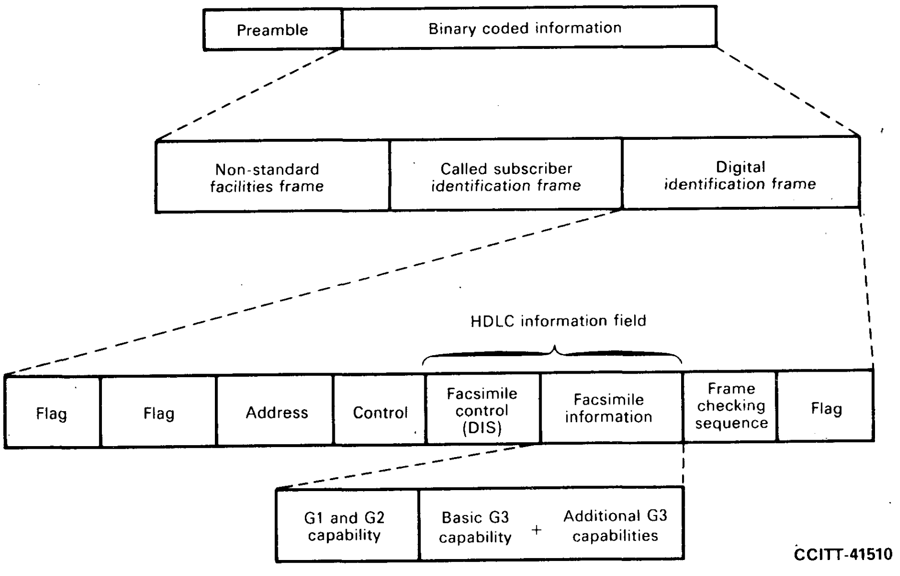


FIGURE 16/T.30

In the following descriptions of the fields it is intended that the information bits be transmitted in the order as printed, i.e. from left to right.

The equivalent between binary notation symbols and the significant conditions of the signalling code should be in accordance with Recommendation V.1 [4].

5.3.1 *Preamble*

The preamble shall precede all binary coded signalling whenever a new transmission of information begins in any direction (i.e. for each line turnaround). This preamble assures that all elements of the communication channel (e.g. echo suppressors) are properly conditioned so that the subsequent data may be passed unimpaired. This preamble may take the following forms:

5.3.1.1 The preamble for binary coded signalling at 300 bit/s shall be a series of flag sequences for 1s ± 15%.

5.3.1.2 For the optional binary coded procedure at 2400 bit/s, the preamble shall be the long training modem sequence defined in Recommendation T.4.

5.3.2 *Message/signalling delineation*

5.3.2.1 Where Group 1 or Group 2 modulation techniques are employed, the delineation is obtained by the transmission of the tonal EOM signal as defined in § 4.3.2.4. This signals the T.2 or T.3 modulation system to drop off the line and be replaced by the T.30 binary coded modulation system.

5.3.2.2 When Group 3 modulation technique is employed, the delineation is obtained by the transmission of the RTC signal as defined in § 4.1.4 of Recommendation T.4. This signals the T.4 modulation system to drop off the line and be replaced by the T.30 binary coded modulation system.

5.3.2.3 The transmission of the delineation signal, either the tonal EOM signal or the RTC signal, shall be followed by a delay or 75 ± 20 ms before the T.30 binary coded modulation system commences to transmit.

5.3.3 *Flag sequence*

The eight bit HDLC flag sequence is used to denote the beginning and end of the frame. For facsimile procedure, the flag sequence is used to establish bit and frame synchronization. To facilitate this, the preamble defined in § 5.3.1 should be used prior to the first frame. Subsequent frames need only one flag sequence.

Continued transmission of the flag sequence may be used to signal to the distant station that the machine remains on line but is not presently prepared to proceed with the facsimile procedure.

Format: 0111 1110

5.3.4 *Address field*

The eight bit HDLC address field is intended to provide identification of specific station(s) in a multi-point arrangement. In the case of transmission on the general switched telephone network, this field is limited to a single format.

Format: 1111 1111

5.3.5 *Control field*

The eight bit HDLC control field provides the capability of encoding the commands and responses unique to the facsimile control procedures.

Format: 1100 X000

X = 0 for non-final frames within the procedure, X = 1 for final frames within the procedure. A final frame is defined as the last frame transmitted prior to an expected response from the distant station.

5.3.6 *Information field*

The HDLC information field is of variable length and contains the specific information for the control and message interchange between two facsimile stations. In this Recommendation it is divided into two parts, the facsimile control field (FCF) and the facsimile information field (FIF).

5.3.6.1 *Facsimile control field (FCF)*

The facsimile control field is defined to be the first eights bits of the HDLC information field. This field contains the complete information regarding the type of information being exchanged and the position in the overall sequence. The bit assignments within the FCF are as follows:

Where X appears as the first bit of FCF, X will be defined as follows:

X is set to 1 by the station which receives a valid DIS signal;

X is set to 0 by the station which receives a valid and appropriate response to a DIS signal;

X will remain unchanged until the station again enters the beginning of phase B.

5.3.6.1.1 *Initial identification*

From the called to the calling station.

Format: 0000 XXXX

1) *Digital identification signal (DIS)* – Characterizes the standard CCITT capabilities of the called apparatus.

Format: 0000 0001

2) *Called subscriber identification (CSI)* – This optional signal may be used to provide the specific identity of the called subscriber by its international telephone number (see § 5.3.6.2.4, CSI coding format).

Format: 0000 0010

3) *Non-standard facilities (NSF)* – This optional signal may be used to identify specific user requirements which are not covered by the Series T Recommendations.

Format: 0000 0100

5.3.6.1.2 *Command to send*

From a calling station wishing to be a receiver to a called station which is capable of transmitting.

Format: 1000 XXXX

1) *Digital transmit command (DTC)* – The digital command response to the standard capabilities identified by the DIS signal.

Format: 1000 0001

2) *Calling subscriber identification (CIG)* – This optional signal indicates that the following FIF information is an identification of that calling station. It may be used to provide additional security to the facsimile procedure (see § 5.3.6.2.5, CIG coding format).

Format: 1000 0010

3) *Non-standard facilities command (NSC)* – This optional signal is the digital command response to the information contained in the NSF signal.

Format: 1000 0100

5.3.6.1.3 *Command to receive*

From the transmitter to the receiver.

Format: X100 XXXX

1) *Digital command signal (DCS)* – The digital set-up command responding to the standard capabilities identified by the DIS signal.

Format: X100 0001

2) *Transmitting subscriber identification (TSI)* – This optional signal indicates that the following FIF information is the identification of the transmitting station. It may be used to provide additional security to the facsimile procedures. (See § 5.3.6.2.6, TSI coding format).

Format: X100 0010

3) *Non-standard facilities set-up (NSS)* – This optional signal is the digital command response to the information contained in the NSC or NSF signal.

Format: X100 0100

4) *Training check (TCF)* – This digital command is sent through the T.4 modulation system to verify training and to give a first indication of the acceptability of the channel for this data rate.

Format: A series of 0s for 1.5 s ± 10%.

Note – No HDLC frame is required for this command.

5.3.6.1.4 *Pre-message response signals*

From the receiver to the transmitter.

Format: X010 XXXX

1) *Confirmation to receive (CFR)* – A digital response confirming that the entire pre-message procedure has been completed and the message transmissions may commence.

Format: X010 0001

2) *Failure to train (FTT)* – A digital response rejecting the Group 3 training signal and requesting a retraining.

Format: X010 0010

5.3.6.1.5 *In-message procedure*

From the transmitter to the receiver. In case of Group 3 machines the in-message procedure formats and specific signals shall be consistent with Recommendation T.4. In-message procedures for Group 1 and Group 2 are defined in Recommendations T.2 and T.3 respectively.

5.3.6.1.6 *Post message commands*

From the transmitter to the receiver.

Format: X111 XXXX

1) *End-of-message (EOM)* – To indicate the end of a page of facsimile information and to return to the beginning of phase B.

Format: X111 0001

2) *Multipage signal (MPS)* – To indicate the end of a page of facsimile information and to return to the beginning of phase C upon receipt of a confirmation.

Format: X111 0010

3) *End-of-procedures (EOP)* – To indicate the end of a page of facsimile information and to further indicate that no further documents are forthcoming and to proceed to phase E, upon receipt of a confirmation.

Format: X111 0100

4) *Procedure interrupt – End-of-message (PRI-EOM)* – To indicate the same as an EOM command with the additional optional capability of requesting operator intervention. If operator intervention is accomplished, further facsimile procedures shall commence at the beginning of phase B.

Format: X111 1001

5) *Procedure interrupt – Multipage signal (PRI-MPS)* – To indicate the same as an MPS command with the additional optional capability of requesting operator intervention. If operator intervention is accomplished, further facsimile procedures shall commence at the beginning of phase B.

Format: X111 1010

6) *Procedure interrupt – End-of-procedure (PRI-EOP)* – To indicate the same as an EOP command with the additional optional capability of requesting operator intervention. If operator intervention is accomplished, further facsimile procedures shall commence at the beginning of phase B.

Format: X111 1100

5.3.6.1.7 *Post-message responses*

From the receiver to the transmitter.

Format: X011 XXXX.

1) *Message confirmation (MCF)* – To indicate that a complete message has been received and that additional messages may follow. (This is a positive response to MPS or EOM.)

Format: X011 0001

2) *Retrain positive (RTP)* – To indicate that a complete message has been received and that additional messages may follow after retransmission of training and/or phasing and CFR.

Format: X011 0011

3) *Retrain negative (RTN)* – To indicate that the previous message has not been satisfactorily received. However, further receptions may be possible, provided training and/or phasing are retransmitted.

Format: X011 0010

4) *Procedural interrupt positive (PIP)* – To indicate that a message has been received but that further transmissions are not possible without operator intervention. Failing operator intervention and if further documents are to follow, the facsimile procedure shall begin at the beginning of phase B.

Format: X011 0101

5) *Procedure interrupt negative (PIN)* – To indicate that the previous (or in-process) message has not been satisfactorily received and that further transmissions are not possible without operator intervention. Failing operator intervention and if further documents are to follow, the facsimile procedure shall begin at the beginning of phase B.

Format: X011 0100

5.3.6.1.8 *Other line control signals*

For the purpose of handling errors and controlling the state of the line.

Format: X101 XXXX

1) *Disconnect (DCN)* – This command indicates the initiation of phase E (call release). This command requires no response.

Format: X101 1111

2) *Command repeat (CRP)* – This optional response indicates that the previous command was received in error and should be repeated in its entirety (i.e., optional frames included).

Format: X101 1000

5.3.6.2 *Facsimile information field (FIF)*

In many cases the FCF will be followed by the transmission of additional 8-bit octets to further clarify the facsimile procedure. This information for the basic binary coded system would consist of the definition of the information in the DIS, DCS, DTC, CSI, CIG, TSI, NSC, NSF and NSS signals.

5.3.6.2.1 *DIS standard capabilities*

Additional information fields will be transmitted immediately following the DIS facsimile control field. The first 8 bits of this information relate to Group 1 and Group 2 apparatus and subsequent bits relate to Group 3 apparatus. The bit assignment for this information is given in Table 2/T.30 where a 1 indicates the condition is valid, except where specifically noted otherwise (e.g. bits 11, 12 and 21, 22, 23).

5.3.6.2.2 *DCS standard commands*

When issuing the command, bits 1, 4 and 9 shall be set to 0. The DCS standard commands are formatted as shown in Table 2/T.30.

5.3.6.2.3 *DTC standard command*

The DTC standard capabilities are formatted as shown in Table 2/T.30.

5.3.6.2.4 *CSI coding format*

The facsimile information field of the CSI signal shall be the international telephone number including the telephone country code, area code, and subscriber number. This field shall consist of 20 numeric digits coded as shown in Table 3/T.30. The least significant bit of the least significant digit shall be the first bit transmitted.

TABLE 2/T.30

Bit No.	DIS/DTC	DCS
1	Transmitter - T.2 operation	
2	Receiver - T.2 operation	Receiver - T.2 operation
3	T.2 IOC = 176	
4	Transmitter - T.3 operation	
5	Receiver - T.3 operation	Receiver - T.3 operation
6	Reserved for future T.3 operation features	
7	Reserved for future T.3 operation features	
8	Reserved for future T.3 operation features	
9	Transmitter - T.4 operation	
10	Receiver - T.4 operation	Receiver - T.4 operation
11,12 (0,0) (0,1) (1,0) (1,1)	Data signalling rate V.27*ter*[2] fallback mode V.27*ter*[2] V.29 [3] V.27*ter*[2] and V.29 [3]	Data signalling rate 2400 bit/s V.27*ter*[2] 4800 bit/s V.27*ter*[2] 9600 bit/s V.29 [3] 7200 bit/s V.29 [3]
13	Reserved for new modulation system	
14	Reserved for new modulation system	
15	Vertical resolution =7.7 line/mm	Vertical resolution = 7.7 line/mm
16	Two-dimensional coding capability	Two-dimensional coding
17	Maximum width of paper 256 mm (B4)	Maximum width of paper 256 mm (B4)
18	Maximum width of paper 297 mm (A3)	Maximum width of paper 297 mm (A3)
19	Maximum length of paper 364 mm (B4)	Maximum length of paper 364 mm (B4)
20	Unlimited length of paper	Unlimited length of paper

TABLE 2/T.30 *(end)*

Bit No.	DIS/DTC	DCS
21,22,23 (0,0,0) (0,0,1) (0,1,0) (1,0,0) (0,1,1) (1,1,0) (1,0,1) (1,1,1)	Minimum scan line time capability at the receiver 20 ms at 3.85 l/mm; $T_{7.7} = T_{3.85}$ 40 ms at 3.85 l/mm; $T_{7.7} = T_{3.85}$ 10 ms at 3.85 l/mm; $T_{7.7} = T_{3.85}$ 5 ms at 3.85 l/mm; $T_{7.7} = T_{3.85}$ 10 ms at 3.85 l/mm; $T_{7.7} = 1/2\ T_{3.85}$ 20 ms at 3.85 l/mm; $T_{7.7} = 1/2\ T_{3.85}$ 40 ms at 3.85 l/mm; $T_{7.7} = 1/2\ T_{3.85}$ 0 ms at 3.85 l/mm; $T_{7.7} = T_{3.85}$	Minimum scan line time 20 ms 40 ms 10 ms 5 ms 0 ms
24	Extend field	Extend field
25	2400 bit/s handshaking	2400 bit/s handshaking
26	Uncompressed mode	Uncompressed mode
27	Unassigned	
28	Unassigned	
29	Unassigned	
30	Unassigned	
31	Unassigned	
32	Extend field	Extend field

Note 1 – Standard facsimile units conforming to T.2 must have the following capability: Index of cooperation (IOC) = 264.

Note 2 – Standard facsimile units conforming to T.3 must have the following capability: Index of cooperation (IOC) = 264.

Note 3 – Standard facsimile units conforming to T.4 must have the following capability: Paper length = 297 mm.

Note 4 – Where the DIS or DTC frame defines V.27 *ter* [2] capabilities, the equipment may be assumed to be operable at either 4800 or 2400 bit/s.
Where the DIS or DTC frame defines V.29 [3] capabilities, the equipment may be assumed to be operable at either 9600 or 7200 bit/s per V.29.

Note 5 – $T_{7.7}$ and $T_{3.85}$ refer to the scan line times to be utilized when the vertical resolution is 7.7 lines/mm or 3.85 lines/mm, respectively (see bit 15 above). $T_{7.7} = 1/2\ T_{3.85}$, indicates that in the high resolution mode, the scan line time can be decreased by half.

Note 6 – The standard FIF field for the DIS, DTC and DCS signals is 24 bits long. If the «extended field» bit(s) is a 1, the FIF field shall be extended by an additional eight bits.

TABLE 3/T.30

Digit	MSB (FB)	Bits	LSB
0	0	011000	0
1	0	011000	1
2	0	011001	0
3	0	011001	1
4	0	011010	0
5	0	011010	1
6	0	011011	0
7	0	011011	1
8	0	011100	0
9	0	011100	1
Space	0	010000	0

MSB Most significant bit
LSB Least significant bit
FB Fill bit

5.3.6.2.5 *CIG coding format*

The facsimile information field of the CIG signal shall be the international telephone number including the telephone country code, area code and subscriber number. This field shall consist of 20 numeric digits coded as shown in Table 3/T.30. The least significant bit of the least significant digit shall be the first bit transmitted.

5.3.6.2.6 *TSI coding format*

The facsimile information field of the TSI signal shall be the international telephone number including the telephone country code, area code and subscriber number. This field shall consist of 20 numeric digits coded as shown in Table 3/T.30. The least significant bit of the least significant digit shall be the first bit transmitted.

5.3.6.2.7 *Non-standard capabilities (NSF, NSC, NSS)*

When a non-standard capabilities FCF is utilized, it must be immediately followed by a FIF. This information field will consist of at least two octets. The first two octets will contain the unique registered CCITT members' code (see Note below). Additional information could then be transmitted within the FIF field. This information is not specified and can be used to describe non-standard features, etc.

Note – The procedure for filing for the registered CCITT members' code is under study (Questions 21/I [5] and 11/VIII [6]).

5.3.7 *Frame checking sequences (FCS)*

The FCS shall be a 16 bit sequence. It shall be the 1s complement of the sum (modulo 2) of:

1) the remainder of x^k $(x^{15} + x^{14} + x^{13} + \ldots + x^2 + x + 1)$ divided (modulo 2) by the generator polynominal $x^{16} + x^{12} + x^5 + 1$, where k is the number of bits in the frame existing between, but not including, the final bit of the opening flag and the first bit of the FCS, excluding bits inserted for transparency, and

2) the remainder after multiplication by x^{16} and then division (modulo 2) by the generator polynominal $x^{16} + x^{12} + x^5 + 1$ of the content of the frame, existing between, but not including, the final bit of the opening flag and the first bit of the FCS, excluding bits inserted for transparency.

As a typical implementation, at the transmitter, the initial remainder of the division is preset to all 1s and is then modified by division by the generator polynominal (as described above) on the address, control and information fields; the 1s complement of the resulting remainder is transmitted as the 16-bit FCS sequence.

At the receiver, the initial remainder is preset to all 1s and the serial incoming protected bits and the FCS when divided by the generator polynominal will result in a remainder of 0001110100001111 (x^{15} through x^0, respectively) in the absence of transmission errors.

The FCS shall be transmitted to the line commencing with the coefficient of the highest term.

5.4 *Binary coded signalling implementation requirements*

5.4.1 *Commands and responses*

Whereas § 5.2 defines a flow diagram to give an accurate example of the typical use of the binary coded procedures, these procedures are defined specifically in terms of the actions that occur on receipt of commands by the receiving station (see § 5.3).

A response must be sent, and only sent, upon detecting a valid command. Upon receiving a valid response, a new command must be issued within 3 seconds.

5.4.1.1 *Optional command and response frames*

If optional frames (e.g., NSF or NSF, CSI) are sent they must directly precede any mandatory command/response frame which is sent. In this case, bit 5 of the control field is 0 for the optional frames and is 1 only for the final frame (refer to § 5.3.5).

5.4.1.2 *Options within standard frames*

Certain optional portions of standard signals (e.g. the fifth bit of the PRI-Q signal) need not be utilized at either the transmitting unit or the receiving unit. However, the use of these optional portions of standard signals shall not cause erroneous operation.

5.4.2 *Line control procedures and error recovery*

Once the transmitting and receiving stations have been identified, all commands are initiated by the transmitting station and solicit an appropriate response from the receiving station (see Appendix III). Furthermore, the transmission of a response is permitted only when solicited by a valid command. If the transmitting station does not receive an appropriate valid response within 3 s ± 15%, it will repeat the command. After three unsuccessful attempts, the transmitting station will send the disconnect (DCN) command and terminate the call. A command or a response is not valid and should be discarded if:

i) any of the frames, optional or mandatory, have an FCS error;

ii) any single frame exceeds 3 s ± 15% (see Note below);

iii) the final frame does not have the control bit 5 set to a binary 1;

iv) the final frame is not a recognized standard command/response frame (see Appendix III).

The delay of 3 s before retransmission of the command can be shortened by the use of the optional command repeat (CRP) response. If the transmitting station receives a CRP response, it may immediately retransmit the most recent command.

During the initial pre-message procedure, neither station has a defined role (i.e., transmitter or receiver). Therefore, the station transmitting the DIS command will continue to retransmit it until, according to the procedures, each station has identified itself and the normal line control procedures may be followed.

Note – The implications of a maximum frame length of 3 s ± 15% are:

a) no transmitted frame should exceed 2.55 s (i.e., 3 s – 15%);

b) any frame which is received and is detected as greater than 3.45 s shall be discarded (i.e., 3 s + 15%);

c) a frame received which is between 2.55 and 3.45 s duration may be discarded.

5.4.3 *Timing considerations*

5.4.3.1 *Time Outs*

Time-out T1 defines the amount of time two stations will continue to attempt to identify each other. T1 is 35 ± 5 seconds, begins upon entering phase B, and is reset upon detecting a valid signal or when T1 times out.

Time-out T2 makes use of the tight control between commands and responses to detect the loss of command/response synchronization. T2 is 6 ± 1 seconds and begins when initiating a command search, (e.g. the 1st entrance into the "command received" subroutine, reference flow diagram in § 5.2). T2 is reset when an HDLC flag is received or when T2 times out.

Time-out T3 defines the amount of time a station will attempt to alert the local operator in response to a procedural interrupt. Failing to achieve operator intervention, the station will discontinue this attempt and shall issue other commands or responses. T3 is 10 ± 5 seconds, begins on the first detection of a procedural interrupt command/response signal (i.e., PIN/PIP or PRI-Q), and is reset when T3 times out or when the operator initiates a line request.

APPENDIX I

(to Recommendation T.30)

Example of non-standard manual-to-manual basic facsimile operation

It is acknowledged that there are existing equipments in the field that may not conform in all aspects to this Recommendation. Therefore, the decision may be made to go to a mode of operation other than specified herein. Figure I-1/T.30 describes, as an example, one of these conditions. Other methods may be possible as long as they do not interfere with the recommended operation.

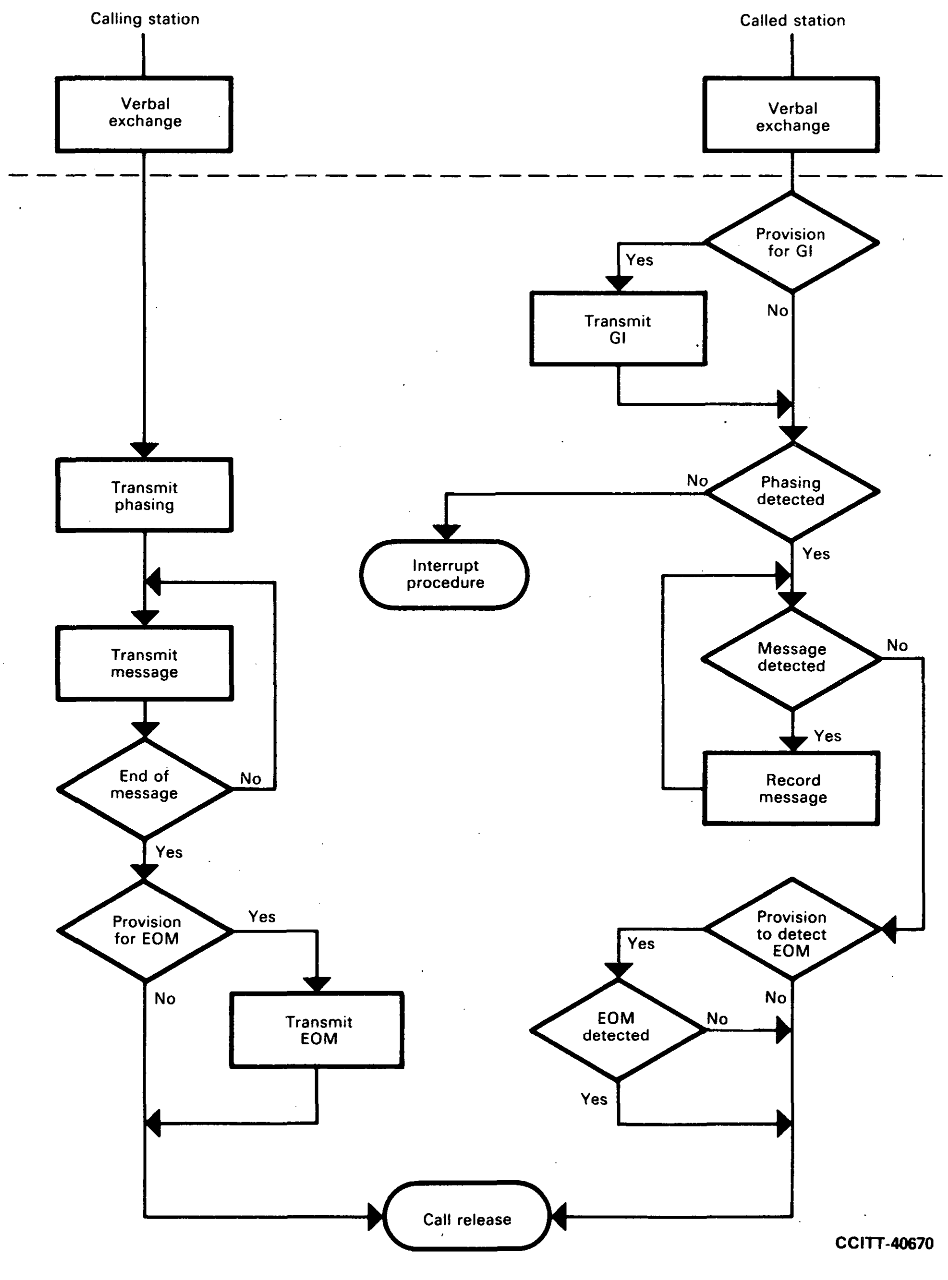


FIGURE I-1/T.30

APPENDIX II

(to Recommendation T.30)

Index of abbreviations used in Recommendation T.30

Abbre-viation	Function	Signal format	Reference
CED	Called station identification	2100 Hz	4.3.3.2
CFR	Confirmation to receive	X010 0001 1850 or 1650 Hz for 3 s	5.3.6.1.4, 1) 4.3.1.2
CRP	Command repeat	X101 1000	5.3.6.1.8, 2)
CIG	Calling subscriber identification	1000 0010	5.3.6.1.2, 2)
CNG	Calling tone	1100 Hz for 500 ms	4.3.3.3
CSI	Called subscriber identification	0000 0010	5.3.6.1.1, 2)
DCN	Disconnect	X101 1111	5.3.6.1.8, 1)
DCS	Digital command signal	X100 0001	5.3.6.1.3, 1)
DIS	Digital identification signal	0000 0001	5.3.6.1.1, 1)
DTC	Digital transmit command	1000 0001	5.3.6.1.2, 1)
EOM	End of message	X111 0001 1100 Hz	5.3.6.1.6, 1) 4.3.2.4
EOP	End of procedure	X111 0100	5.3.6.1.6, 3)
FCF	Facsimile control field	–	5.3.6.1
FIF	Facsimile information field	–	5.3.6.2
FTT	Failure to train	X010 0010	5.3.6.1.4, 2)
GC	Group command	1300 Hz for 1.5 — 10.0 s 2100 Hz for 1.5 — 10.0 s	4.3.2.1
GI	Group identification	1650 or 1850 Hz	4.3.1.1
HDLC	High-level data link control	–	5.3
LCS	Line conditioning signals	1100 Hz	4.3.2.2
MCF	Message confirmation	X011 0001 1650 or 1850 Hz	5.3.6.1.7, 1) 4.3.1.3
MPS	Multi-page signal	X111 0010	5.3.6.1.6, 2)
NSC	Non-standard facilities command	1000 0100	5.3.6.1.2, 3)
NSF	Non-standard facilities	0000 0100	5.3.6.1.1, 3)
NSS	Non-standard set-up	X100 0100	5.3.6.1.3, 3)
PIN	Procedural interrupt negative	X011 0100	5.3.6.1.7, 5)
PIP	Procedural interrupt positive	X011 0101	5.3.6.1.7, 4)
PIS	Procedure interrupt signal	462 Hz for 3 s	4.3.3.1
PRI-EOM	Procedure interrupt - EOM	X111 1001	5.3.6.1.6, 4)
PRI-EOP	Procedure interrupt - EOP	X111 1100	5.3.6.1.6, 6)
PRI-MPS	Procedure interrupt - MPS	X111 1010	5.3.6.1.6, 5)
RTN	Retrain negative	X011 0010	5.3.6.1.7, 3)
RTP	Retrain positive	X011 0011	5.3.6.1.7, 2)
TCF	Training check	Zeros for 1.5 s	5.3.6.1.3, 4)
TSI	Transmitting subscriber identification	X100 0010	5.3.6.1.3, 2)

APPENDIX III

(to Recommendation T.30)

List of commands and appropriate responses

Commands	Comments	Appropriate responses
(NSF) (CSI) DIS	Identifying capabilities: from a manual receiver or an auto answer unit	(NSC) (CIG) DTC (TSI) DCS (NSF) (CSI) DIS (CRP) (TSI) (NSS)
(NSC) (CIG) DTC	Mode setting command: from the calling unit. This is a poll operation	(TSI) DCS (NSF) (CSI) DIS (CRP) (TSI) (NSS)
(TSI) DCS (TSI) (NSS)	Mode setting command: from manual transmitter or automatic transceiver. This command is always followed by phasing/training	CFR FTT (NSC) (CIG) DTC (NSF) (CSI) DIS (CRP)
MPS or EOP or EOM or (PRI-MPS) or (PRI-EOP) or (PRI-EOM)	Post-message commands	MCF RTP RTN PIP PIN (CRP)
DCN	Phase E command	None

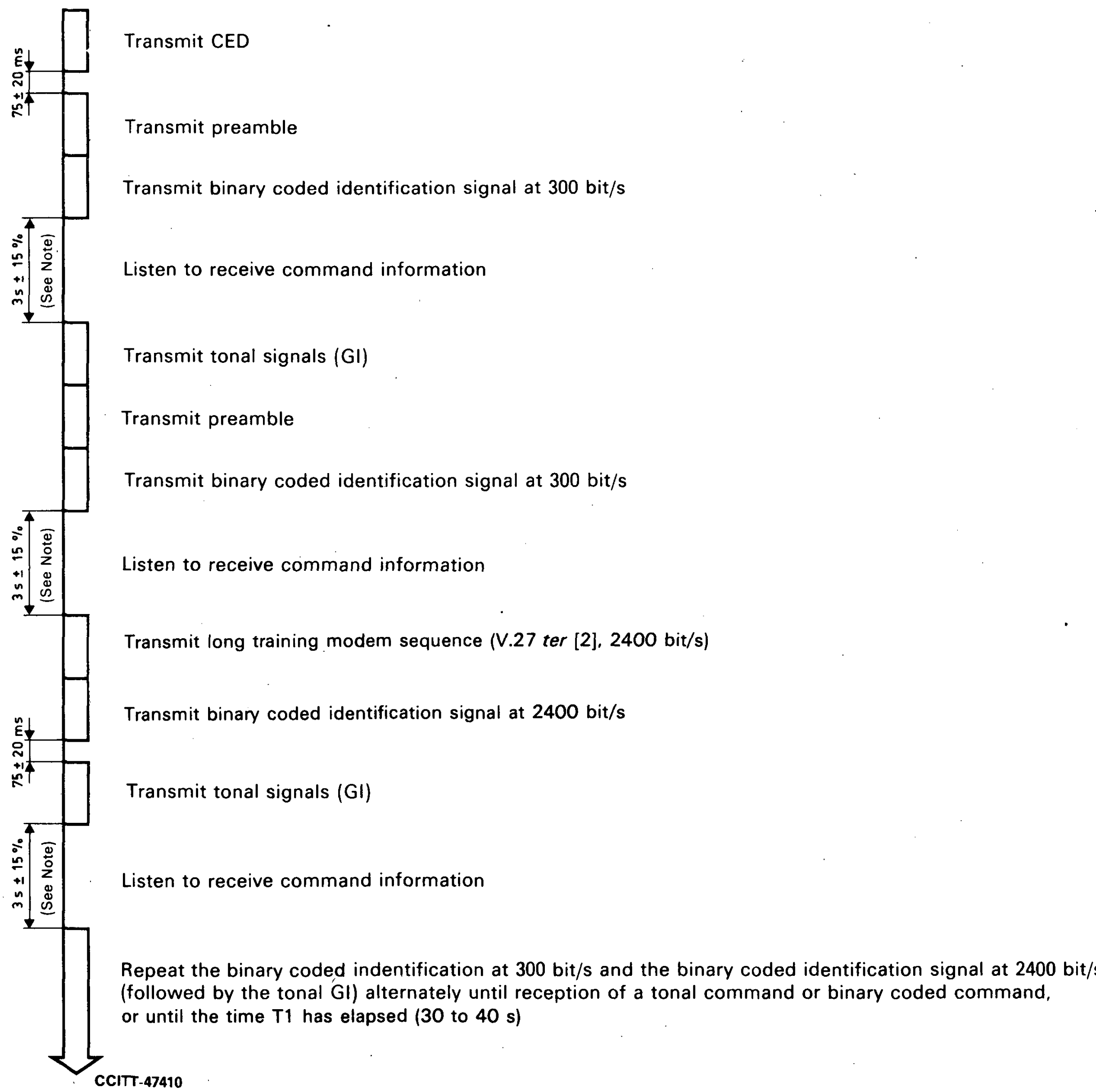
Note – Where the symbols ( ) are used, the signals within these symbols are optional.

APPENDIX IV

(to Recommendation T.30)

Interworking between the standard mode and the recognized optional mode for the binary coded handshaking procedure

An example of a station having the standard binary coded, recognized optional binary coded and tonal capabilities is given in Figure IV-1/T.30.



Note – For manual receivers using the binary coded procedure, this delay should be 4.5 s ± 15%.

FIGURE IV-1/T.30

Called station procedures (Alternating method)

APPENDIX V

(to Recommendation T.30)

Signal sequence examples

The examples below are based on the flow diagrams and are for illustrative and instructional purpose only. They should not be interpreted as establishing or limiting the protocol. The exchange of the various commands and responses is limited only by the rules specified in this Recommendation. (See §§ 5.3 and 5.4).

The notations used in these diagrams are as follows:

- an arrowhead signifies the receiver of the signal;
- a solid line indicates transmission of the signal at the data rate of 300 bit/s;
- the dashed lines indicate transmission at the message data rate (Recommendations V.27 *ter* [2], V.29 [3]);
- a lightning bolt (↯) indicates an invalid frame;
- a bold solid line indicates the transmission of tonal signals.

In the following figures, the examples given assume that DIS will be repeated for T1 seconds unless responded by a valid signal.

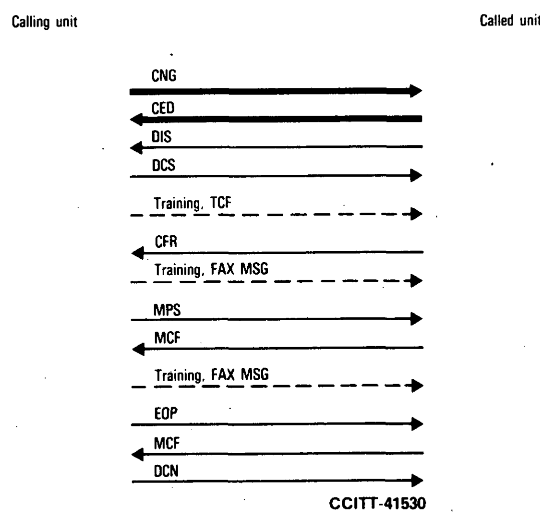


FIGURE V-1/T.30

Example 1 – An auto calling unit wishing to transmit to an auto answer unit: example of post-message commands.

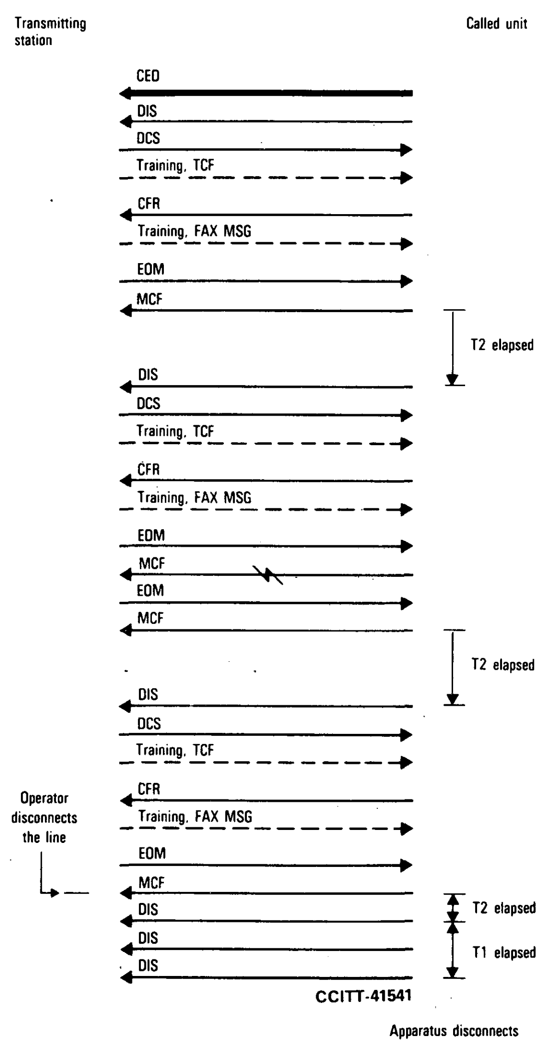


FIGURE V-2/T.30

Example 2 – A single page transmitter wishing to transmit to an auto answer unit : example of EOM.

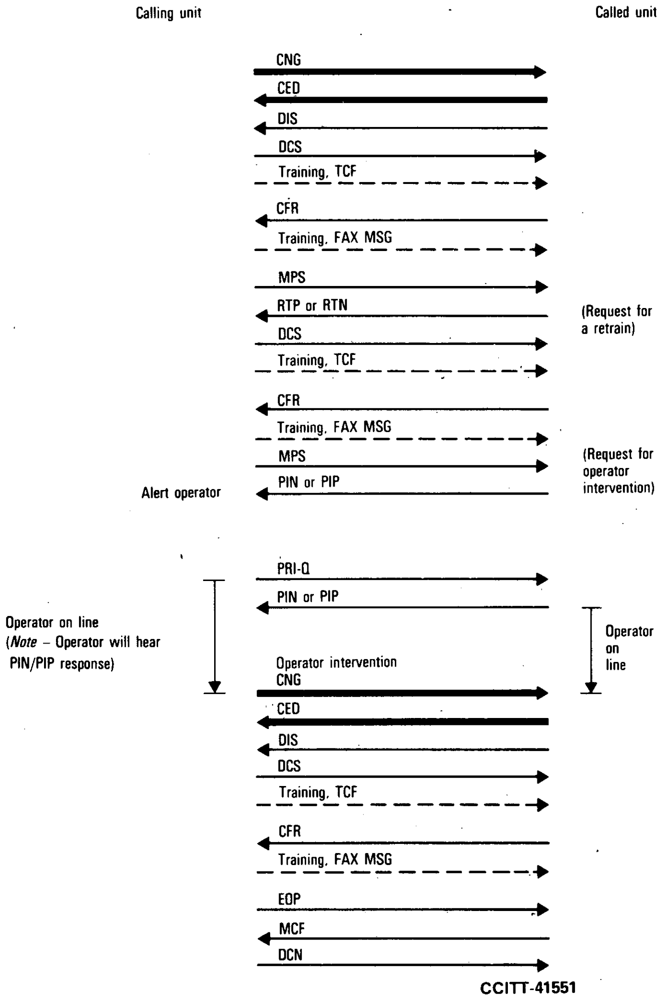


FIGURE V-3/T.30

Example 3 – An auto calling unit wishing to transmit to an auto answer unit: example of post-message responses.

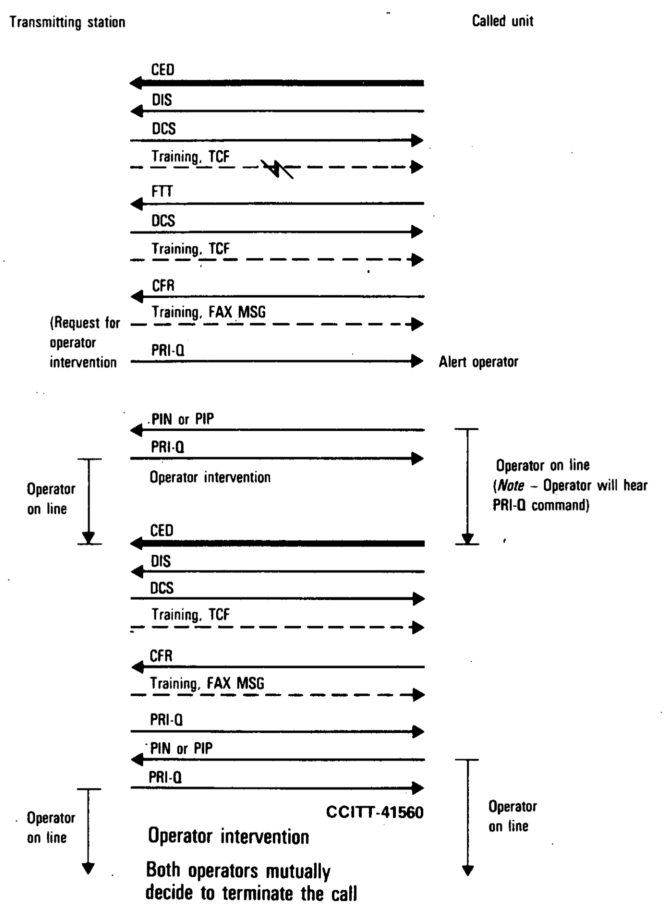


FIGURE V-4/T.30

Example 4 – Manual transmitter wishing to transmit to an auto answer unit : example of initial training failure and procedural interrupts.

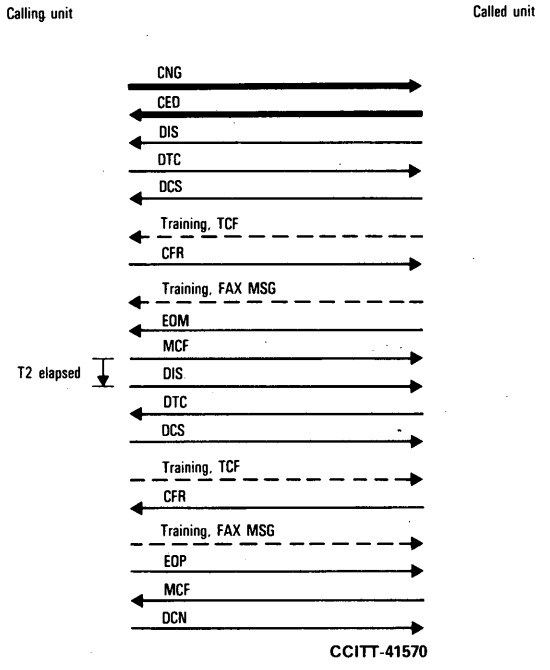


FIGURE V-5/T.30

Example 5 – Auto calling unit wishing to first receive from, then transmit to, an auto answer unit.

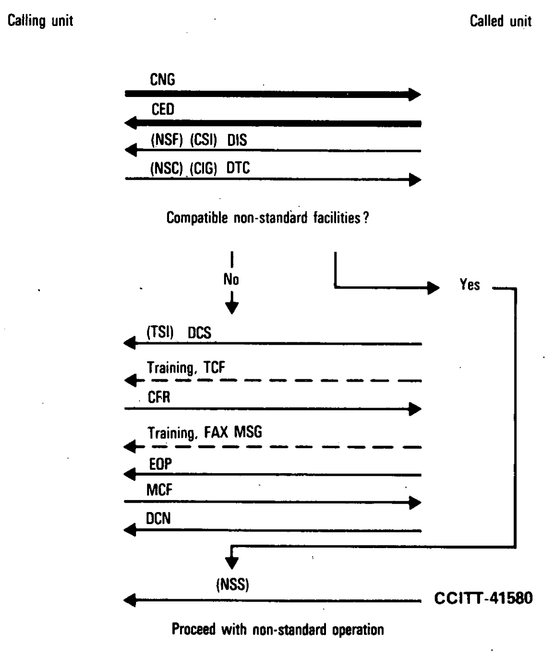


FIGURE V-6/T.30

Example 6 – Auto calling unit wishing to receive from an auto answer unit: example of polling and of optional as well as non-standard signals.

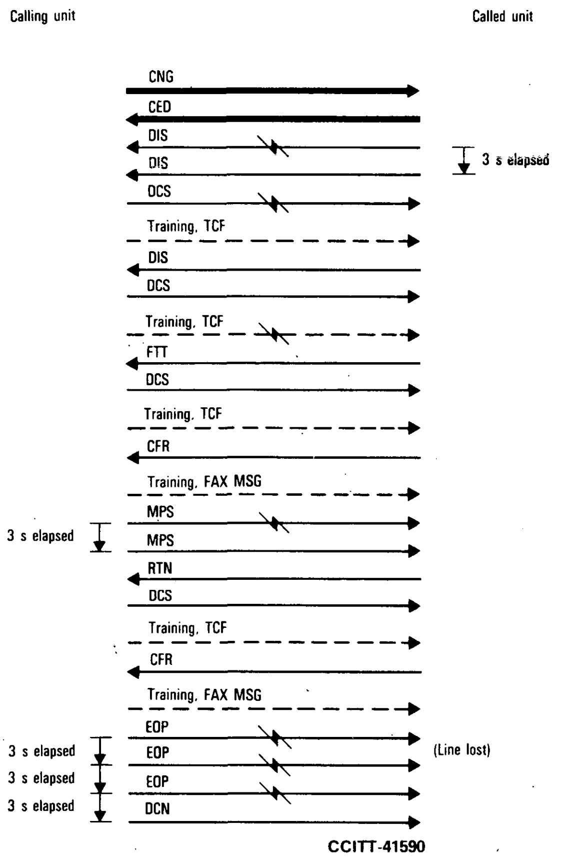


FIGURE V-7/T.30

Example 7 – An auto calling unit wishing to transmit to an auto answer unit: example of standard error recovery techniques.

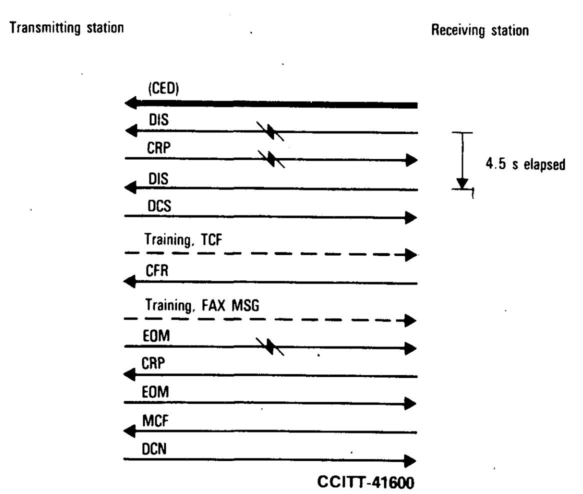
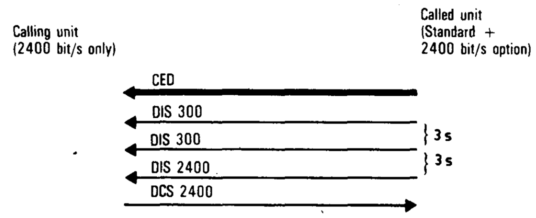


FIGURE V-8/T.30

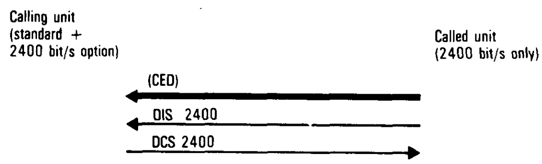
Example 8 – Manual transmitter wishing to transmit to a manual receiver: example of error recovery technique using the optional CRP response.



CCITT-41610

FIGURE V-9/T.30

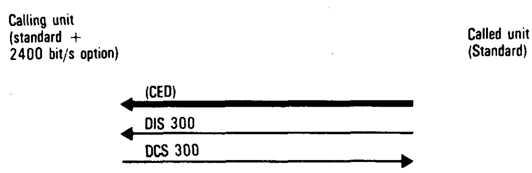
Example 9 – A 2400 bit/s only machine wishing to transmit to a standard machine including the recognized option for binary coded handshaking procedure.



CCITT-41615

FIGURE V-10/T.30

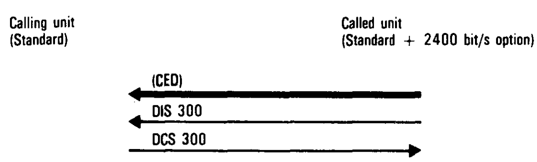
Example 10 – A standard machine including the recognized option for binary coded handshaking procedure wishing to transmit to a 2400 bit/s only machine.



CCITT-41620

FIGURE V-11/T.30

Example 11 – A standard machine including the recognized option for binary coded handshaking procedure wishing to transmit to a standard machine (not including the optional mode).



CCITT-41625

FIGURE V-12/T.30

Example 12 – A standard machine (not including the optional mode) wishing to transmit to a standard machine including the recognized option for binary coded handshaking procedure.

References

[1] CCITT Recommendation *300 bits per second duplex modem standardized for use in the general switched telephone network*, Vol. VIII, Fascicle VIII.1, Rec. V.21.

[2] CCITT Recommendation *4800/2400 bits per second modem standardized for use in the general switched telephone network*, Vol. VIII, Fascicle VIII.1, Rec.V.27 *ter.*

[3] CCITT Recommendation *9600 bits per second modem standardized for use on point-to-point 4-wire leased telephone-typed circuits*, Vol. VIII, Fascicle VIII.1, Rec. V.29.

[4] CCITT Recommendation *Equivalent between binary notation symbols and the significant conditions of a two-condition code*, Vol. VIII, Fascicle VIII.1, Rec. V.1.

[5] CCITT Question 21/I, Contribution COM I-No. 1, Study Period 1981-1984, Geneva, 1981.

[6] CCITT Question 11/VIII, Contribution COM VIII-No. 1, Study Period 1981-1984, Geneva, 1981.

Printed in Switzerland — ISBN 92-61-01141-1