INTERNATIONAL TELECOMMUNICATION UNION

CCITT

THE INTERNATIONAL
TELEGRAPH AND TELEPHONE
CONSULTATIVE COMMITTEE

BLUE BOOK

VOLUME VII – FASCICLE VII.3

TERMINAL EQUIPMENT AND PROTOCOLS FOR TELEMATIC SERVICES

RECOMMENDATIONS T.0-T.63

IXTH PLENARY ASSEMBLY
MELBOURNE, 14-25 NOVEMBER 1988

Geneva 1989

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ISBN 92-61-03611-2

Printed in Switzerland

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APPLICABLE AFTER THE NINTH PLENARY ASSEMBLY (1988)

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Terminal equipment and protocols for telematic services

PRELIMINARY NOTES

1 The Questions entrusted to each Study Group for the Study Period 1989-1992 can be found in Contribution No. 1 to that Study Group.

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

3 The status of annexes and appendices attached to the Series 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.

FASCICLE VII.3

Recommendations T.0-T.63

TERMINAL EQUIPMENT AND PROTOCOLS FOR TELEMATIC SERVICES

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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, amended at Malaga-Torremolinos, 1984)

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* (Nairobi, 1982) states that the purposes of the Union are:

"*a)* to maintain and extend international cooperation between all Members of the Union for the improvement and rational use of telecommunications of all kinds, as well as to promote and to offer technical assistance to developing countries in the field of telecommunications;

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.

Recommendation A.22

COLLABORATION WITH OTHER INTERNATIONAL ORGANIZATIONS ON INFORMATION TECHNOLOGY

(Melbourne, 1988)

The CCITT,

considering

(a) that the purposes of the International Telecommunication Union and the recognition of CCITT relations with other organizations were given in 1964 and later, in CCITT Recommendation A.20 which concerns data transmission;

(b) that the principles of responsibility in regard to CCITT-defined Telematic services were given in 1980 and later, in Recommendation A.21 which mentions some subjects of mutual interest;

(c) that CCITT Resolution No. 7 in 1984 further recognized common interests with ISO and IEC concerning Information Technology and cooperation with them by appropriate means,

recognizes the following principles

(1) that in accordance with CCITT Recommendations A.20 and A.21 and Resolution No. 7, every effort should be made in establishing respective study programmes to identify overlapping studies with a view to avoiding duplication of work;

(2) that where subjects are identified in which coordination seems desirable, text should be drawn up mutually and kept aligned;

(3) that in carrying on the respective programmes of Information Technology studies, collaborative meetings at appropriate levels should be scheduled, where necessary. In drafting aligned text, it is necessary to take into account the respective timing for approvals and publication, particularly with the ISO/IEC Joint Technical Committee 1 (JTC1) on Information Technology;

(4) that commonality of text with ISO/IEC and cross-references is considered desirable in certain areas of mutual interest, such as:

- Message Handling Systems,
- Directory Systems,
- Open Systems Interconnection (OSI) architecture – service definitions and protocol specifications,
- certain areas of Interworking,
- certain aspects of Telematic Services,
- Document Architecture,
- certain aspects of ISDN.

Recommendation T.0

CLASSIFICATION OF FACSIMILE APPARATUS FOR DOCUMENT TRANSMISSION OVER THE PUBLIC NETWORKS

(Geneva, 1976; amended at Geneva, 1980; Malaga-Torremolinos, 1984 and Melbourne, 1988)

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 (PDNs). The apparatus will utilize procedures applicable to the PDN and will assure an essentially 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 this apparatus, in accordance with their needs and the facilities afforded by the connection and the network.

4 Procedures for Groups 1, 2 and 3 document facsimile transmission in the public switched telephone network should be in accordance with Recommendation T.30.

5 Procedures for Group 4 document facsimile transmission should be in accordance with Recommendations T.62, T.62 *bis*, and T.70.

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 has been standardized in Recommendations T.6, T.503, T.521 and T.563.

6 Annex A contains definitions for terms used in the T-series Recommendations applicable to facsimile apparatus.

ANNEX A

(to Recommendation T.0)

Definitions for terms used in the T-series Recommendations applicable to fascimile apparatus

The following definitions apply to Recommendations T.1, T.2, T.3 and T.4:

A.1 **dead sector** (Recommendations T.1, T.2)

In drum apparatus, that portion of the drum surface the scanning time of which cannot be used for picture signal transmission.

A.2 **drum factor** (Recommendation T.1)

In drum apparatus, the ratio of the usable scanning length of the drum to its diameter.

A.3 **facsimile** (Series T)

The process of scanning a document (page), converting the image scanned into electrical signals for transmission to a remote receiver and the conversion of the received signals to produce a copy of the image originally scanned.

A.4 **factor of cooperation** (Recommendation T.1)

The product of the total scanning line length and the scanning density.

A.5 **flat-bed transmitter** (Recommendation T.1)

Apparatus in which the original document is placed flat and scanned line by line.

A.6 **index of cooperation** (Recommendations T.1, T.2, T.3)

Quotient of the factor of cooperation divided by the quantity π. In the case of a drum apparatus, the index of cooperation is also equal to the product of the drum diameter and the scanning density.

A.7 **judder, longitudinal** (Recommendation T.1)

Effect due to the irregular rotation of the drum or helix causing, on the reproduced picture, slight waviness or breaks in lines that are regular on the original document.

A.8 **judder, transverse** (Recommendation T.1)

Effect due to irregularity of the scanning pitch resulting in concurrent overlapping and underlapping in the reproduced picture.

A.9 **lost time** (Recommendation T.3)

The portion of the scanning line period which cannot be used for picture signal transmission.

Note – In the case of drum apparatus, this is the same as the dead sector scanning time.

A.10 **nominal black (white)** (Recommendation T.1)

Level or frequency of the signal corresponding to a pure black (white).

A.11 **pel** (Series T)

A contraction of "picture element".

A.12 **phasing** (Recommendations T.1, T.2, T.3)

At the receiver, ensuring the exact coincidence of the midpoint of the scanning field, with the corresponding point at the transmitter so as to ensure the correct positioning of the picture on the recording medium.

A.13 **phasing signal** (Recommendations T.1, T.2, T.3)

A signal sent by the transmitter for phasing purposes.

Note – Phasing is known as "phase white (black)" if the phasing signal is a black (white) signal of which a short interruption corresponding to the white (black) is sent during the lost time.

A.14 **phototelegraphy** (Recommendation T.1)

Method of reception of facsimile telegraphy which is chiefly intended for the reproduction of graded tonal densities and in which a photographic process is used at the receiver.

A.15 **picture element** (Recommendations T.3, T.4)

a) at transmission:

The part of the area of the original document which coincides with the scanning spot at a given instant and which is of one intensity only, with no distinction of the details that may be included.

b) at reception:

The area of the finest detail that can be effectively reproduced on the recording medium.

A.16 **reproduction ratio** (Recommendation T.1)

The ratio of the linear dimensions of the reproduced document to the corresponding dimensions of the original document.

A.17 **resolution** (Series T)

A measure of the capability for delineating picture detail. In Group 3 and Group 4 facsimile transmission resolution is expressed as picture elements or pels per mm (horizontal resolution) and lines per mm (vertical resolution).

A.18 **scanning density** (Recommendations T.1, T.2, T.3)

Number of scanning pitches per unit length.

A.19 **scanning line** (Recommendations T.1, T.2, T.3)

The area explored by the scanning spot in one sweep from one side to the other of the scanning field.

A.20 **scanning pitch** (Recommendation T.1)

The distance between the corresponding edges of two consecutive scanning lines.

A.21 **skew** (Recommendation T.3)

A defect in reproduction in which lines that should be at right-angles to the scanning direction are inclined to it, owing to a difference between the scanning speeds at transmission and reception.

A.22 **synchronization** (Recommendation T.1)

The establishment of equal scanning line frequencies at the transmitter and receiver.

Recommendation T.1

STANDARDIZATION OF PHOTOTELEGRAPH APPARATUS

(former CCIT Recommendation D.1; amended at New Delhi, 1960; Geneva, 1964; Mar del Plata, 1968; Malaga-Torremolinos, 1984 and Melbourne, 1988)

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.

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1) Measured in the direction perpendicular to the scanning line.

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.

5.2 The speed of transmitters must be maintained as nearly as possible to the nominal speed and in any case within $\pm$ 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 $\pm$ 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 $\pm$ 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 than 16 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.

Note – It is recognized that there are difficulties operating with these frequency limits on the public switched telephone network (PSTN) where certain types of signalling equipment are used. By prior agreement between users on the PSTN, alternative frequencies of 1300 Hz for white and 2100 Hz for black may be used.

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.

12 Colour transmission (optional)

12.1 Phototelegraphy apparatus constructed in accordance with this Recommendation can be used in colour phototelegraphy by splitting the spectrum of light reflected from the picture elements into three basic colours and transmitting the three resulting signals sequentially. Then each signal can be treated and transmitted as a phototelegraphy signal as specified in this Recommendation above.

12.2 The splitting of light reflected from picture element into three spectral components should be performed simultaneously. Thus synchro and phase coincidence and electronic colour correction can be achieved.

12.3 The triad RGB (red, green, blue) shall be used as a basis of main colours. The red colour shall be in range of 575-700 nm, green 485-575 nm, blue 400-485 nm.

Note – For the high quality reproduction of art images by means of graphic facilities, transmission of fourth components (i.e. black overtone) is desirable.

12.4 The order of signal transmission shall be as follows: red, green, blue. In the case of negative reproduction the order of colour separated signals transmission is reversed.

12.5 The speeds of the transmitting and receiving sets should not differ by more than 1 part in 10^7.

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.

Recommendation T.3

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* 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* 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.

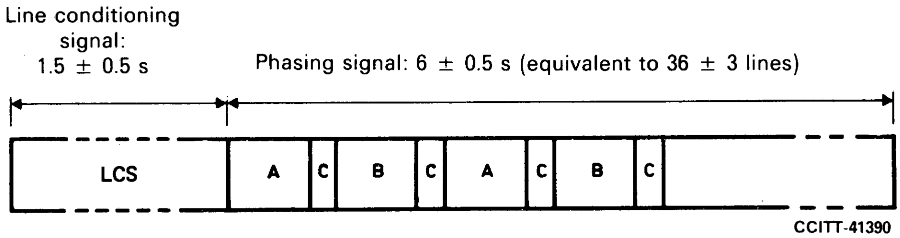
Note – Another scanning line frequency (e.g. 300 lines per minute) may be chosen by agreement between the two stations.

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 4-6% of TLL

FIGURE 1/T.3

Structure of line conditioning and phasing signal

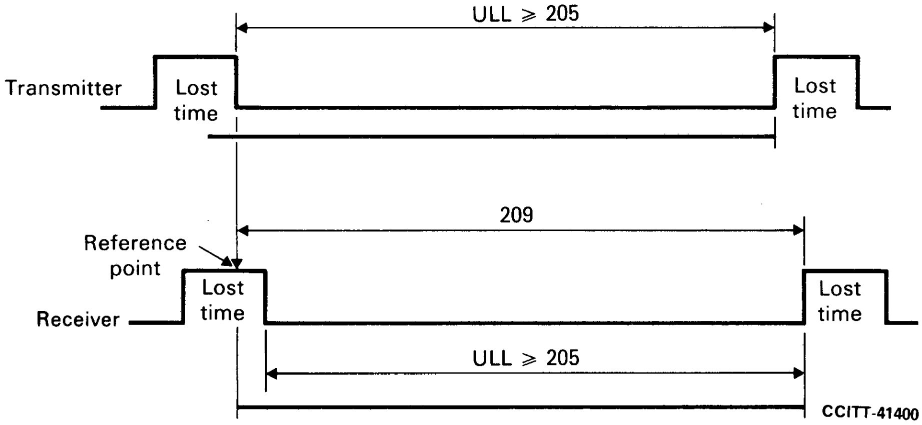


FIGURE 2/T.3

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.

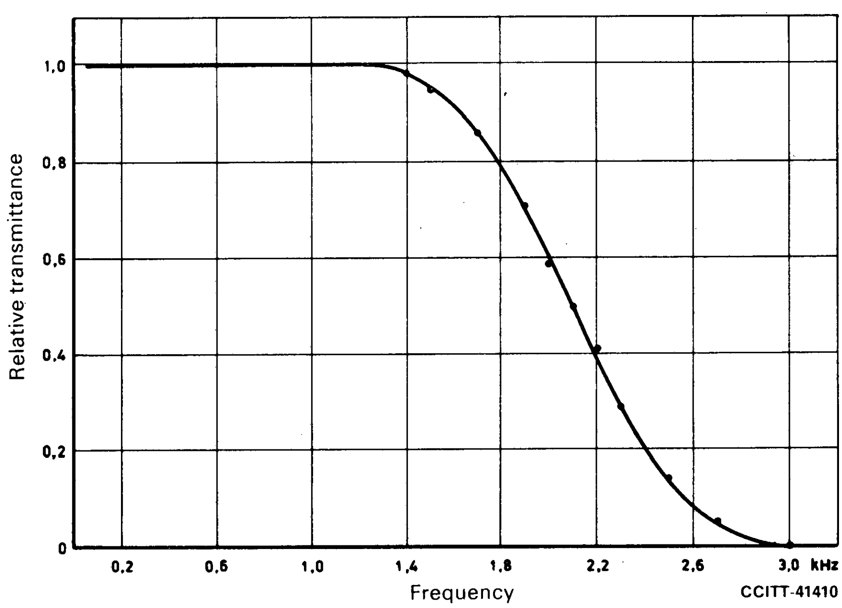


FIGURE 3/T.3

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

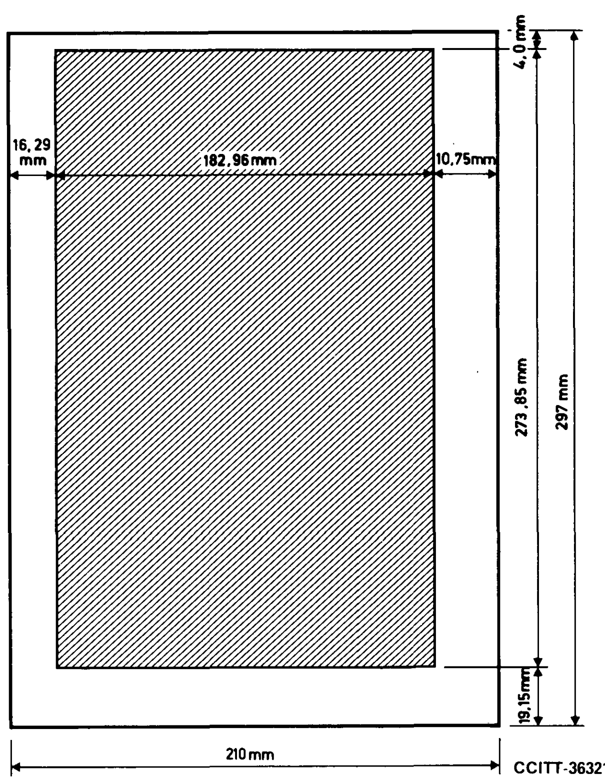
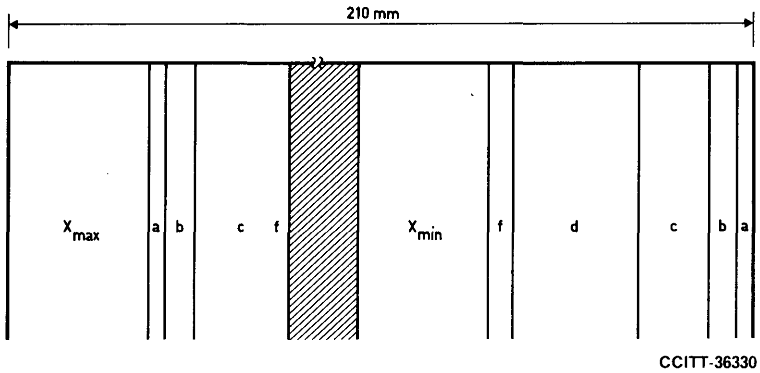


FIGURE I-1/T.3

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

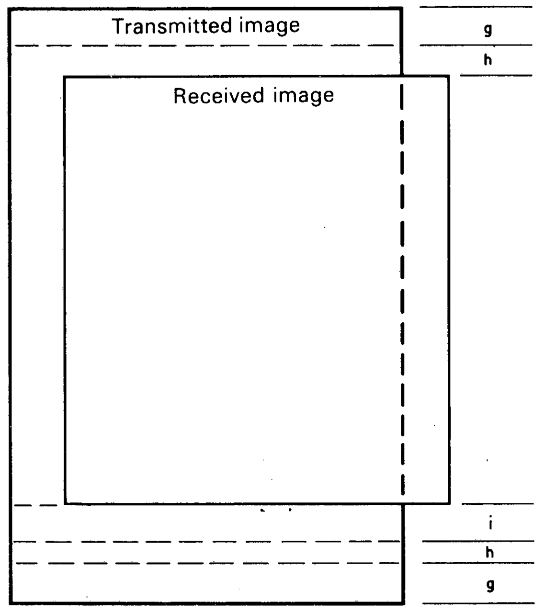
TABLE I-1/T/3

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	$\pm 5 \times 10^{-6}$	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

		Top (mm)	Bottom (mm)
Gripping loss	g	4.0	4.0
Paper insertion	h		
Enlarging + FOC	i	–	15.15
	Total	4.0	19.15

STANDARDIZATION OF GROUP 3 FACSIMILE APPARATUS FOR DOCUMENT TRANSMISSION

(Geneva, 1980, amended at Malaga-Torremolinos, 1984 and Melbourne, 1988)

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%,

and, for equipment which provides A5 and/or A6 facilities:

e) optionally, 864 black and white picture elements along a scan line length of 107 mm ± 1%,

f) optionally, 1216 black and white picture elements along a scan line length of 151 mm ± 1%,

g) Optionally, 1728 black and white picture elements along a scan line length of 107 mm ± 1%,

h) Optionally, 1728 black and white picture elements along a scan line length of 151 mm ± 1%.

The normal method of interworking when transmitting from an A5 or A6 machine to an A4 machine not signalling such capabilities, is that the A5 or A6 content will be enlarged to fill the A4 page (see also Note 3). This means that if the document is then retransmitted, or if it has been stored for later retransmission, it will be received without additional reduction.

Where the full image contents being received from an A4 machine need to be maintained, g) or h) respectively should be used.

Interworking between equipments with A5/A6 and A4 facilities and between equipments with combinations of these facilities is shown in Annex C.

Note 1 – Cases e) to h) describe equipments which may be implemented singly or in any combination and would not, for A5/A6 facsimile equipments, require implementation of a) or b). These equipments may be implemented with cases different for sending and receiving.

Note 2 – In cases e) to h), 1728 pels will always be provided to the coder (see Annex C).

In cases e) and f), the additional pels required are produced by pel processing (i.e., either by picture processing or by adding white pels on each side of the central picture information) prior to coding.

Note 3 – It could be possible, by a setting on the A5/A6 transmitting machine, to send the document so that it is received equal size on an A4 machine not signalling such capabilities. In this case the vertical resolution will be 3.85 (or 7.7) line/mm. The user should be made aware that in this particular equal size case if the received copy is transmitted back to the A5/A6 machine the subsequent copy will be reduced.

Note 4 – Some Administrations may require that equipments using e) or f) dimensions, when working with a receiver not signalling such capabilities, insert a message e.g., "ISO A6" or "ISO A5", as the case may be, into the picture at the transmitting side.

2.2 Input documents up to a minimum of ISO A4 size should be accepted.

Note – The size of the guaranteed reproducible area is shown in Appendix I.

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 end-of-line (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.

3.3 *Error correction mode*

For the optional error correction mode, an HDLC frame structure is utilized to transmit the total coded scan line. This error correction mode is defined in Annex A.

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.

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.

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 maintaining the standard horizontal resolution. This option has been provided for by the addition of the Make-up code set defined as follows:

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

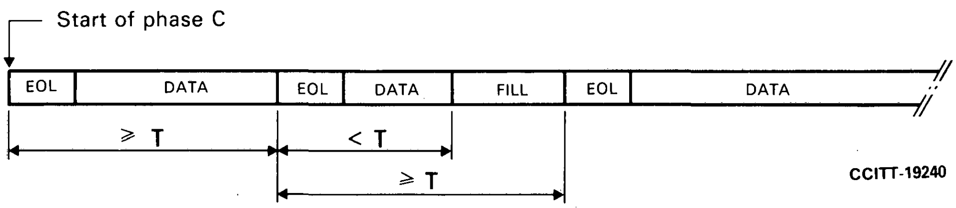
4.1.4 *Return to control (RTC)*

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

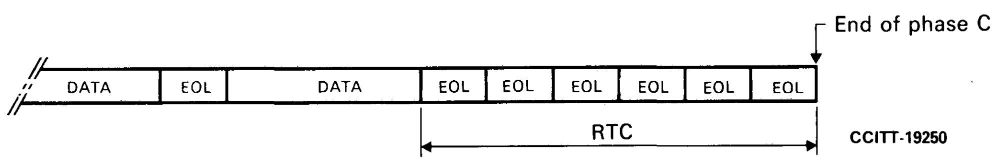


FIGURE 2/T.4

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.

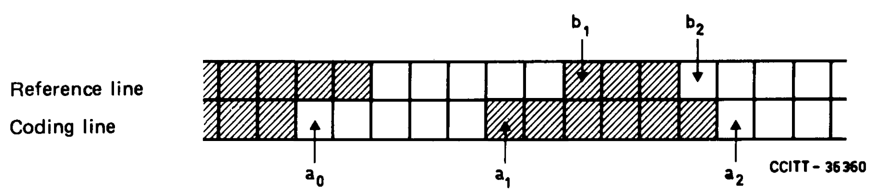


FIGURE 3/T.4

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).

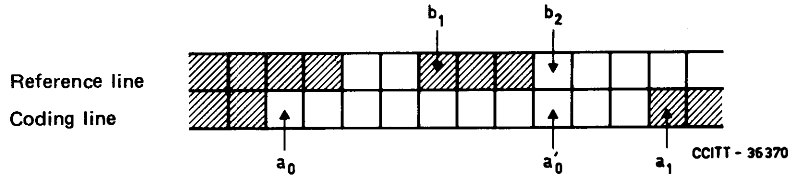


FIGURE 4/T.4

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.

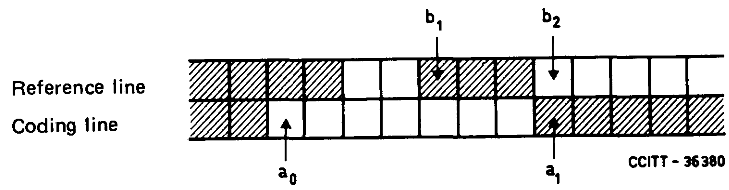


FIGURE 5/T.4

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.

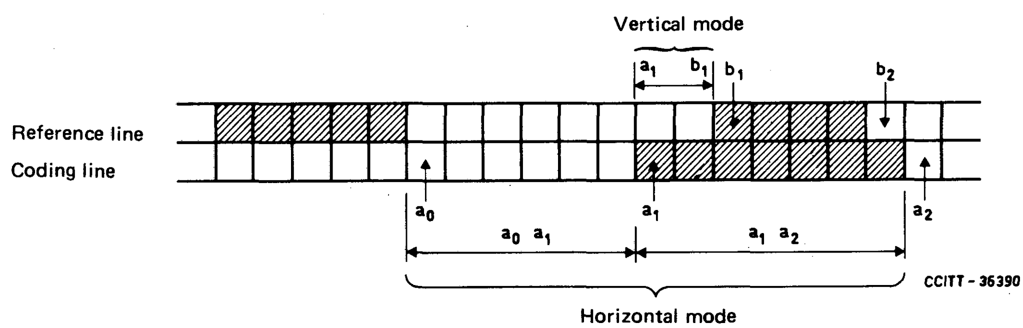


FIGURE 6/T.4

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 $|a_1b_1| \leq 3$, 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.

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 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-dimensinally coded, the coder must not switch into 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
Exit 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).

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.

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

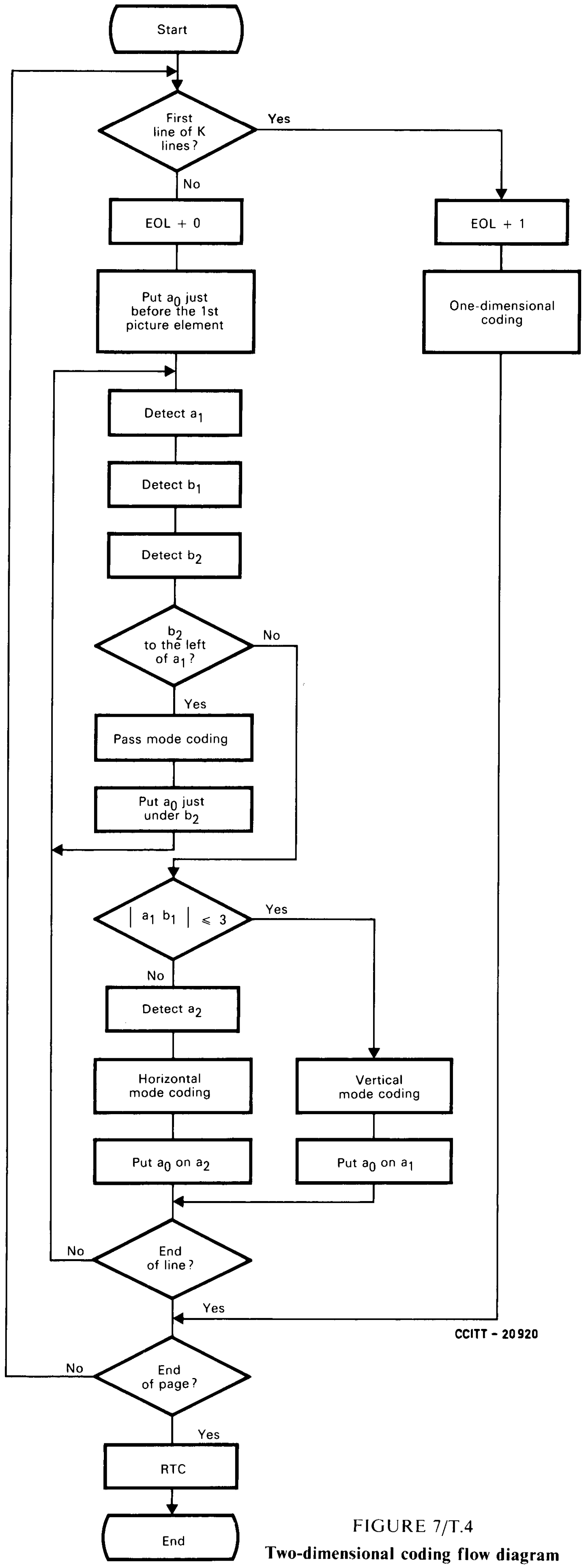


FIGURE 7/T.4

Two-dimensional coding flow diagram

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.

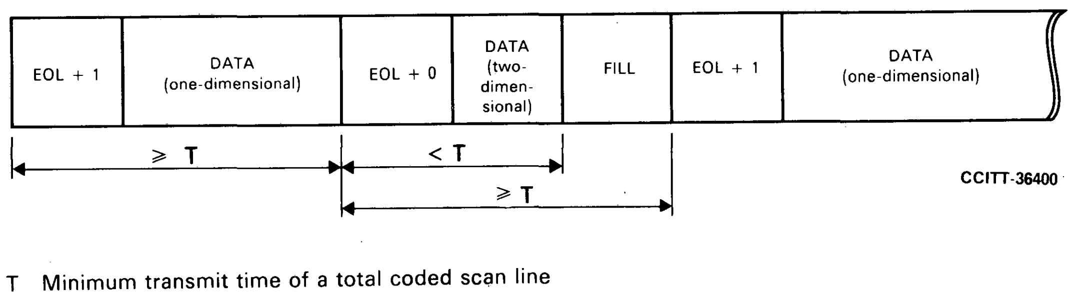


FIGURE 8/T.4
Message transmission (first part of page)

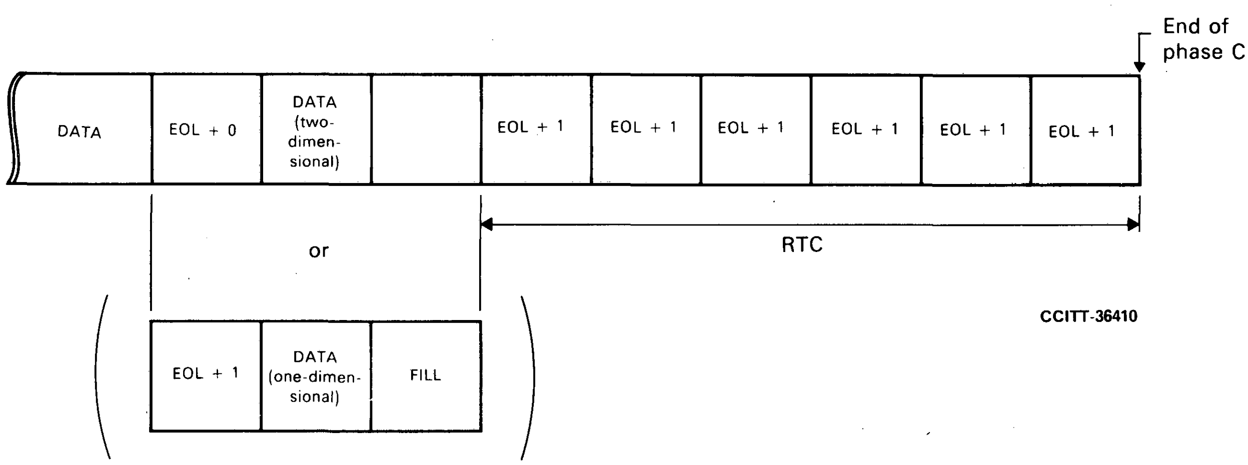


FIGURE 9/T.4
Message transmission (last part of page)

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.

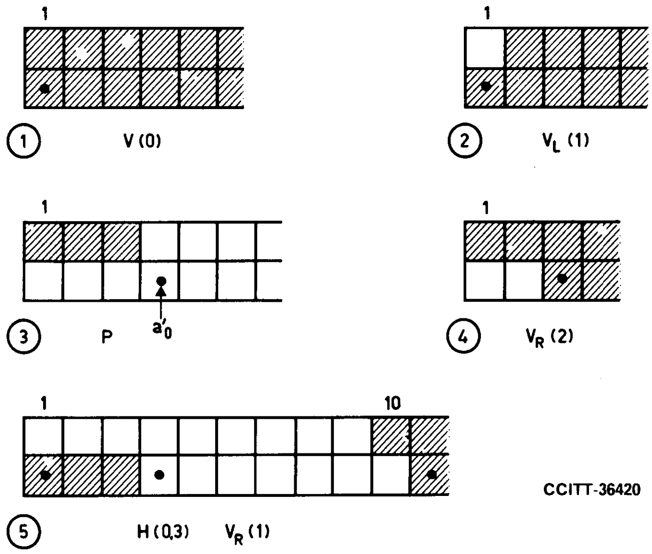


FIGURE 10/T.4
Coding examples: first part of scan line

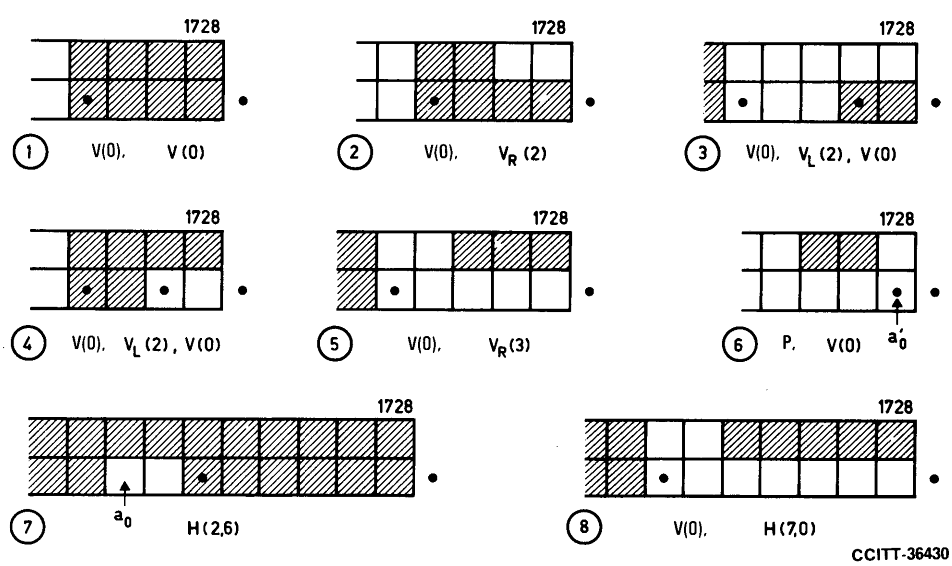


FIGURE 11/T.4
Coding examples: last part of scan line

Revision (1990) of Recommendation T.4 by Study Group VIII in accordance with the provisions of CCITT Resolution 2

Changes to Recommendation T.4, Blue Book Fascicle VII.3, page 34.

- the following new paragraph 4.3 should replace the existing paragraph 4.3,
- the existing paragraph 4.3 consequently becomes paragraph 4.4,
- note 3 to paragraph 5.2 should be replaced by the following note 3,
- new notes 4 and 5 should be added to paragraph 5.2.

4.3 *Extended two-dimensional coding scheme*

The basic facsimile coding scheme specified in § 2.2 of Recommendation T.6 may be used as an option in Group 3 facsimile. This coding scheme is limited to the use of the Error Correction Mode specified in § 3.3.

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 Recommendations V.29, V.33 and V.17. For V.29 this specifically refers to §§ 1, 2, 3, 4, 7, 8, 9, 10 and 11. Under this option the data should be non-multiplexed and limited to the data signalling rates of 9600 bit/s and 7200 bit/s. For V.33 this specifically refers to §§ 1, 2, 3, 4, 7 and 8. Under this option the data should be non-multiplexed. For V.17 this specifically refers to §§ 1 through 5.

Note 4 – When V.33 signalling is used the training signal shall be preceded by a Talker Echo Protection signal. The Talker Echo Protection signal shall consist of an unmodulated carrier for a duration of 185 ms to 200 ms followed by a silent period of 20 to 25 ms.

Note 5 – When V.17 signalling is used the training signal shall include the Talker Echo Protection (TEP) signal defined in § 5.3/V.17.

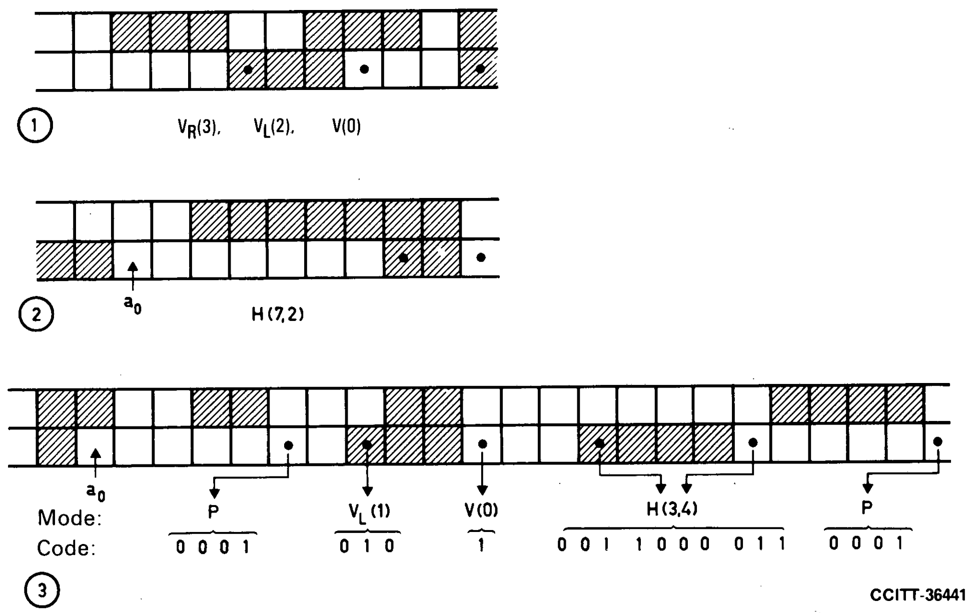


FIGURE 12/T.4
Coding examples

4.3 *Error limiting mode*

One-dimensional coding scheme with the division of scan line into parts.

The one-dimensional coding scheme with the division of scan line into parts is an optional extension of the one-dimensional coding scheme specified in Annex B.

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*, specifically §§ 2, 3, 7, 8, 9, 11 and the Appendix.

5.1 The training signal to be used shall be the long training sequence with protection against talker echo. (See Recommendation V.27 *ter*, § 2.5.1, Table 3/V.27 *ter*).

5.2 The data signalling rates to be used are 4800 bit/s and 2400 bit/s as defined in Recommendation V.27 *ter*.

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, specifically §§ 1, 2, 3, 4, 7, 8, 9, 10 and 11. 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.

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.

8 Implementation of apparatus

Although paper sizes are referred to, this does not always require a physical paper scanner and/or printer to be implemented. Details may be defined by Administrations.

If the message is not generated from a physical scanner or displayed on paper, then the signals appearing across the network interface shall be identical to those which would be generated if paper input and/or output had been implemented.

ANNEX A

(to Recommendation T.4)

Optional error correction mode

A.1 *Introduction*

This annex specifies the message format required for document transmission incorporating the optional error correction capability.

A.2 *Definitions*

The definitions contained in Recommendations T.4 and T.30 shall be applied unless explicitly amended.

A.3 *Message format*

An HDLC frame structure is utilized for all binary coded facsimile message 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 and error checking.

Specific examples are given in Figures A-1/T.4 and A-2/T.4 of formats used for binary coded signalling. These examples show an initial partial page (PP) frame structure and a last PP frame structure.

In the following descriptions of the fields, the order in which the bits are transmitted is from the most to the least significant bit, i.e., from left to right as printed. The exception to this is the frame number (see § A.3.6.1).

The equivalent between binary notation symbols and the significant condition of the signalling code should be in accordance with Recommendation V.1.

A.3.1 *Synchronization*

A synchronization sequence shall precede all binary coded information whenever a new transmission begins. The synchronization shall be a training sequence and a series of flag sequences for nominal 200 ms, tolerance +100 ms.

Note – Continuous flags have two zeros as shown in the following diagram:

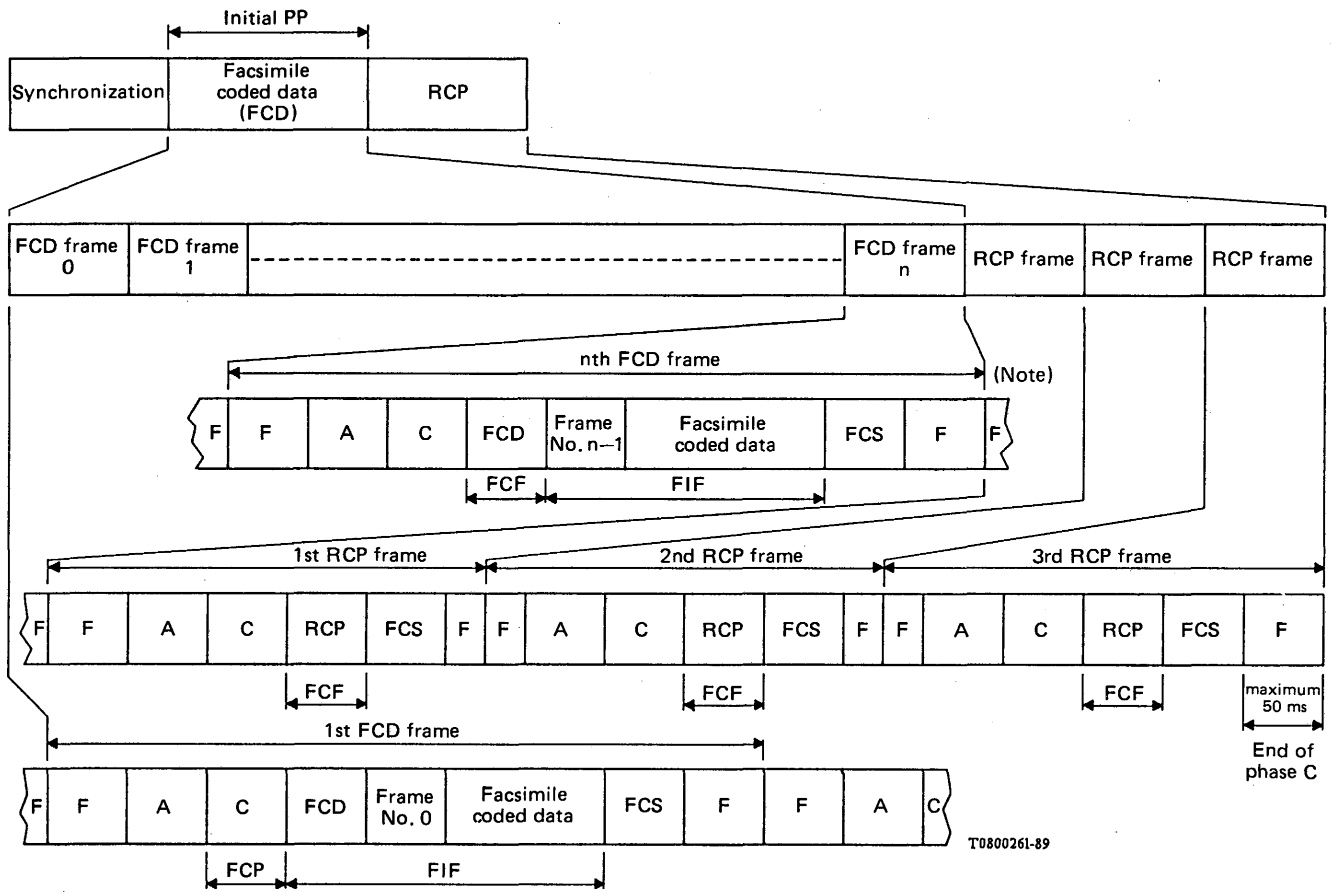
. . . 0111 1110 0111 1110 0111 1110 . . .

A.3.2 *Flag sequence (F)*

The eight bit HDLC flag sequence is used to denote the beginning and end of the frame for the facsimile message procedure. The flag sequence is also used to establish bit and frame synchronization. To facilitate this the synchronization defined in A.3.1 should be used prior to the first frame. Subsequent frames and end of the last frame need one or more than one flag sequence.

Format: 0111 1110

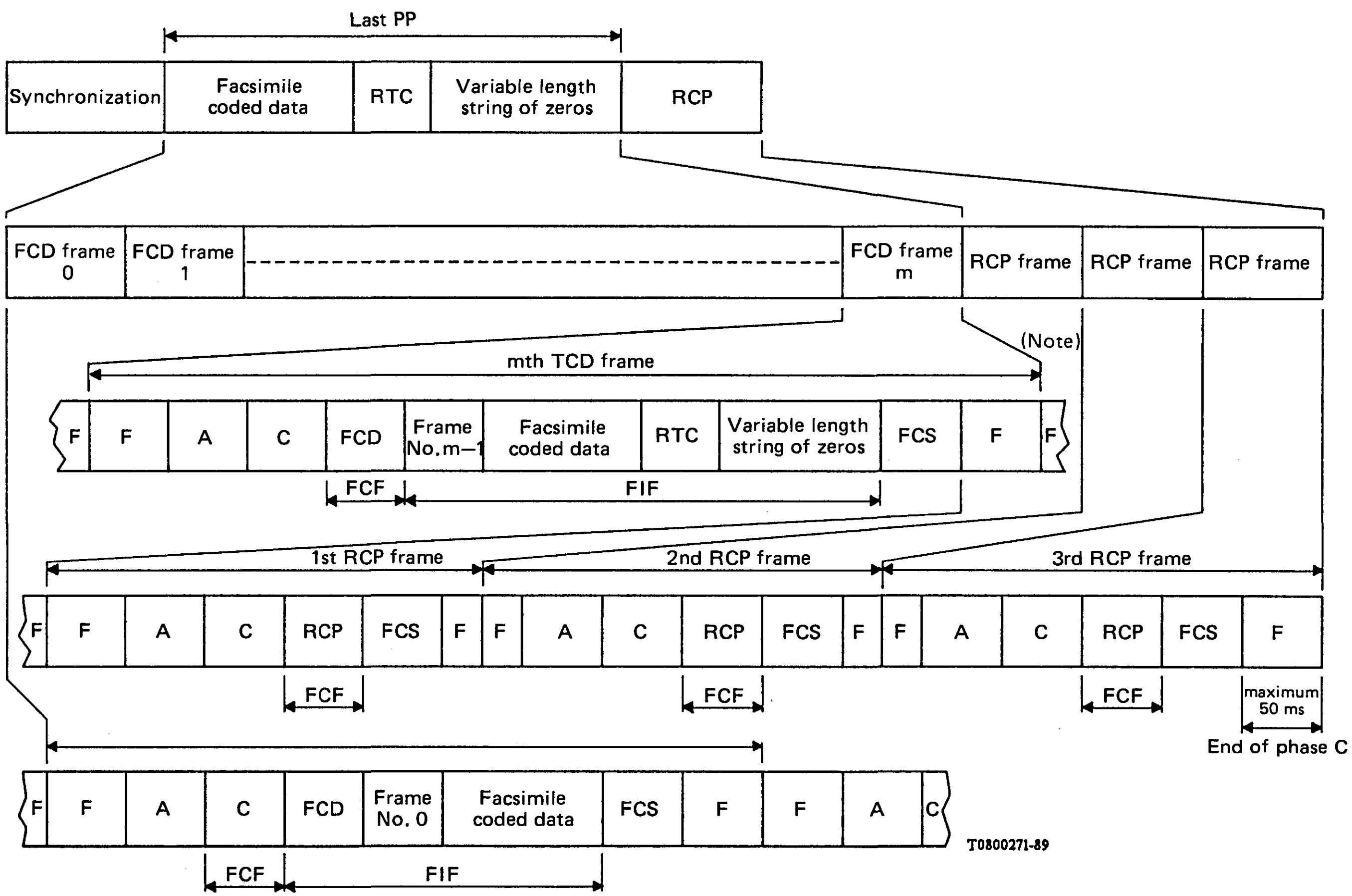
Note – The leading flag of a frame may be the trailing flag of the previous frame.



Note – See § A.3.2.

FIGURE A-1/T.4

Initial partial page (PP) frame structure



Note – See § A.3.2.

FIGURE A-2/T.4

Last partial page (PP) frame structure

A.3.3 *Address field (A)*

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

A.3.4 *Control field (C)*

The eight bit HDLC control field provides the capability of encoding the command unique to the facsimile message procedure.

Format: 1100 X000

The X bit is set to 0 for the FCD frame (facsimile coded data frame) and the RCP frame (return to control for partial page frame).

A.3.5 *Facsimile control field (FCF)*

In order to distinguish between the FCD frame (facsimile coded data frame) and the RCP frame (return to control for partial page frame), the FCF for the in-message procedure is defined as follows:

1) FCF for the FCD frame

   Format: 0110 0000

2) FCF for the RCP frame

   Format: 0110 0001

A.3.6 *Facsimile information field (FIF)*

The facsimile information field is a length of 257 or 65 octets (see Note 1) and is divided into two parts, the frame number and the facsimile data field (see Note 2).

Note 1 – This does not include bit stuffing to preclude non-valid flag sequences.

Note 2 – There is no information field in the RCP frame.

A.3.6.1 *Frame number*

This is an eight bit binary number. The frame number is defined to be the first eight bits of the facsimile information field. The least significant bit is transmitted first.

The frame number 0-255 (maximum number is 255) is used to identify the facsimile data field (see Recommendation T.30, Annex A).

The frame 0 is transmitted first in each block.

A.3.6.2 *Facsimile data field*

The coding schemes specified in § 4 are valid with the following notes.

1) The facsimile data field is a length of 256 or 64 octets.
2) The total coded scan line is defined as the sum of DATA 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 the EOL bits plus a tag bit.
3) At the end of facsimile data field, if necessary, Pad bits may be used to align on octet boundaries and frame boundaries (see Notes 1 and 2). The format is a variable length string of zeros.

Note 1 – The receiver is able to receive both Pad bits and Fill bits.

Note 2 – The facsimile data field length of the final frame including RTC signal may be less than 256 or 64 octets.

A.3.7 *Frame checking sequence (FCS)*

The FCS shall be a 16 bit sequence (see Recommendation T.30, § 5.3.7).

A.3.8 *Return to control for partial page (RCP)*

The end of a partial page transmission is indicated by sending three consecutive RCP frames (see Note).

Following these RCP frames, 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, Annex A.

Note – The flag sequence following the last RCP frame shall be less than 50 ms.

ANNEX B

(to Recommendation T.4)

Optional error limiting mode

Note – The text of Annex B shall be refined and studied during the next study period.

B.1 *Data*

B.1.1 *The division of a scan line into parts*

In order to limit the disturbed area in the event of transmission error, the scan lines are divided into parts before coding.

The number of parts shall be used as follows:

a) standard, 12 parts in a line composed of 1728 black and white picture elements,

b) optionally, 15 parts in a line composed of 2048 black and white picture elements,

c) optionally, 17 parts in a line composed of 2432 black and white picture elements.

Note – For alternatives b) and c), the last part of a scan line can be shortened and then will contain 32 and 128 pels respectively.

B.1.2 *Scan line coding*

All parts of a scan line are divided into whites (W) if they are composed of all white picture elements and not-white (NW) if they contain at least one black element.

The coding procedure is as shown in the flow diagram of Figure B-1/T.4.

B.1.2.1 *Shaping the extended description of a scan line*

For each coded scan line the extended scan line description (ELD) is shaped. ELD represents a sequence, where the bit number is equal to the part number in a scan line, i.e., each part has corresponding bit in the sequence. This bit is equal to "1", if the part is "NW" and it is equal to "0" if the part is "W".

B.1.2.2 *Scan line part coding*

W-parts are not encoded. The coding of each NW-part is independent of the coding of other parts in the given scan line. In the NW-part the white and black runs alternate. The coding always begins with a white run. If the actual scan line begins with a black run then a white run length of zero will be sent. Run lengths are encoded using Tables 1/T.4 and 2/T.4 as described in § 4.1.1. The last run of each NW-part is not encoded. Resulted coded run lengths (CRL) are sent directly one after another.

B.1.2.3 *Code bit number variation (CBNV)*

It is necessary to code and send the number of coded bits for each NW-part. For this purpose the code bit number of the previous NW-part q_{i-1} is subtracted from the code bit number of the given NW-part q_i. The resulting difference $q_i - q_{i-1}$ is coded by using code words listed in Table B-1/T.4. For the first NW-part in a scan line q_0 is taken to be 40. In the code words given in Table B-1/T.4 the bit X corresponds to the sign of the difference $q_i - q_{i-1}$. When the difference is positive, bit X equals "0", but when the difference is negative bit X equals "1".

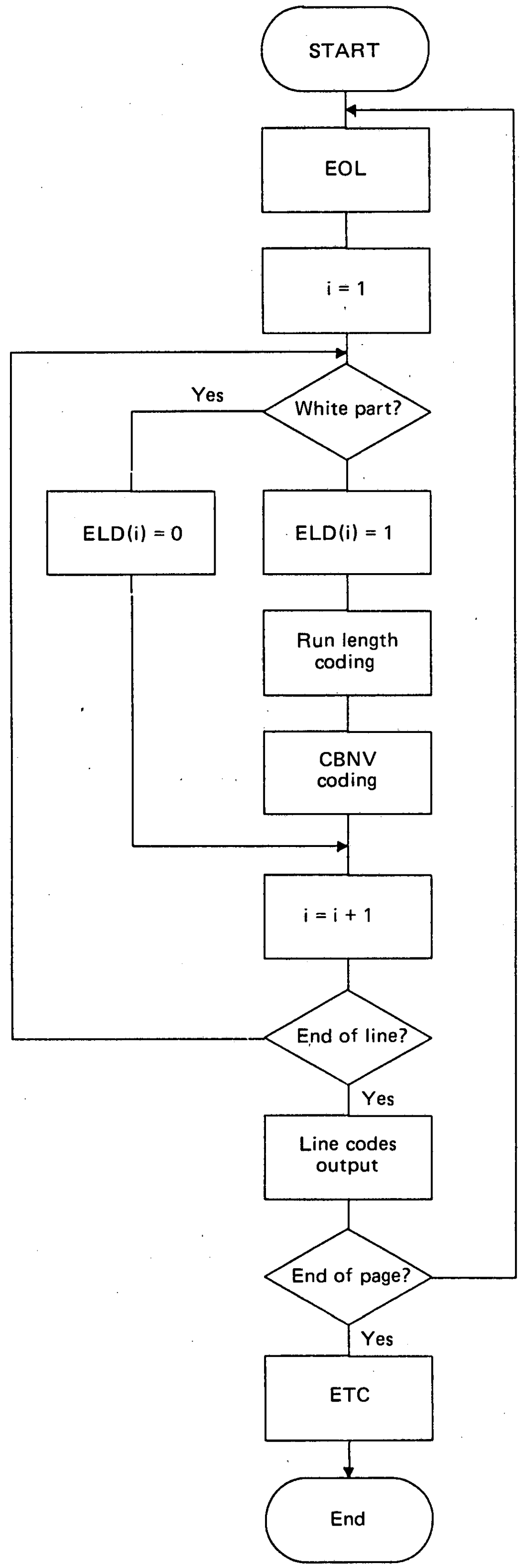


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FIGURE B-1/T.4

TABLE B-1/T.4

Code table for the code bit number variation

Absolute value of variation	Code	Absolute value of variation	Code
0	100000	51	X11111 010101
1	X00001	52	X11111 010110
2	X00010	53	X11111 010111
3	X00011	54	X11111 011000
4	X00100	55	X11111 011001
5	X00101	56	X11111 011010
6	X00110	57	X11111 011011
7	X00111	58	X11111 011100
8	X01000	59	X11111 011101
9	X01001	60	X11111 011110
10	X01010	61	X11111 100000
11	X01011	62	X11111 100001
12	X01100	63	X11111 100010
13	X01101	64	X11111 100011
14	X01110	65	X11111 100100
15	X01111	66	X11111 100101
16	X10000	67	X11111 100110
17	X10001	68	X11111 100111
18	X10010	69	X11111 101000
19	X10011	70	X11111 101001
20	X10100	71	X11111 101010
21	X10101	72	X11111 101011
22	X10110	73	X11111 101100
23	X10111	74	X11111 101101
24	X11000	75	X11111 101110
25	X11001	76	X11111 101111
26	X11010	77	X11111 110000
27	X11011	78	X11111 110001
28	X11100	79	X11111 110010
29	X11101	80	X11111 110011
30	X11110	81	X11111 110100
		82	X11111 110101
31	X11111 000001	83	X11111 110110
32	X11111 000010	84	X11111 110111
33	X11111 000011	85	X11111 111000
34	X11111 000100	86	X11111 111001
35	X11111 000101	87	X11111 111010
36	X11111 000110	88	X11111 111011
37	X11111 000111	89	X11111 111100
38	X11111 001000	90	X11111 111101
39	X11111 001001	91	X11111 X11110 010000
40	X11111 001010	92	X11111 X11111 000001
41	X11111 001011	93	X11111 X11111 000010
42	X11111 001100	94	X11111 X11111 000011
43	X11111 001101	95	X11111 X11111 000100
44	X11111 001110	96	X11111 X11111 000101
45	X11111 001111	97	X11111 X11111 000110
46	X11111 010000	98	X11111 X11111 000111
47	X11111 010001	99	X11111 X11111 001000
48	X11111 010010	100	X11111 X11111 001001
49	X11111 010011	101	X11111 X11111 001010
50	X11111 010100	102	X11111 X11111 001011

TABLE B-1/T.4 *(cont.)*

Absolute value of variation	Code	Absolute value of variation	Code
103	X11111 X11111 001100	119	X11111 X11111 011100
104	X11111 X11111 001101	120	X11111 X11111 011101
105	X11111 X11111 001110	121	X11111 X11111 011110
106	X11111 X11111 001111	122	X11111 X11111 100000
107	X11111 X11111 010000	123	X11111 X11111 100001
108	X11111 X11111 010001	124	X11111 X11111 100010
109	X11111 X11111 010010	125	X11111 X11111 100011
110	X11111 X11111 010011	126	X11111 X11111 100100
111	X11111 X11111 010100	127	X11111 X11111 100101
112	X11111 X11111 010101 0	128	X11111 X11111 100110
113	X11111 X11111 010111	129	X11111 X11111 100111
114	X11111 X11111 010111	130	X11111 X11111 101000
115	X11111 X11111 011000	131	X11111 X11111 101001
116	X11111 X11111 011001	132	X11111 X11111 101010
117	X11111 X11111 011010	133	X11111 X11111 101011
118	X11111 X11111 011011	134	X11111 X11111 101100

Note – Bit X corresponds to the sign of the variation.

B.1.3 *Data format*

The data format for the scan line containing several NW-parts is shown in Figure B-2/T.4 and containing only one NW-part is shown in Figure B-3/T.4. The data format for the scan line containing all whites is shown in Figure B-4/T.4.

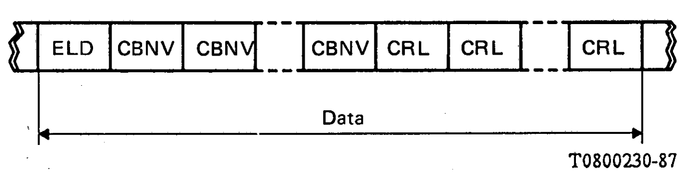


FIGURE B-2/T.4

Data format for the scan line containing several NW-parts

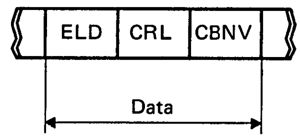


FIGURE B-3/T.4

Data format for the scan line containing one NW-part

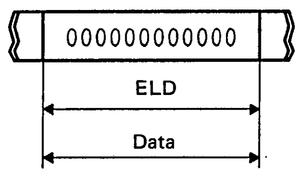


FIGURE B-4/T.4

Data format for the scan line containing 1728 white picture elements

B.2 *End of line (EOL)*

This code word follows each line of data. There is a slight probability of occurrence of the same bit combination for ELD and the code word EOL. This should be taken account in the decoding algorithm. In addition, EOL is sent prior to the format data line of the page.

Format: 000000000001

B.3 *Fill*

A pause in the message may be filled as described in § 4.1.3.

B.4 *Return to control (RTC)*

The return to control should comply with § 4.1.4.

Note – When decoding, the correction of the corrupted parts can be performed by replacing the corrupted part with the corresponding uncorrupted part from the previous line. The exceeding of the value 144 by the decoded part length or the absence of code word of the given part in the code table vocabulary can be shown as a sign for replacement.

(to Recommendation T.4)

Interworking between equipments with A5/A6 and A4 facilities and between equipments with combinations of these facilities

TABLE C-1/T.4

Terminal capabilities at reception side / Situation at transmission side				Case from § 2.1	b)	e)	f)	g)	h)
				Horizontal resolution	1728 pels/ 215 mm	864 pels/ 107 mm	1216 pels/ 151 mm	1728 pels/ 107 mm	1728 pels/ 151 mm
				Vertical resolution	3.85 l/mm 7.7 l/mm	7.7 l/mm 15.4 l/mm	5.44 l/mm 10.9 l/mm	7.7 l/mm 15.4 l/mm	5.44 l/mm 10.9 l/mm
				Pel process	1728 Original	864 (≈ 1728 × 0.70) (Note 1)	1216 (≈ 1728 × 0.70) (Note 2)	1728 Original	1728 Original
Case from § 2.1	Horizontal resolution	Vertical resolution	Pel process	DIS-DTC / DCS	–	Bit 33 = 1 Bit 35 = 1	Bit 33 = 1 Bit 34 = 1	Bit 33 = 1 Bit 37 = 1	Bit 33 = 1 Bit 36 = 1
b)	1728 pels/ 215 mm	3.85 l/mm 7.7 l/mm	Original 1728	(Notes 1, 2) Bit 17 = 0 Bit 18 = 0 Bit 33 = 0	Equal (A4)	Reduced (A4 → A6)	Reduced (A4 → A5)	Reduced (A4 → A6)	Reduced (A4 → A5)
e)	864 pels/ 107 mm	7.7 l/mm 15.4 l/mm	864 × 2 (Note 1)		Enlarged (A6 → A4)	Equal (A6) (Note 1)	Enlarged (A6 → A5)	Equal (A6)	Enlarged (A6 → A5)
f)	1216 pels/ 151 mm	5.44 l/mm 10.9 l/mm	1216 × 1.42 (Note 2)		Enlarged (A5 → A4)	Reduced (A5 → A6)	Equal (A5) (Note 2)	Reduced (A5 → A6)	Equal (A5)
g)	1728 pels/ 107 mm	7.7 l/mm 15.4 l/mm	Original 1728		Enlarged (A6 → A4)	Equal (A6)	Enlarged (A6 → A5)	Equal (A6)	Enlarged (A6 → A5)
h)	1728 pels/ 151 mm	5.44 l/mm 10.9 l/mm	Original 1728		Enlarged (A5 → A4)	Reduced (A5 → A6)	Equal (A5)	Reduced (A5 → A6)	Equal (A5)

Note 1 – Bit 33 = 1 Transmit pel process = 432(W) + 864 + 432(W)
Bit 35 = 1 Receive pel process extracts central 864 pels

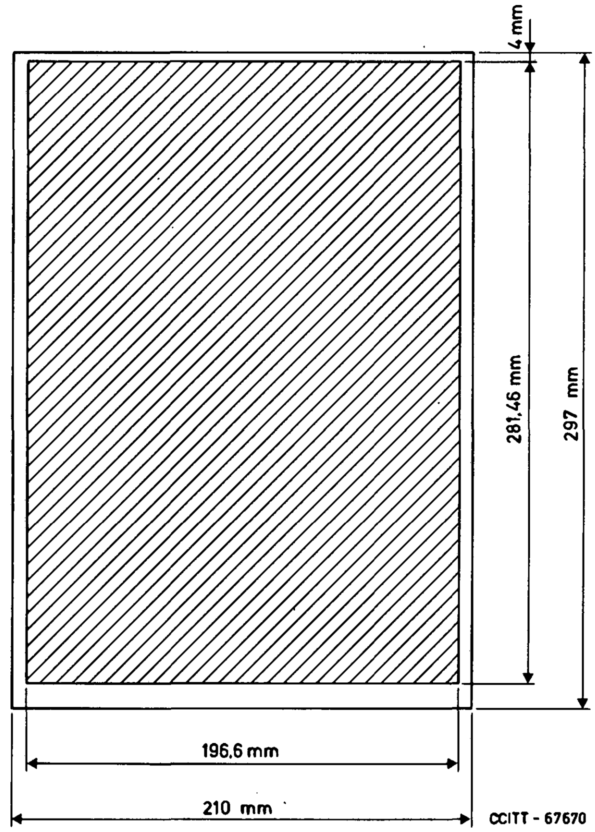
Note 2 – Bit 33 = 1 Transmit pel process = 256(W) + 1216 + 256(W)
Bit 34 = 1 Receive pel process extracts central 1216 pels

(W) = white pels
l = line

APPENDIX I

(to Recommendation T.4)

Guaranteed reproducible area for Group 3 apparatus conforming to Recommendation T.4



Note 1 – Paper characteristics (i.e. weight) are important parameters. Lightweight paper may cause additional paper handling errors and may result in a reduced guaranteed reproducible area.

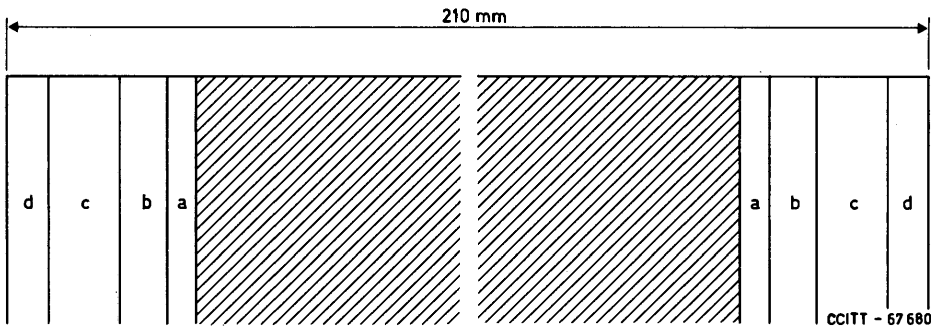
Note 2 – Sheet feed mechanisms may reduce the guaranteed reproducible area.

Note 3 – All calculations were done using worst case values. Using nominal values increases the reproducible area.

Note 4 – The exact horizontal position of this area within the ISO A4 paper size as well as sizes larger than the above are subject to national recommendations and/or definitions.

FIGURE I-1/T.4

Guaranteed reproducible area for Group 3 machines for use on facsimile services referring to ISO A4 paper size



a : Printer/scanner tolerances
b : Loss caused by the enlarging effect due to TLL tolerance
c : Loss caused by skew
d : Record medium positioning errors

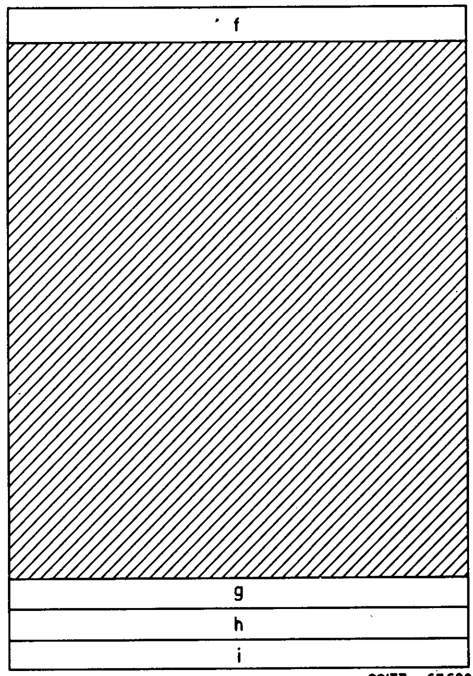
FIGURE I-2/T.4

Horizontal loss

TABLE I-1/T.4

Horizontal losses

Printer/scanner	a	± 0.5 mm
Enlarging	b	± 2.1 mm
Skew	c	± 2.6 mm
Positioning errors	d	± 1.5 mm



f : Paper insertion loss
g : Loss caused by skew
h : Scanning density tolerance
i : Gripping loss

FIGURE I-3/T.4

TABLE I-2/T.4

Vertical losses

Paper insertion	f	4.0 mm
Skew	g	± 1.8 mm
Scanning density tolerance	h	± 2.97 mm
Gripping loss	i	2.0 mm

Note – Scanning density tolerance will reduce to 0 mm on roll-fed machines.

FACSIMILE CODING SCHEMES AND CODING CONTROL FUNCTIONS FOR GROUP 4 FACSIMILE APPARATUS

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

1 General

1.1 *Scope*

1.1.1 Recommendation T.6 defines the facsimile coding schemes and their control functions to be used in the Group 4 facsimile.

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

T.503	A document application profile for the interchange of Group 4 facsimile documents
T.521	Communication application profile for document bulk transfer based on the session service (according to the rules defined in T.62 *bis*)
T.563	Terminal characteristics for Group 4 facsimile apparatus
T.73	Document interchange protocol for the Telematic services
T.62	Control procedures for Teletex and Group 4 facsimile services
T.62 *bis*	Control procedures for Teletex and Group 4 facsimile services based on Recommendations X.215/X.225
T.70	Network-independent basic transport service for Telematic services
F.161	International Group 4 facsimile service

In addition, in the case of Group 4 Class II/III (Teletex or mixed mode of operation), the following Recommendations should also be read:

T.60	Terminal equipment for use in the Teletex service
T.61	Character repertoire and coded character sets for the international Teletex service
T.72	Terminal capabilities for mixed mode of operation

1.2 *Fundamental principles*

1.2.1 *Facsimile coding schemes and coding control functions*

Facsimile coding schemes consist of the basic facsimile coding scheme and optional facsimile coding schemes. They are defined in § 2 and §§ 3 and 4, respectively.

Facsimile coding schemes are specified assuming that transmission errors are corrected by control procedures at a lower level.

The basic facsimile coding scheme is the two-dimensional coding scheme which is in principle the same as the two-dimensional coding scheme of Group 3 facsimile specified in Recommendation T.4.

Optional facsimile coding schemes are specified not only for black and white images but also for grey scale images and colour images.

Facsimile coding control functions are used in facsimile user information in order to change facsimile parameters or to invoke the end of facsimile block. They are defined in § 2.4.

2 Facsimile coding schemes and coding control functions for black and white images

2.1 *General*

This section specifies the facsimile coding schemes, and associated control functions for black and white images.

Facsimile coding schemes consist of the basic facsimile coding scheme and optional coding schemes.

The use of the optional facsimile coding schemes is subject to mutual agreement between terminals and shall be initiated by the appropriate procedural steps.

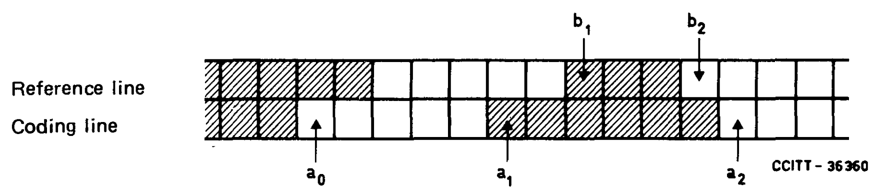
2.2 *Basic facsimile coding scheme*

2.2.1 *Principle of the coding scheme*

The coding scheme uses a two-dimensional line-by-line coding method in which the position of each changing picture element on the current 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 is immediately above the coding line. After the coding line has been coded, it becomes the reference line for the next coding line. The reference line for the first coding line in a page is an imaginary white line.

2.2.2 *Definition of changing picture elements* (see Figure 1/T.6)

A changing element is definied 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 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 § 2.2.3).

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 1/T.6

Changing picture elements

2.2.3 *Coding modes*

One of the three coding modes are chosen according to the coding procedure described in § 2.2.4 to code the position of each changing element along the coding line. Examples of the three coding modes are given in Figure 2/T.6, 3/T.6 and 4/T.6.

2.2.3.1 *Pass mode*

This mode is identified when the position of b_2 lies to the left of a_1. (See Figure 2/T.6.)

However, the state where b_2 occurs just above a_1, as shown in Figure 3/T.6 is not considered as a pass mode.

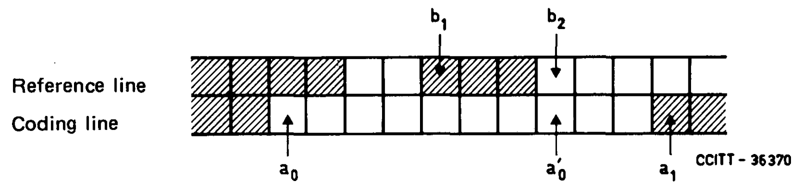


FIGURE 2/T.6

Pass mode

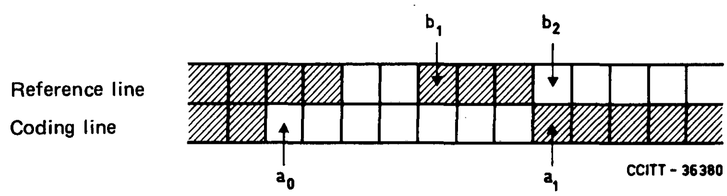


FIGURE 3/T.6

An example not corresponding to a Pass mode

2.2.3.2 *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 (see Figure 4/T.6).

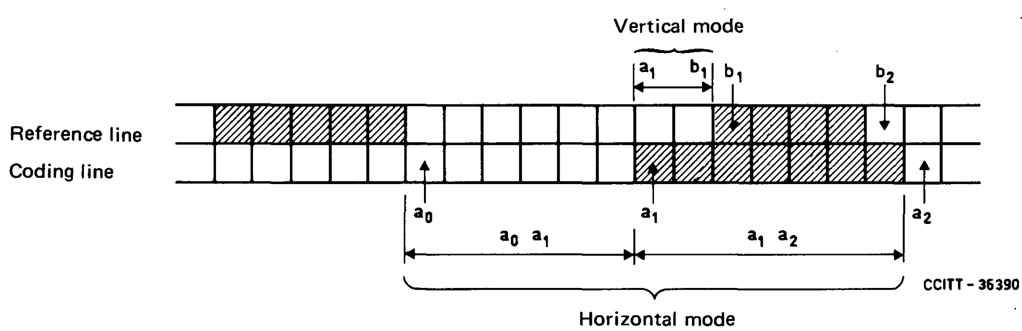


FIGURE 4/T.6

Vertical mode and horizontal mode

2.2.3.3 *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 1/T.6). $M(a_0a_1)$ 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 run-length code tables (Tables 2/T.6 and 3/T.6).

TABLE 1/T.6

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)
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				0000001xxx

Note – Code M( ) of the horizontal mode represents the code words in Tables 2/T.6 and 3/T.6.

TABLE 2/T.6

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 3/T.6

Make-up codes between 64 and 1728

White run length	Code word	Black run length	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

Make-up codes between 1792 and 2560

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

2.2.4 *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 1/T.6. The coding procedure is as shown in the flow diagram of Figure 5/T.6.

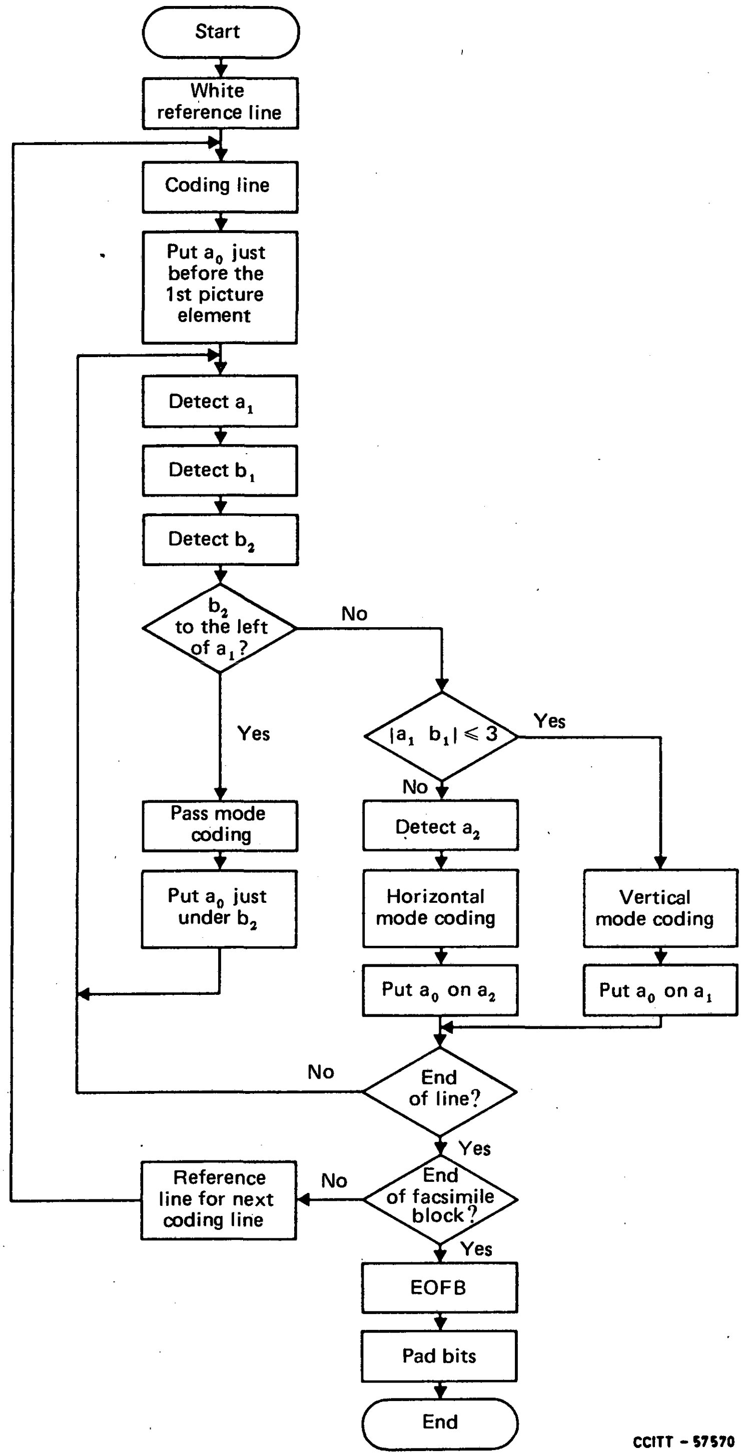


FIGURE 5/T.6

Coding flow diagram

Step 1

i) If a pass mode is identified, this is coded using the word 0001 (Table 1/T.6). 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 2/T.6).

ii) If a pass mode is not detected, then proceed to Step 2.

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 2

i) Determine the absolute value of the relative distance a_1b_1.

ii) If $| a_1b_1 | \leq 3$, as shown in Table 1/T.6, 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 1/T.6, following horizontal mode code 001, a_0a_1 and a_1a_2 are respectively coded by one-dimensional run length coding.

Run lengths in the range of 0 to 63 pels are encoded with their appropriate terminating code word of Table 2/T.6. Note that there is a different list of code words for black and white run lengths. Run lengths in the range of 64 to 2623 pels are encoded first by the make-up code word representing the run length which is nearest, not longer, to 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. Run lengths in the range of lengths longer than or equal to 2624 pels are coded first by the make-up code of 2560. If the remaining part of the run (after the first make-up code of 2560) is 2560 pels or greater, additional make-up code(s) of 2560 are issued until the remaining part of the run becomes less than 2560 pels. Then the remaining part of the run is encoded by terminating code or by make-up code plus Terminating code according to the range as mentioned above.

After this processing, position a_2 is regarded as the new starting picture element a_0 for the next coding.

Note – Coding examples are given in Recommendation T.4, § 4.2.5.

2.2.5 *Processing the first and last picture element in a line*

2.2.5.1 *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 § 2.2.2).

The first run length on a line a_0a_1 is replaced by $a_0a_1 - 1$. Therefore, if the first actual run is black and is deemed to be coded by horizontal mode coding, then the first code word $M(a_0a_1)$ corresponds to an imaginary white run of zero length (see Figure 10/T.4).

2.2.5.2 *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.

2.3 *Optional facsimile coding schemes for black and white images*

2.3.1 *Uncompressed mode*

Uncompressed mode is an optional coding scheme associated to the basic facsimile coding scheme and is used to transmit the image information without data compression techniques as shown in Table 4/T.6.

The extension code in § 2.2.4 with the xxx bits set to 111 is used as an entrance code from the basic coding scheme in § 2.2 to the uncompressed mode.

While using the uncompressed mode, the last picture elements of the end of the line and the first picture elements of the beginning of the following line are concatenated to one pattern.

TABLE 4/T.6

Uncompressed mode code words

Entrance code to uncompressed mode	Basic coding sheme: 0000001111	
Uncompressed mode code	*Image pattern* 1 01 001 0001 00001 00000	*Code word* 1 01 001 0001 00001 000001
Exit 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).

2.4 *Facsimile coding control functions*

2.4.1 *Control functions for basic facsimile coding scheme*

2.4.1.1 *End-of-facsimile block*

The end-of-facsimile block (EOFB) code is added to the end of every coded facsimile block. The format of EOFB is as follows:

Format: 000000000001000000000001
24 bits

2.4.1.2 *Pad bits*

Pad bits may be used after the end-of-facsimile block code if it is necessary to align on octet boundaries or to a fixed block size. The format used is as follows.

Format: Variable length string of 0s.

2.4.1.3 *Extension*

Extension code is used to indicate the change from the current mode to another mode, e.g., another coding scheme.

Format: 0000001xxx,

where xxx = 111 indicates uncompressed mode which is specified in § 2.3.1.

Further study is needed to define other unspecified xxx bit assignments and their use for any further extensions.

3 Optional grey scale facsimile coding schemes and their coding control functions

For further study.

4 Optional colour facsimile coding schemes and their coding control functions

For further study.

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.

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.

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.

PHOTOTELEGRAPH TRANSMISSIONS ON TELEPHONE-TYPE CIRCUIT[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 Recommendation H.41 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 phototelegraph 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.

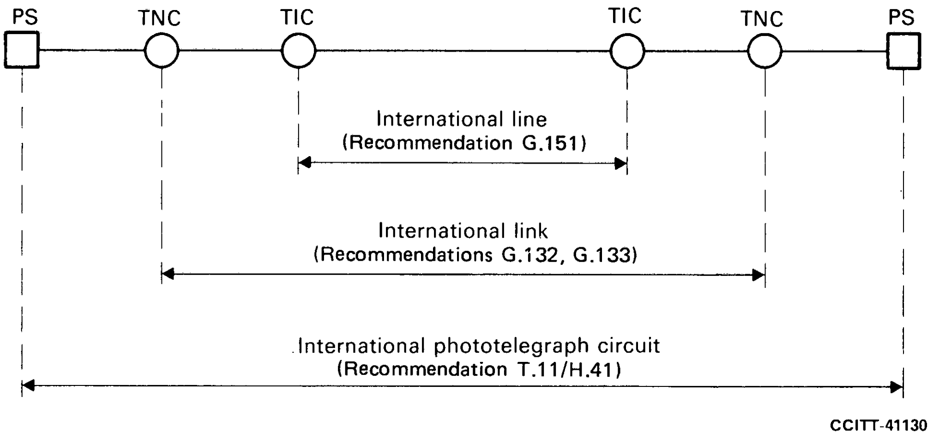
For the same reason, 4-wire circuits should be extended to the phototelegraph stations on a 4-wire basis at the appropriate amplifier stations, the terminating units and echo-suppressors always being disconnected.

The configuration of a phototelegraph circuit is given in Figure 1/T.11.

1) Recommendation T.11 corresponds to Recommendation H.41.

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 and M.1015.

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 concerning telephone circuits. The attenuation distortion between two terminal national centres shall therefore not exceed the limits indicated in Recommendation G.132 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 and Reference [1].

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

$$\Delta t \leqslant \frac{1}{2 f_p}$$

where:

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.

Reference

[1] *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;

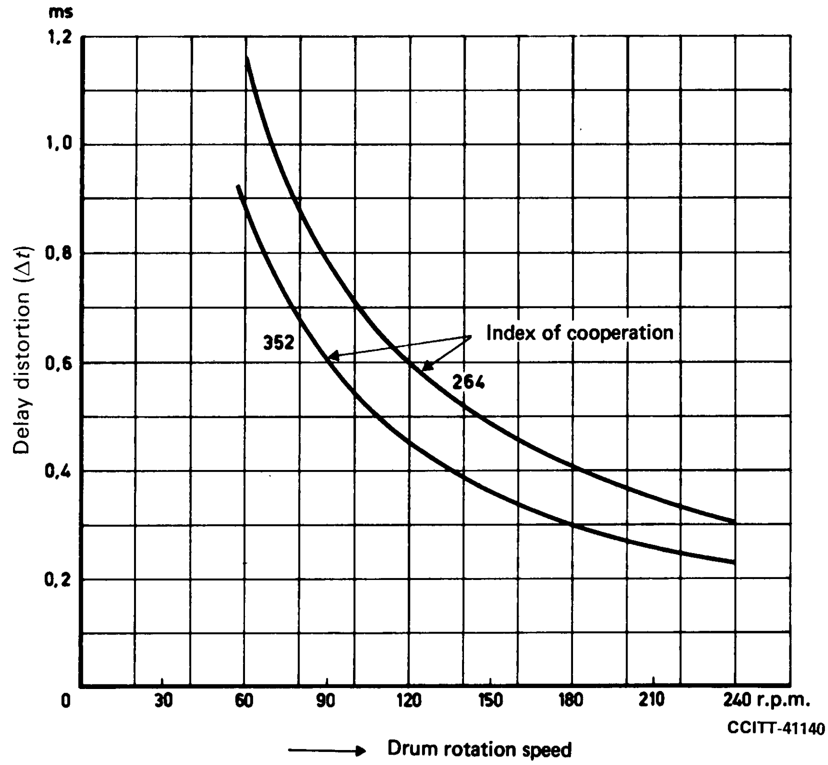
(c) that phototelegraph transmission of satisfactory quality requires that the limits of differences between the group delays in the transmitted frequency band, as shown in Figure 1/T.12, are not to be exceeded;

(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 chain 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.

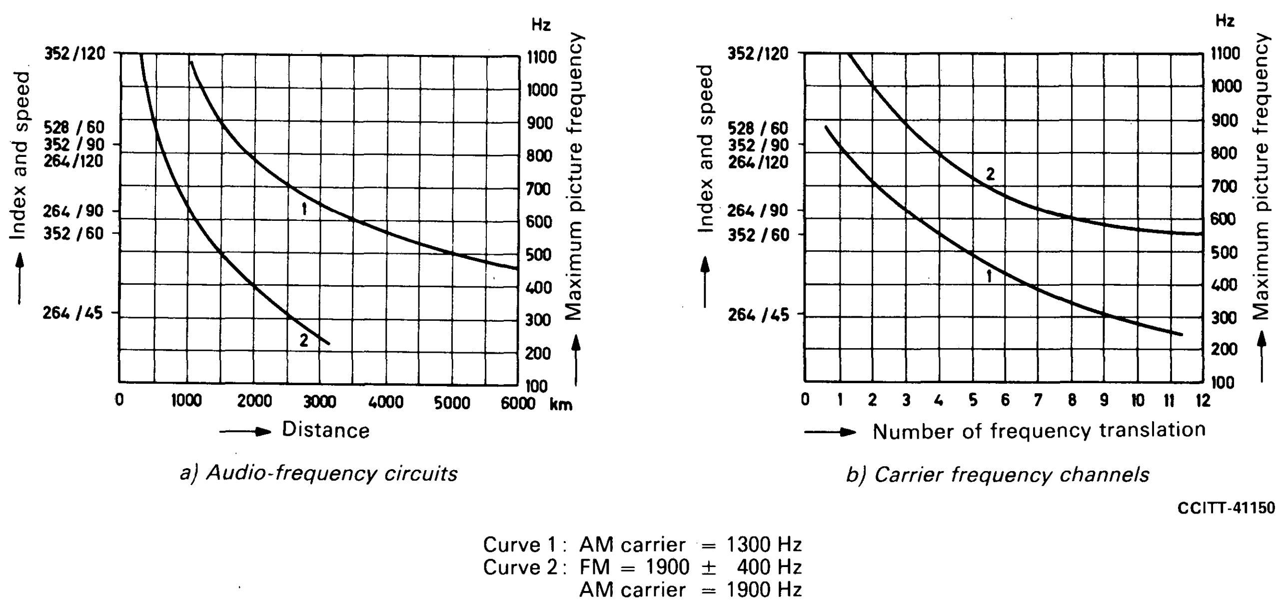


FIGURE 2/T.12

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.

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] 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 and T.1) as shown in Figure 1/T.15.

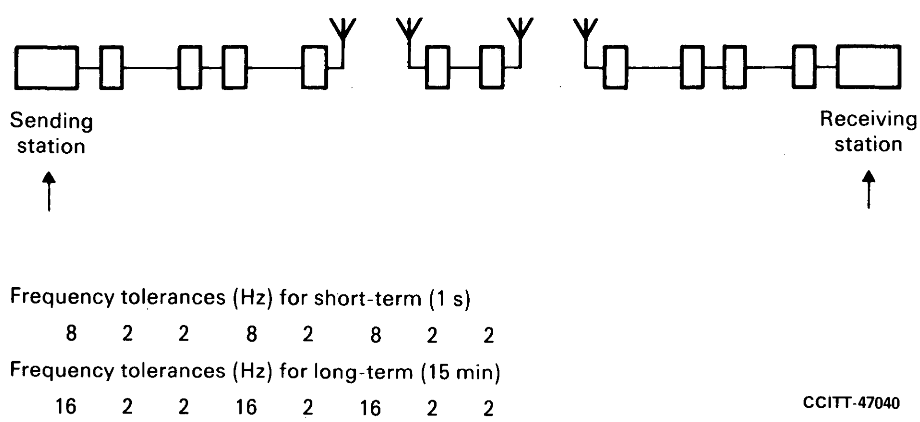


FIGURE 1/T.15
Typical circuit in a worldwide phototelegraph connection

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.

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.

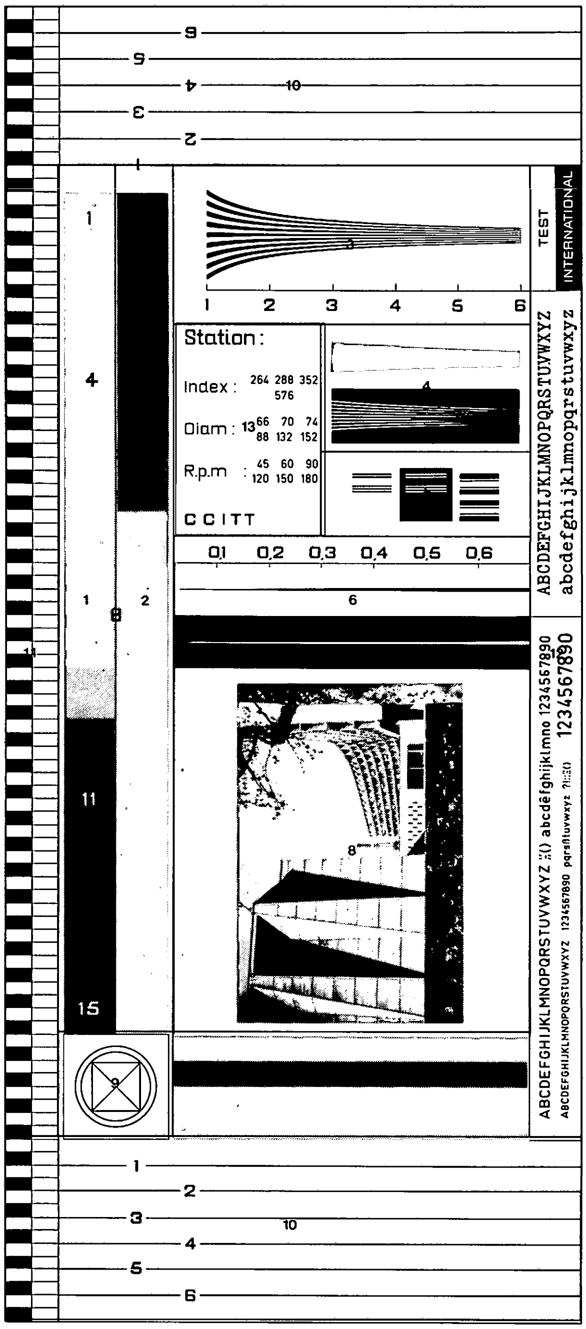
A.12 Section 12 contains letters, digits, and punctuation marks printed in various styles, and arranged so that they can be read sideways.

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.

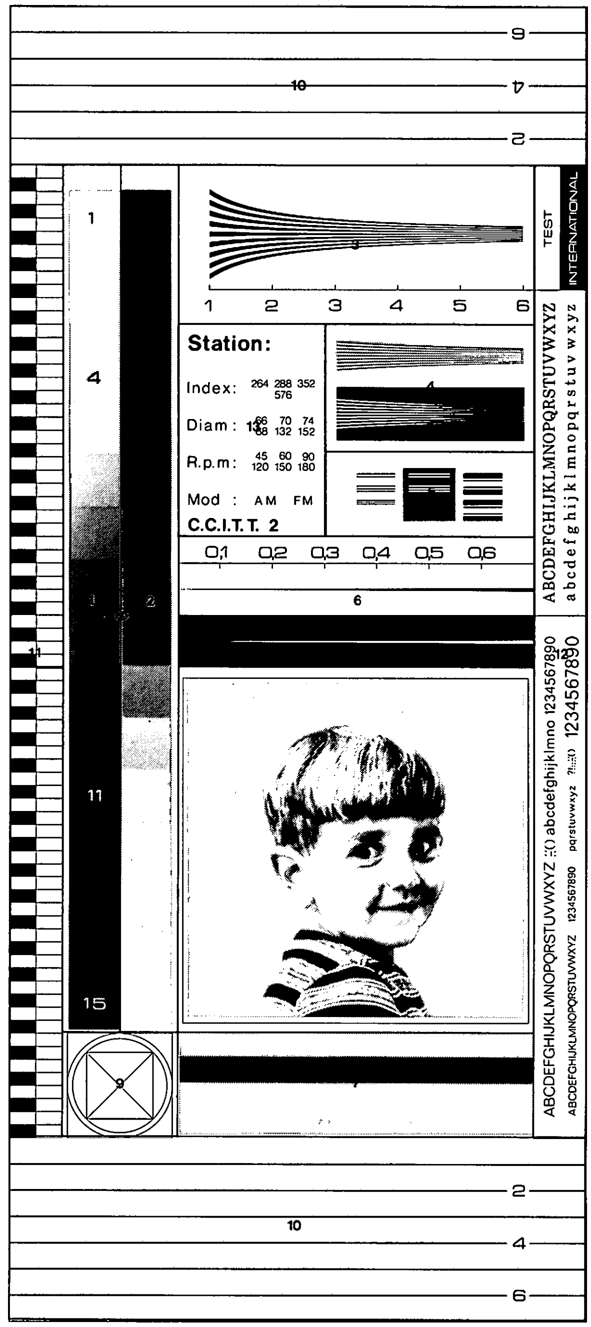
A.13 Section 13 contains

- 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.



CCITT-14150

Test chart No. 1 (first edition)



CCITT-14160

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.

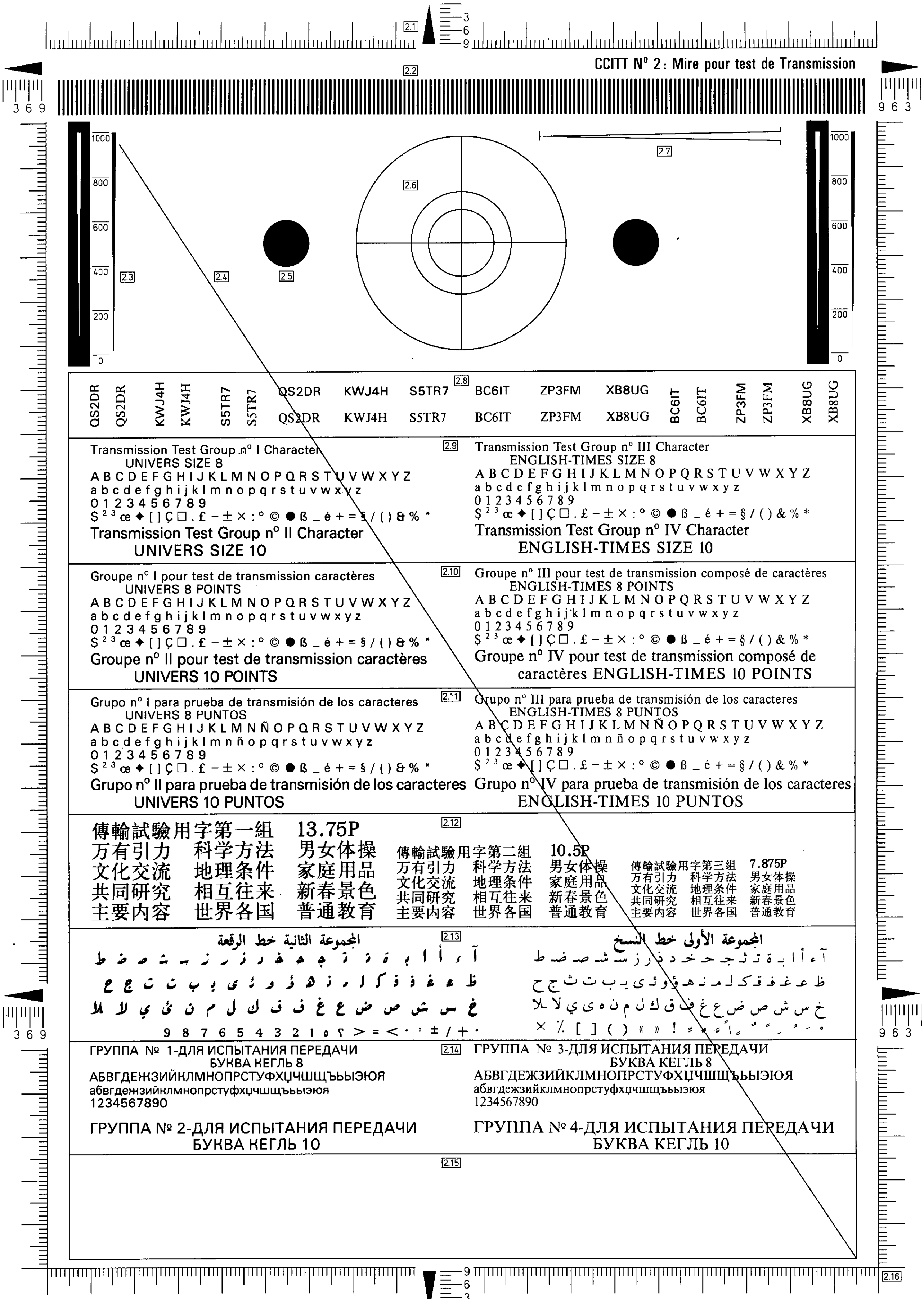
The numbers indicate distances in millimetres measured from the edge of the test pattern.

3.23 *Frame A′ A B B′*

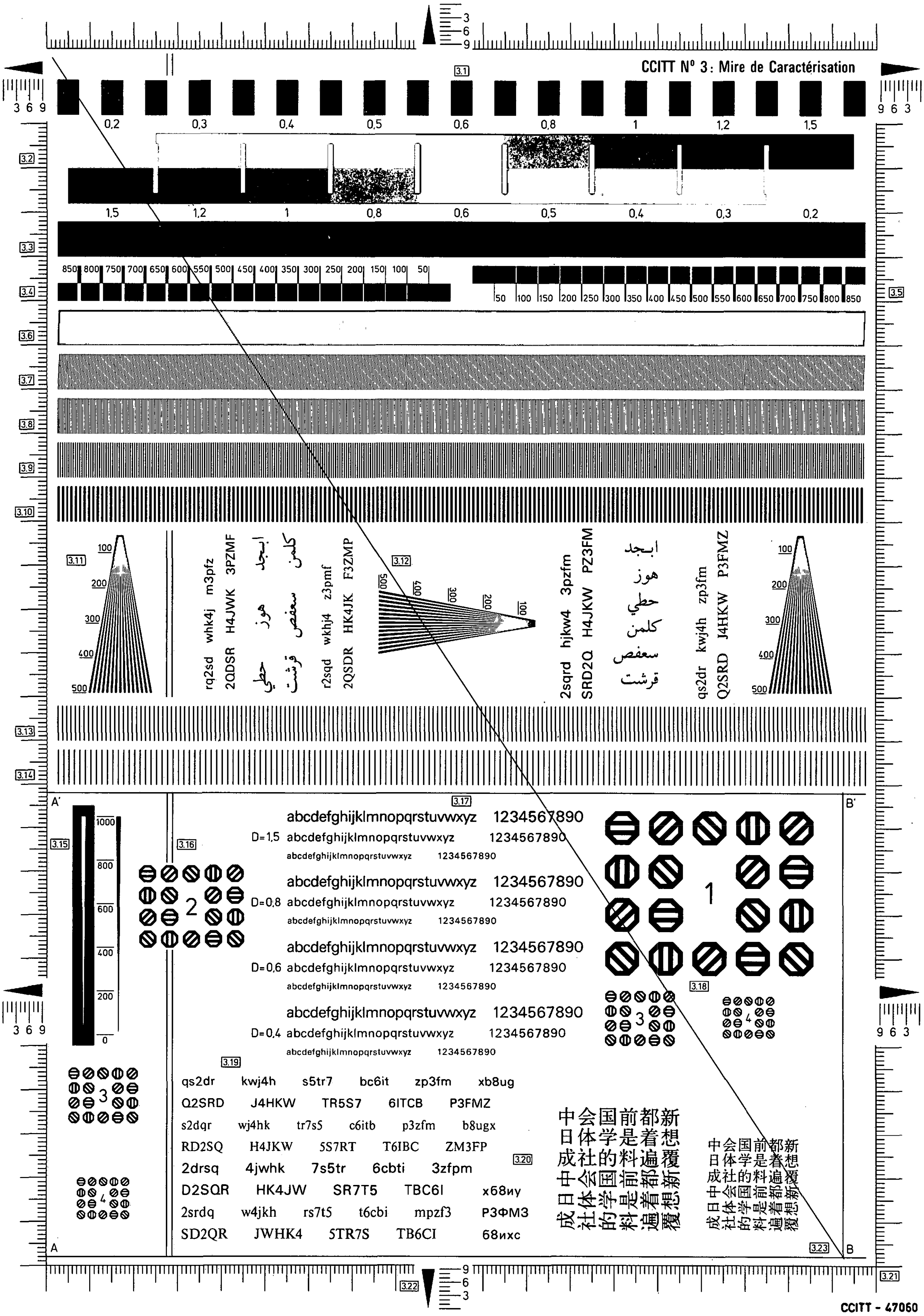
This frame permits measurement of parallelogram deformation of the image caused by time-base frequency differences.

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, Malaga-Torremolinos, 1984 and Melbourne, 1988)

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.

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[1] Facsimile apparatus referred to as Groups 1, 2 or 3 in this Recommendation are those cnforming to Recommendations 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.

If enhanced security is required, this may be provided by the use of the non-standard facilities frame.

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)

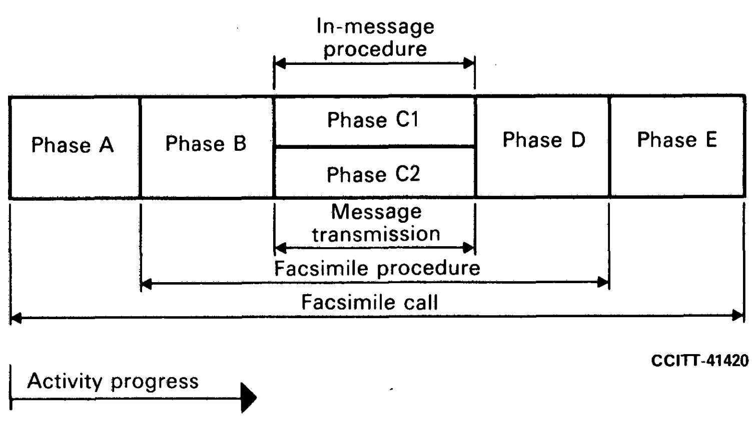

FIGURE 1/T.30

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*[2)]

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.

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2) 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)

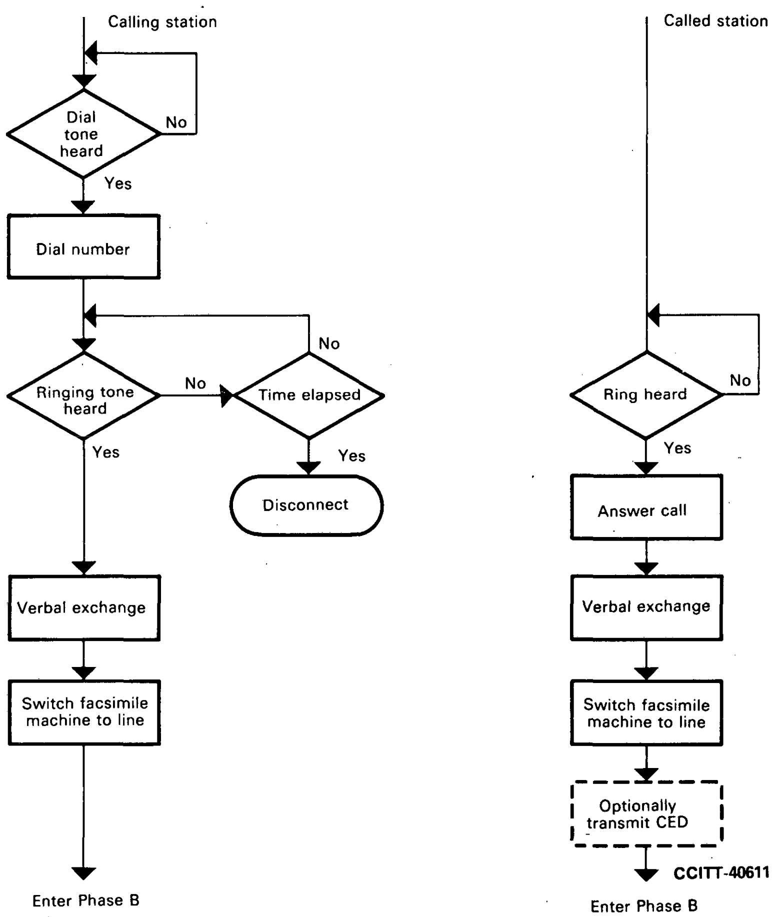


FIGURE 2/T.30

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)

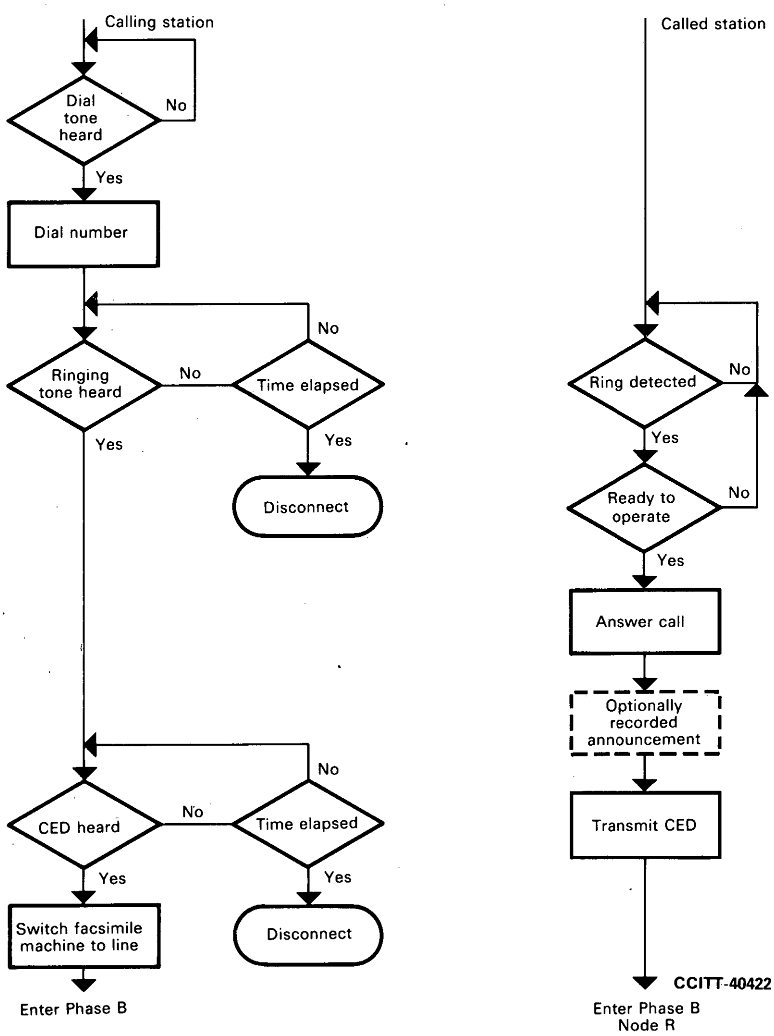


FIGURE 3/T.30

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)

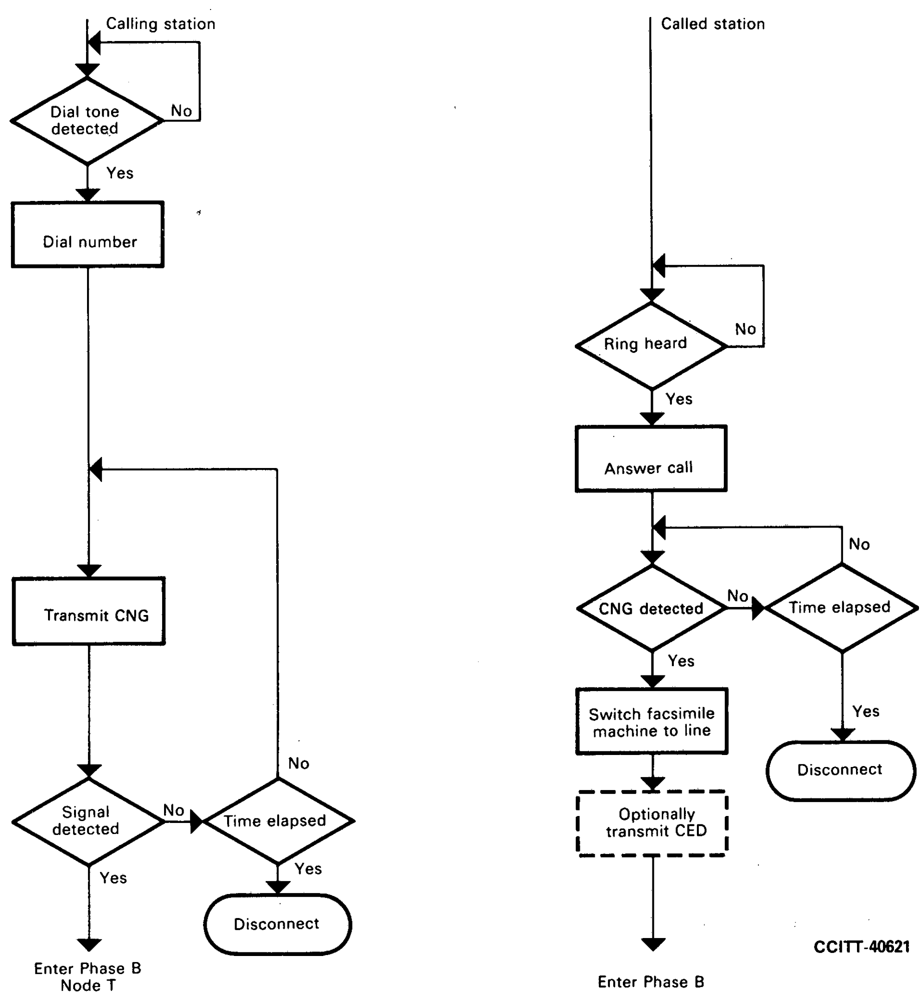


FIGURE 4/T.30
Call establishment, operating method 3

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)

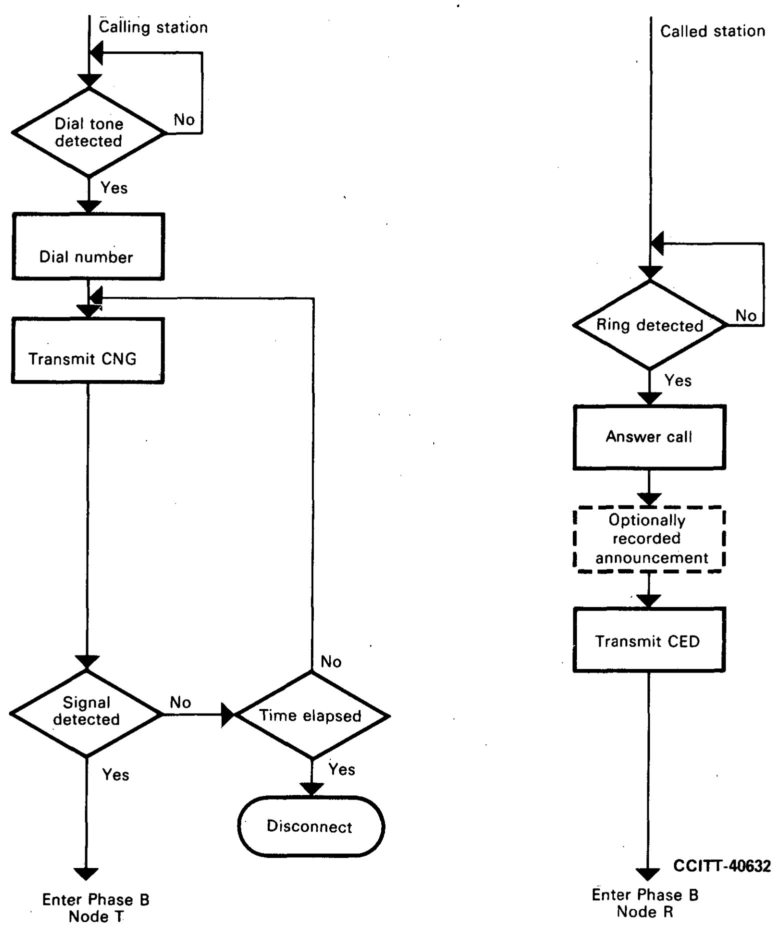


FIGURE 5/T.30
Call establishment, operating method 4

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.

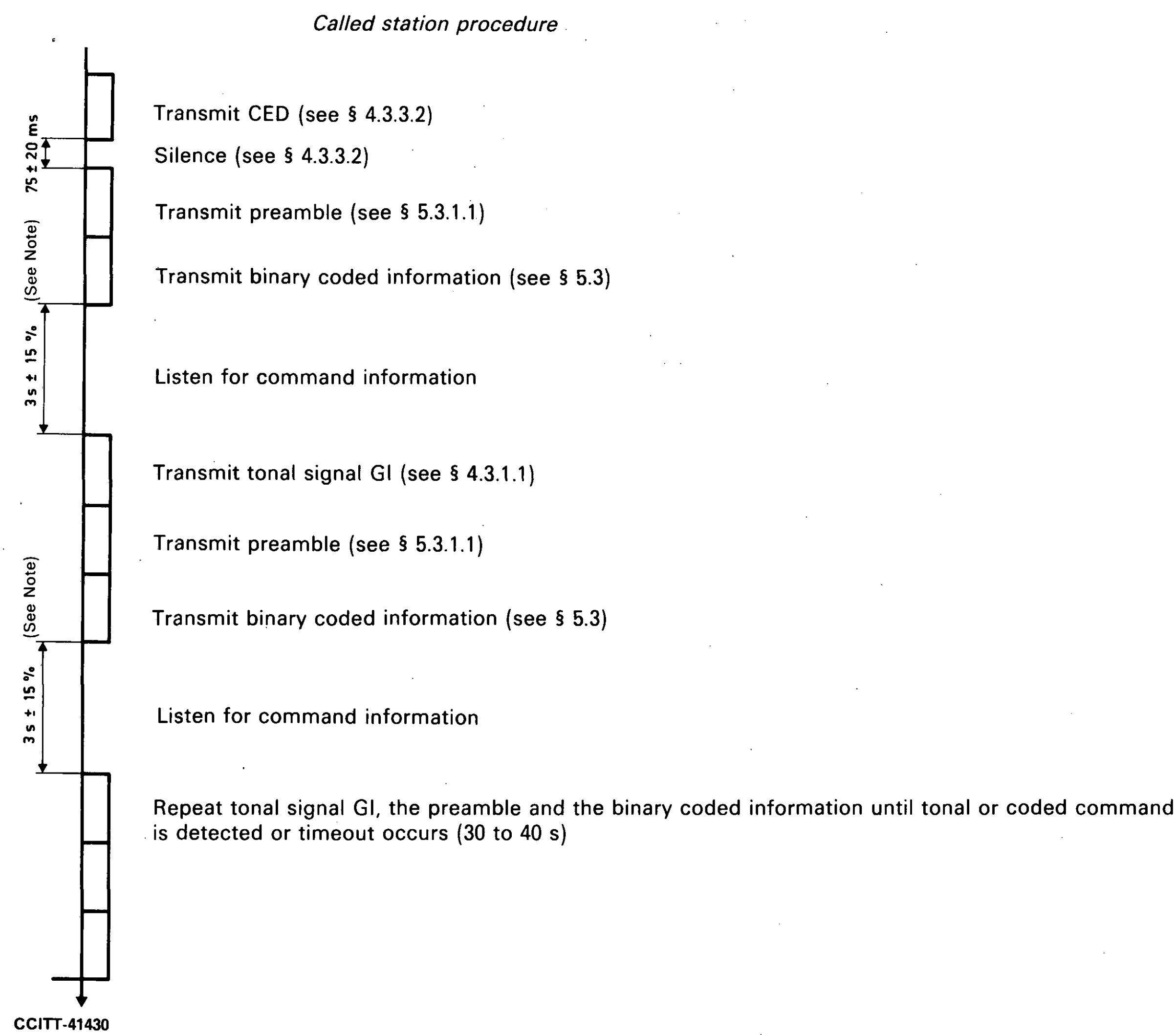
An example of a station having both binary-coded and tonal capabilities is shown in Figure 6/T.30 for further clarification.

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.



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

	Calling transmitter		*Called receiver*
Phase A		←	Called station identification
Phase B		←	Capabilities identification
	Command information	→	
	Phasing and/or training	→	
		←	Confirmation to receive
Phase C	Message	⇒	
Phase D	End of message	→	
		←	Message confirmation

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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.

	Calling receiver		*Called transceiver*
Phase A		←	Called station identification
Phase B		←	Capabilities identification (DIS)
	Transmit command (DTC)	→	
		←	Receive command (DCS)
		←	Phasing/training
	Confirmation to receive (CFR)	→	
Phase C		⇐	Message
Phase D		←	End of message (EOM)
	Message confirmation (MCF)	→	

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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

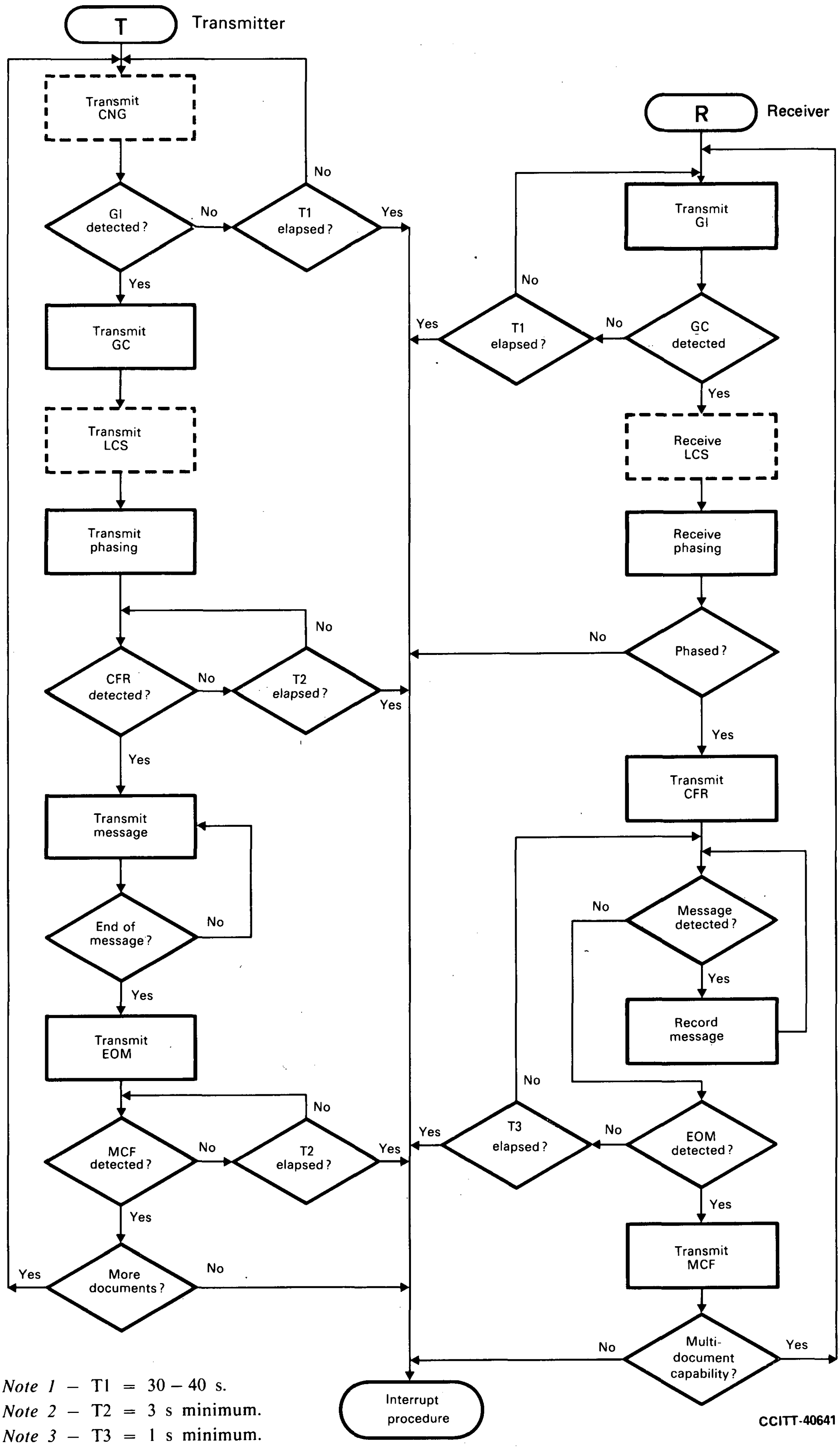
Single-document transmitter	Multi-document receiver
1. Transmit EOM	
	2. Detect EOM
	3. Transmit MCF
	4. Prepare for next document
5. Detect MCF Switch back to telephone Operator loads document	
	6. When ready to receive transmit GI
7. Operator hears GI and switches machine to line	
8. Detect GI	
9. 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*

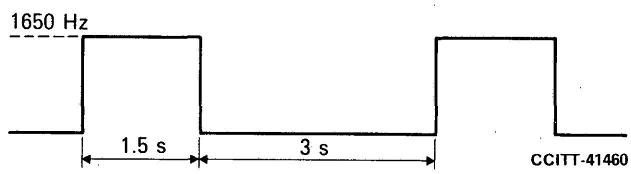
The signals used are single frequencies to line. The equipment used to detect the signal should be capable of functioning correctly with the frequency tolerances quoted plus an additional tolerance of ± 6 Hz due to the line.

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.

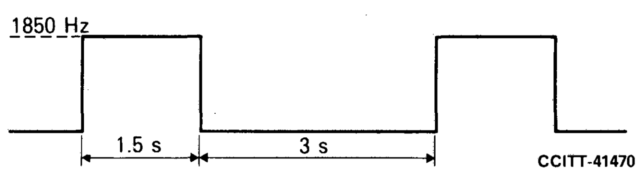
FIGURE 10/T.30

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.

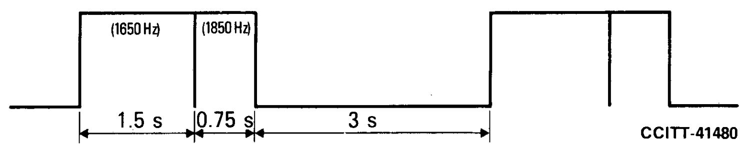
FIGURE 11/T.30

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.

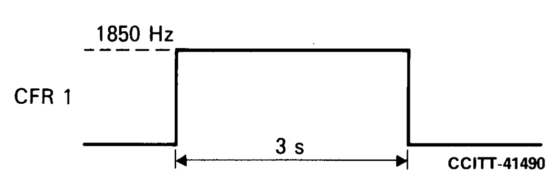
2) The signal is repeated until detection of GC or time T1 elapses.

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.

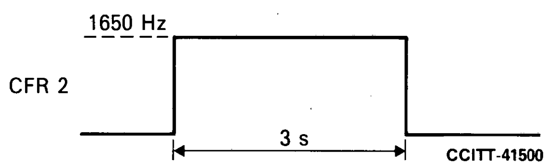
FIGURE 13/T.30

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.

Note – It should be noted that the capabilities identification of a combined Group 1 or 2 and Group 3 machine may consist of the tonal GI signal concatenated with the binary coded identification signal. Some equipment exists which sends the GC signal at the end of the GI signal and not at the end of the capabilities identification signal. This should be avoided in new designs. However, manufacturers of combined group equipments should take account of this anomaly.

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.

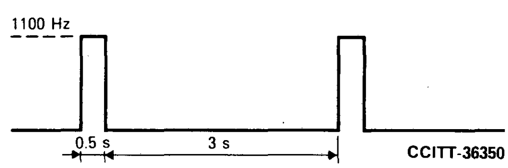
The called station delays for a period of 75 ± 20 milliseconds after terminating the CED tone before transmitting further signals.

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

- in paragraph 5, the following modified note 4 should replace the existing note 4 and the following new note 5 should be added:

Note 4 – The transmission of signalling utilizing the modulation systems of Recommendations V.27 *ter*, V.29, V.33 or V.17 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).

Note 5 – Group 3 machines using the modulation system defined in V.17 (as specified by bits 11, 12, 13 and 14 of Table 2/T.30) shall use the short resynchronization sequence defined in Table 3/V.17 for all trellis mode training except during a TCF message and the first high speed message after a CTC/CTR ECM message sequence. The long synchronization sequence shall be used in the TCF and the first high speed message after the CTC/CTR sequence.

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.

For Group 3 machines, an error correction capability is utilized as a recognized option. This procedure is defined in Annex A.

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.) 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 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* or V.29 training sequence).

Note 4 – The transmission of signalling utilizing the modulation systems of Recommendation V.27 *ter* or Recommendation V.29 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 the end of message send either: a) EOM or b) EOP or c) MPS or d) PRI-Q or e) PPS·NULL or f) PPS·MPS or g) PPS·EOM or h) PPS·EOP or i) PPS·PRI-Q	
	13. Detect EOM, EOP, MPS, PRI-Q, PPS·NULL, PPS·MPS, PPS·EOM, PPS·EOP or PPS·PRI-Q
	14. Transmit of the confirmation signals of postmessage responses (see § 5.3.6.1.7)

Note – Binary coded signals must be preceded by a preamble (see § 5.3.1 below).

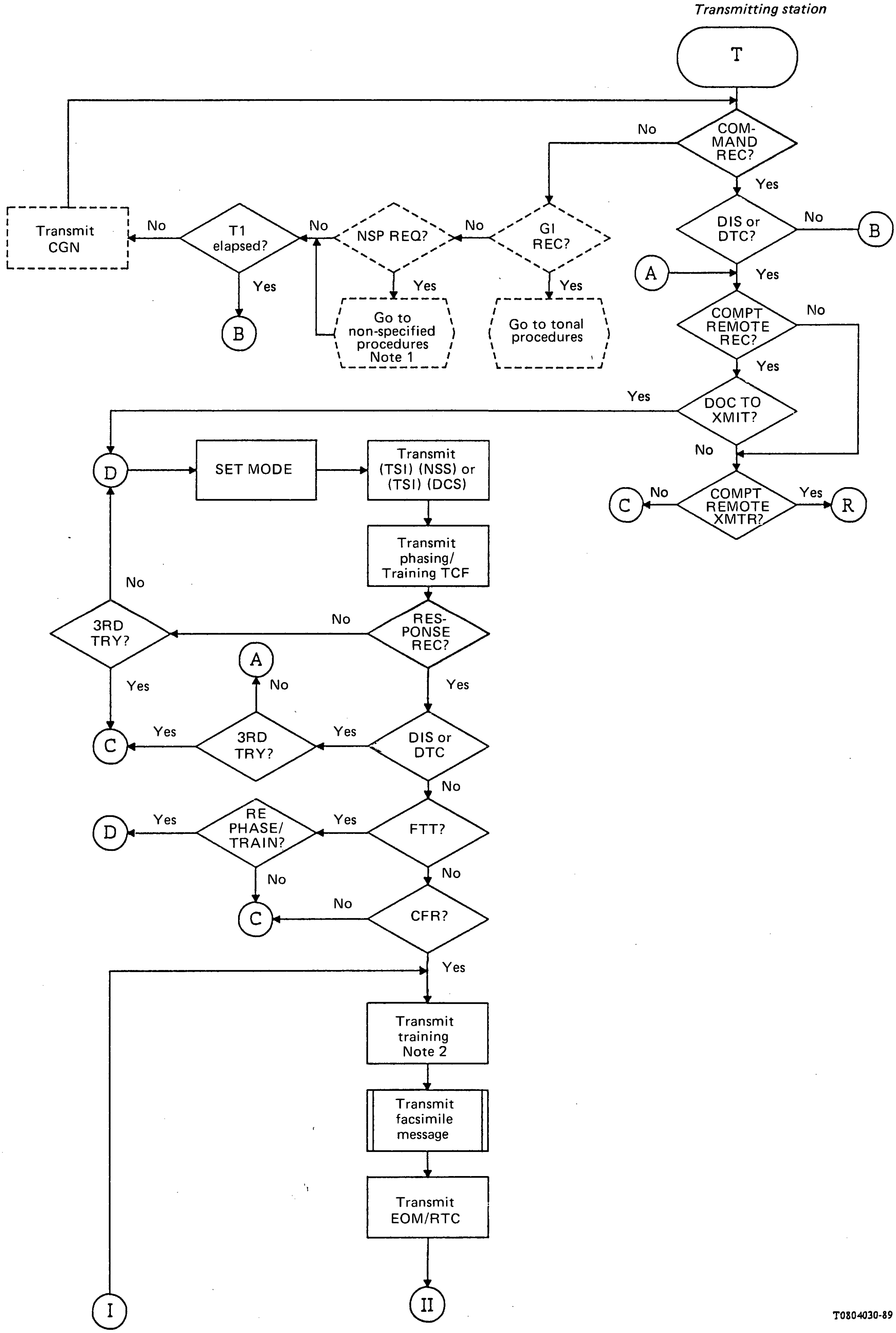
Case 2: Calling station wishes to receive (see Figure 8/T.30).

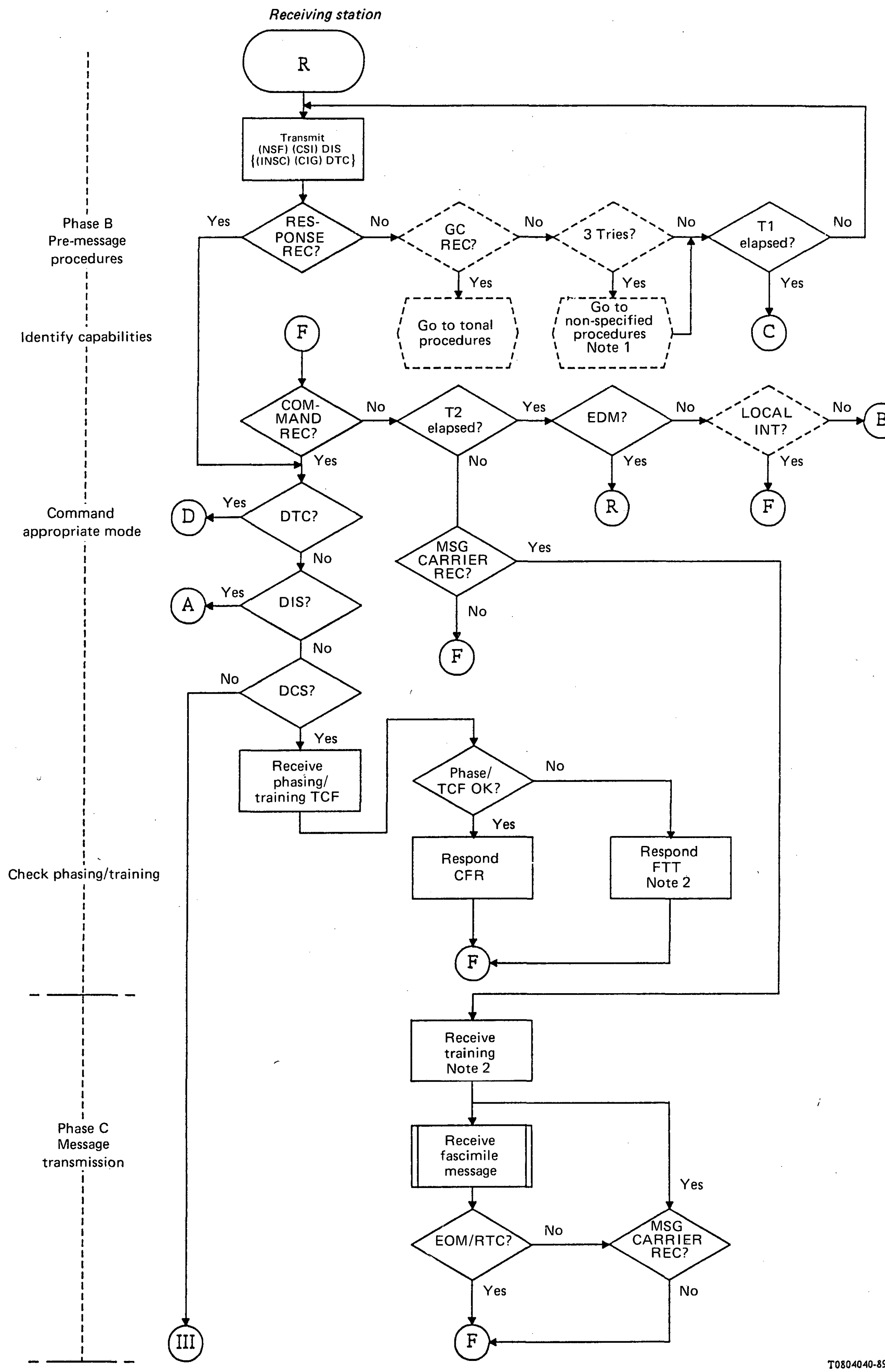
Calling station	Called station
	1. Transmit DIS
2. DIS detected	
3. Transmit DTC	
	4. DTC detected
	5. Transmit DCS
6. DCS detected	
7. Select mode	
	8. Transmit training/phasing
9. Training/phasing	
10. Transmit CFR	
	11. Detect CFR
	12. Transmit message
13. Receive message	
	14. At end of message send either: a) EOM or b) EOP or c) MPS or d) PRI-Q or e) PPS·NULL or f) PPS·MPS or g) PPS·EOM or h) PPS·EOP or i) PPS·PRI-Q
15. Detect EOM, EOP, MPS, PRI-Q, PPS·NULL, PPS·MPS, PPS·EOM, PPS·EOP and PPS·PRI-Q	
16. Transmit of the confirmation signals of postmessage responses (see § 5.3.6.1.7)	

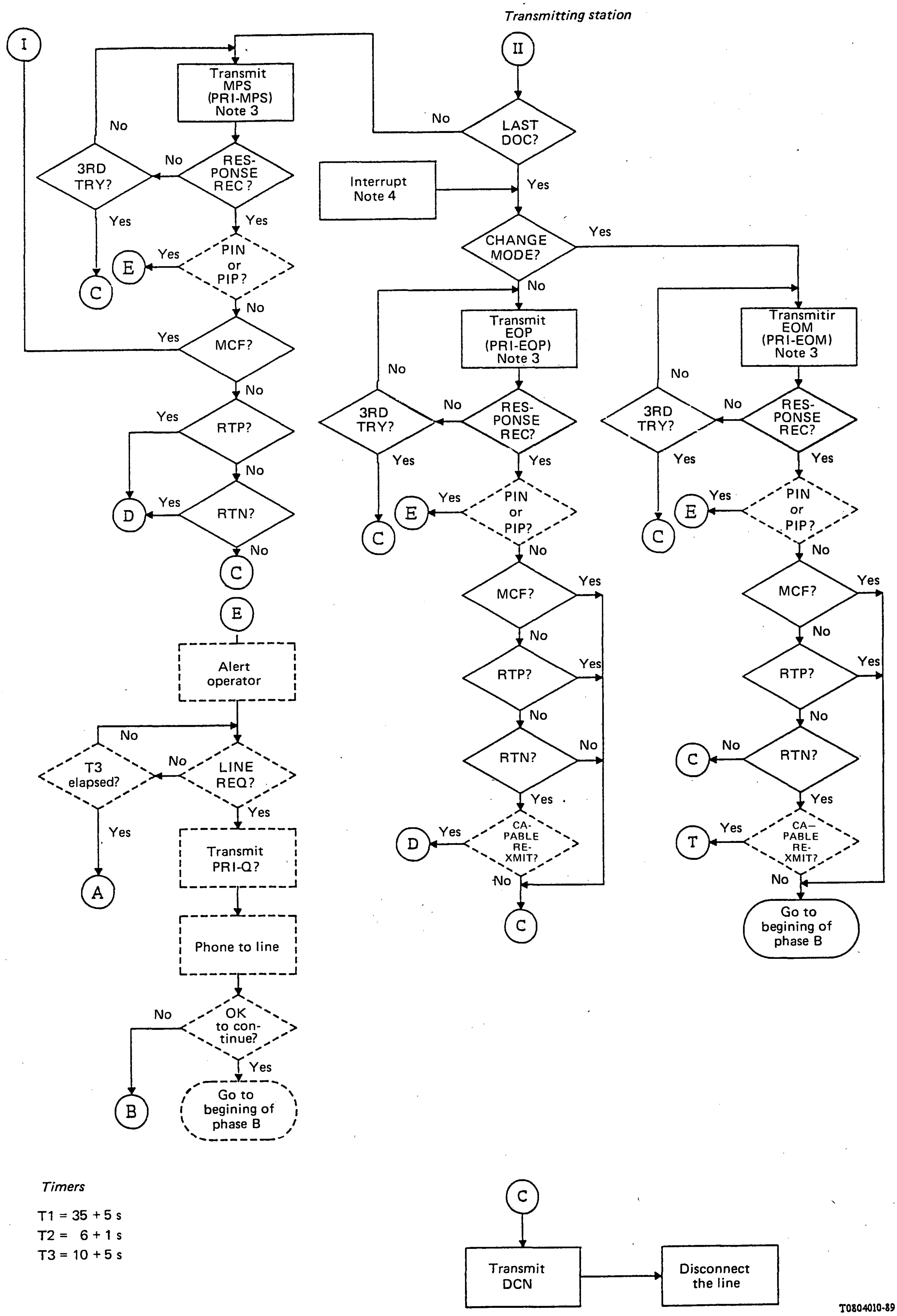
Note – Binary coded signals must be preceded by a preamble (see § 5.3.1 below).

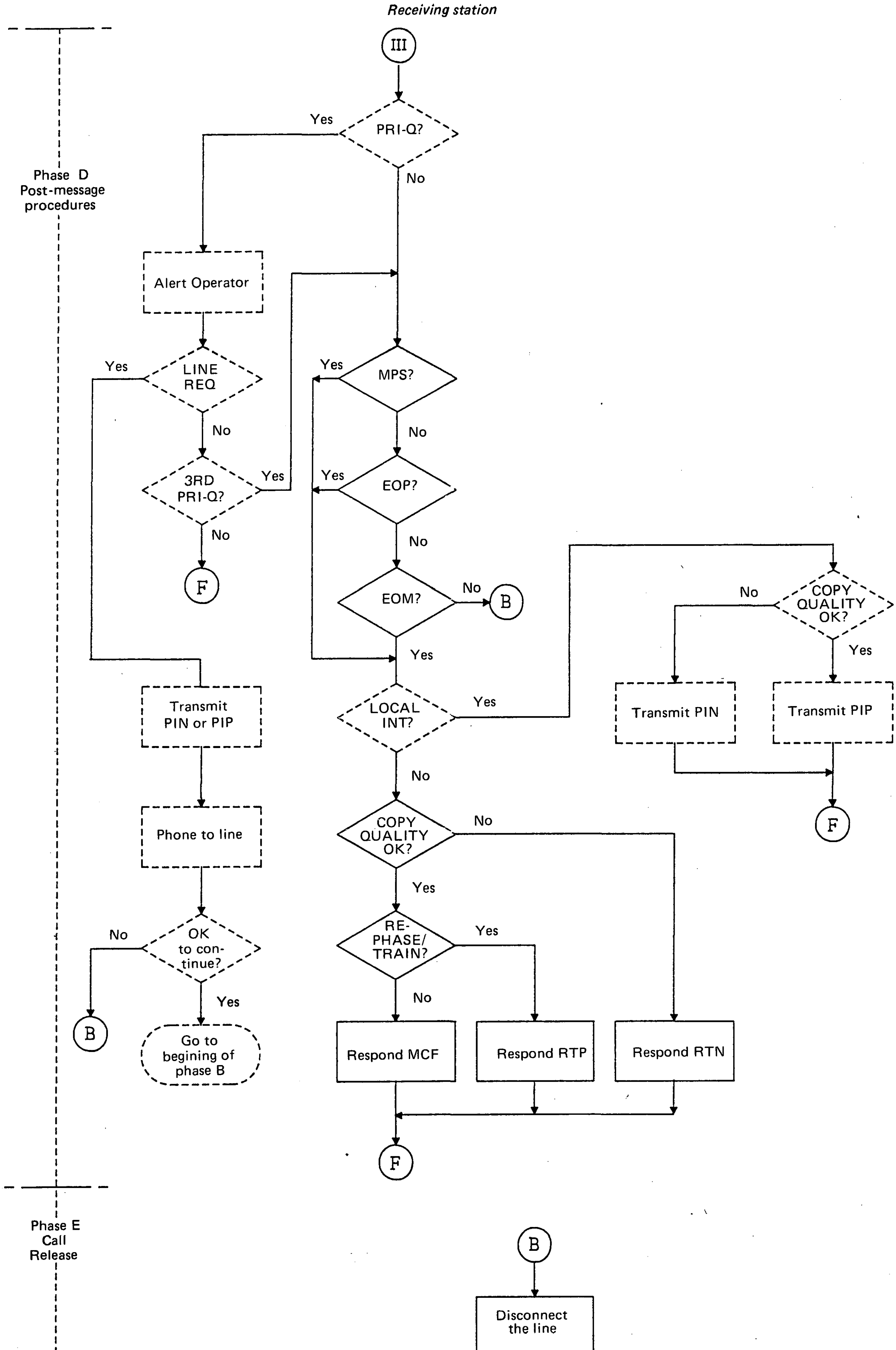
5.2 *Flow diagrams* (see also Appendix IV)

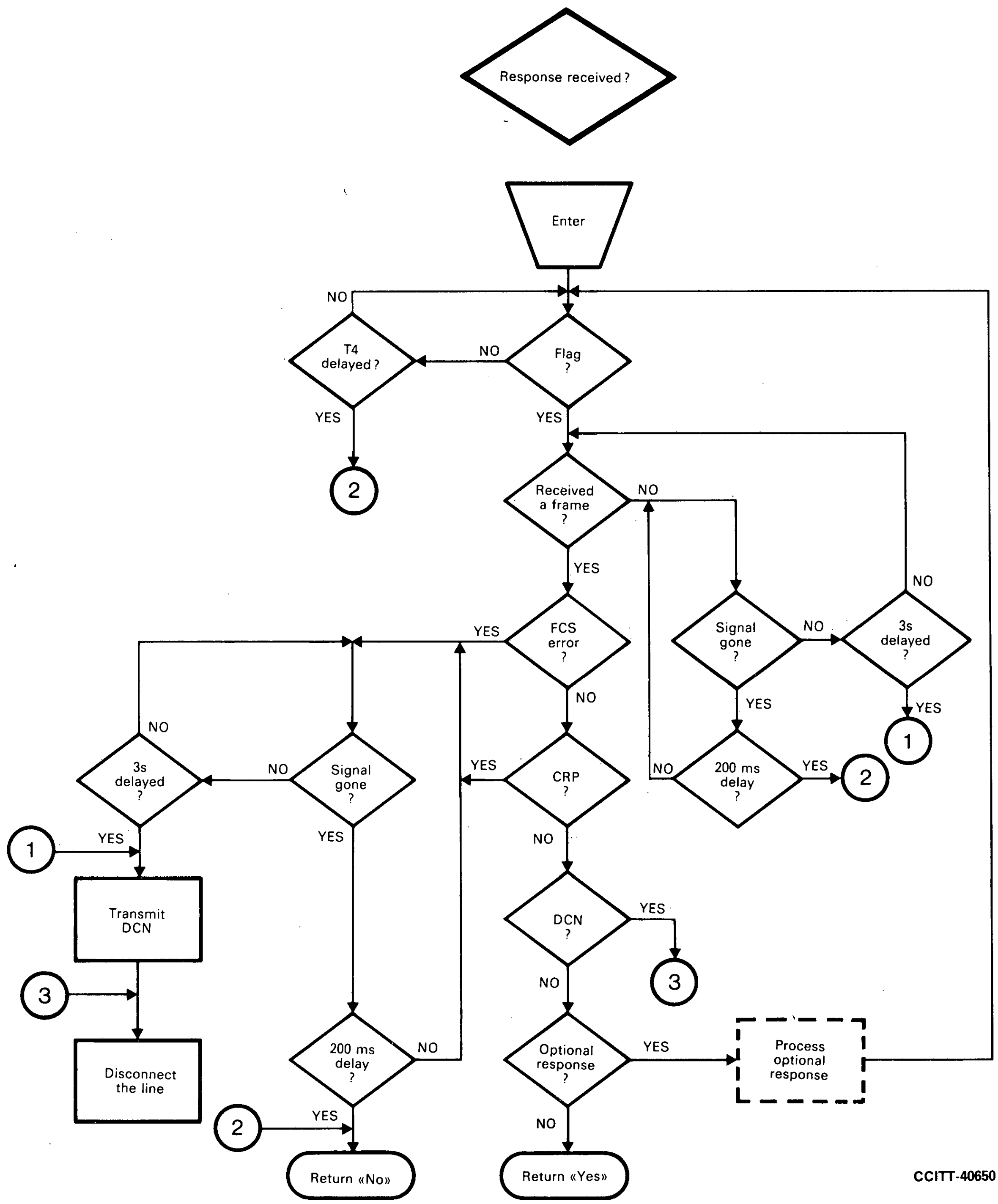
For the Notes and an explanation of terms to the flow diagrams, see § 5.2.1.


Transmitting station
T
COM-MAND REC?
No
Yes
DIS or DTC?
No
B
A
Yes
COMPT REMOTE REC?
No
Yes
DOC TO XMIT?
Yes
No
COMPT REMOTE XMTR?
C
No
Yes
R
GI REC?
No
Yes
Go to tonal procedures
NSP REQ?
No
Yes
Go to non-specified procedures Note 1
T1 elapsed?
No
Yes
B
Transmit CGN
D
SET MODE
Transmit (TSI) (NSS) or (TSI) (DCS)
Transmit phasing/ Training TCF
RES-PONSE REC?
No
3RD TRY?
No
Yes
C
Yes
DIS or DTC
Yes
3RD TRY?
Yes
No
A
No
FTT?
Yes
RE PHASE/ TRAIN?
Yes
D
No
C
No
CFR?
No
Yes
Transmit training Note 2
Transmit facsimile message
Transmit EOM/RTC
I
II
T0804030-89

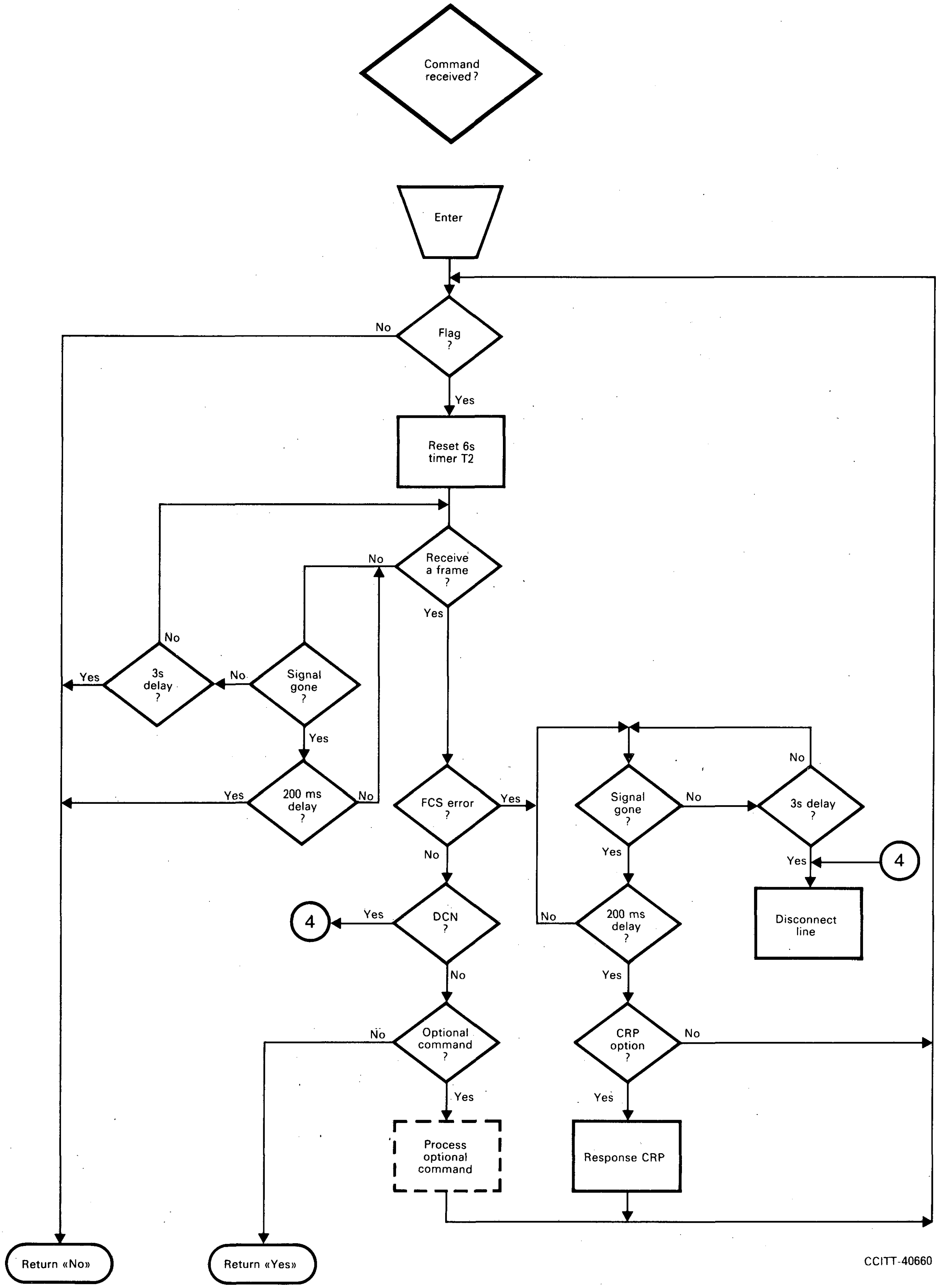

Receiving station
R
Transmit (NSF) (CSI) DIS {(INSC) (CIG) DTC}
Phase B
Pre-message
procedures
RES-PONSE REC?
Yes
No
GC REC?
Go to tonal procedures
3 Tries?
Go to non-specified procedures Note 1
T1 elapsed?
C
Identify capabilities
F
COM-MAND REC?
T2 elapsed?
EDM?
LOCAL INT?
B
R
F
Command
appropriate mode
DTC?
D
MSG CARRIER REC?
DIS?
A
F
DCS?
Receive phasing/ training TCF
Phase/ TCF OK?
Respond CFR
Respond FTT Note 2
Check phasing/training
F
Receive training Note 2
Phase C
Message
transmission
Receive fascimile message
EOM/RTC?
MSG CARRIER REC?
III
F
T0804040-89


Transmitting station
I
II
Transmit MPS (PRI-MPS) Note 3
RES-PONSE REC ?
3RD TRY?
PIN or PIP?
MCF?
RTP?
RTN?
LAST DOC?
Interrupt Note 4
CHANGE MODE?
Transmit EOP (PRI-EOP) Note 3
Transmitir EOM (PRI-EOM) Note 3
RES-PONSE REC?
CA-PABLE RE-XMIT?
Go to begining of phase B
Alert operator
LINE REQ?
T3 elapsed?
Transmit PRI-Q?
Phone to line
OK to con-tinue?
Yes
No
A
B
C
D
E
T
Timers
T1 = 35 + 5 s
T2 = 6 + 1 s
T3 = 10 + 5 s
Transmit DCN
Disconnect the line
T0804010-89


Receiving station
Phase D
Post-message
procedures
III
PRI-Q?
Yes
No
Alert Operator
LINE
REQ
Yes
No
3RD
PRI-Q?
Yes
No
F
MPS?
Yes
No
EOP?
Yes
No
EOM?
No
B
Yes
LOCAL
INT?
Yes
No
COPY
QUALITY
OK?
No
Yes
Transmit PIN
Transmit PIP
F
Transmit
PIN or PIP
Phone to line
OK
to con-
tinue?
No
Yes
B
Go to
begining of
phase B
COPY
QUALITY
OK?
No
Yes
RE-
PHASE/
TRAIN?
Yes
No
Respond MCF
Respond RTP
Respond RTN
F
Phase E
Call
Release
B
Disconnect
the line
T0804020-89

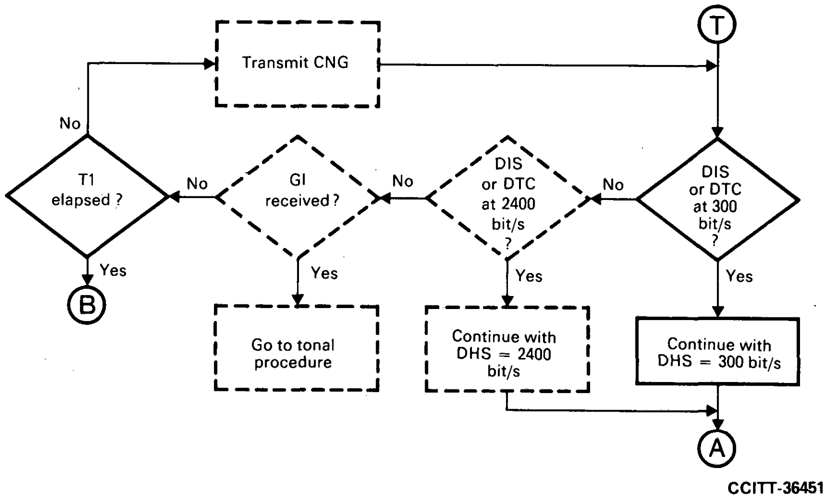


T4 = 4.5s ± 15%, for manual units
T4 = 3.0s ± 15%, for automatic units


Command received?
Enter
Flag ?
No
Yes
Reset 6s timer T2
Receive a frame ?
No
Yes
3s delay ?
Signal gone ?
200 ms delay ?
FCS error ?
DCN ?
4
Optional command ?
Process optional command
Return «No»
Return «Yes»
Signal gone ?
3s delay ?
Disconnect line
200 ms delay ?
CRP option ?
Response CRP
CCITT-40660

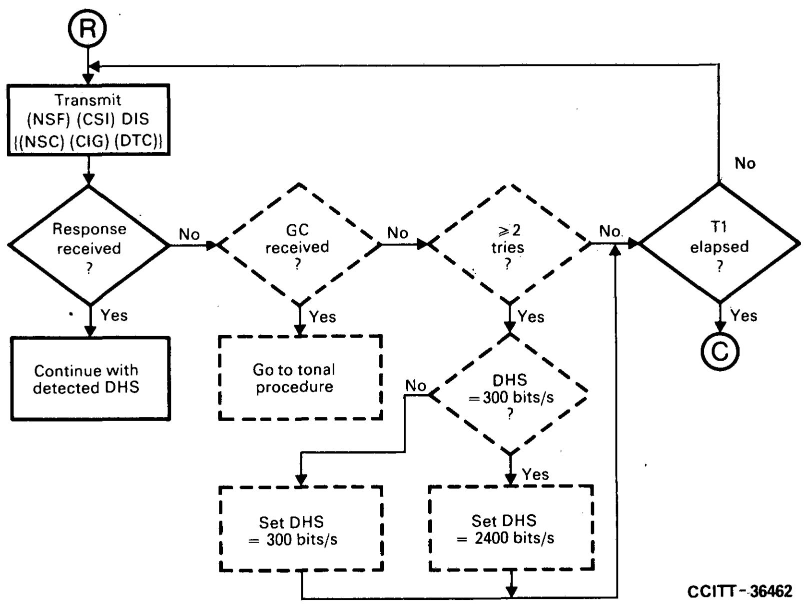
Interworking between the standard mode (300 bit/s) and the recognized optional mode (2400 bit/s) for the binary coded handshaking procedure is provided by an alternating method.

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 REQJ — This means that the local operator has "requested" that the telephone line be connected to the 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).

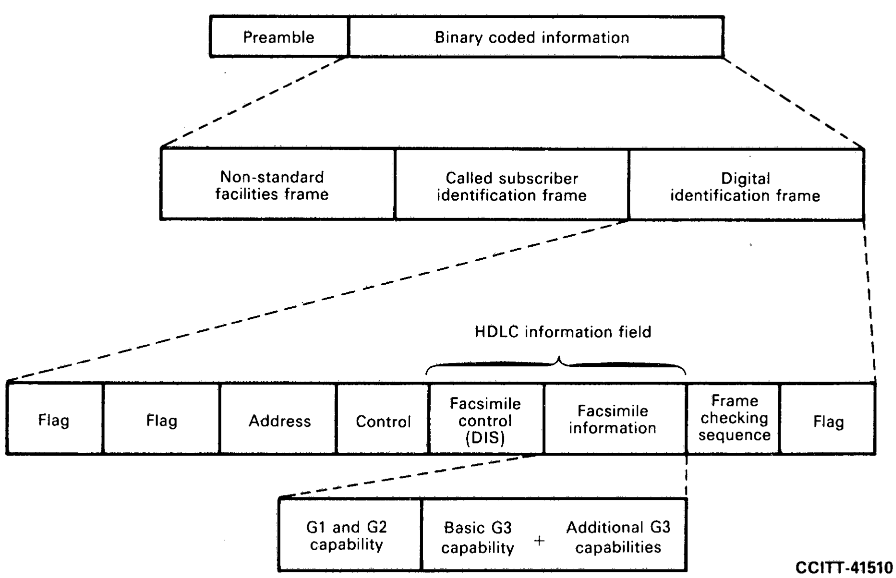


FIGURE 16/T.30

In the following descriptions of the fields, the order in which the bits are transmitted is from the most to the least significant bit, i.e. from left to right as printed. The exception to this is the CSI format (see § 5.3.6.2.4).

The equivalent between binary notation symbols and the significant conditions of the signalling code should be in accordance with Recommendation V.1.

Note 1 – Any initial (capabilities identification) non-standard frame which is transmitted shall be accompanied by a mandatory frame. The mandatory frame shall always be the last one transmitted (see Figure 16/T.30).

Note 2 – A machine which receives optional frame(s) which it does not recognize shall discard the frame(s) and use the mandatory frames in continuing the procedure.

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 1 s ± 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 (see Recommendation T.4, § 4.1.4) and an RCP frame (see Recommendation T.4, Annex A). This signals the T.4 modulation system to drop off the line and be replaced by the T.30 binary coded modulation system.

Note – If the receiver detects at least one RCP frame correctly, it may initiate post-message command reception.

5.3.2.3 The transmission of the delineation signal, either the tonal EOM signal or the RTC signal or the RCP frame, shall be followed by a delay of 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 8 bits or 16 bits of the HDLC information field. An FCF of 16 bits should be applied only for the optional T.4 error correction mode. The FCF 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 follow:

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) *Continue to correct (CTC)* – This digital command is only used in the optional T.4 error correction mode. See 1) of § A.4.1.

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

3) *Response for continue to correct (CTR)* – This digital response is only used in the optional T.4 error correction mode. See 1), § A.4.2.

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 complete 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 complete 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 complete 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

Note 1 – Commands EOM, MPS, EOP, PRI-Q should not be used in the optional T.4 error correction mode.

Note 2 – In the duration between partial-pages, procedure interrupt signals should not be transmitted in the optional T.4 error correction mode.

7) *Partial page signal (PPS)* – This digital command is only used in the optional T.4 error correction mode. See 1), § A.4.3.

8) *End of retransmission (EOR)* – This digital command is only used in the optional T.4 error correction mode. See 2), § A.4.3.

9) *Receive ready (RR)* – This digital command is only used in the optional T.4 error correction mode. See 3), § A.4.3.

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 satisfactorily received and that additional messages may follow. (This is a positive response to MPS, EOM, EOP, RR and PPS.)

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

Note – RTP is not applicable to the optional T.4 error correction mode.

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

Note – RTN is not applicable to the optional T.4 error correction mode.

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. (This is a positive response only to MPS, EOM, EOP, PRI-Q, PPS·MPS, PPS·EOM, PPS·EOP, PPS·PRI-Q.)

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. (This is a negative response only to MPS, EOM, EOP, PRI-Q, PPS·MPS, PPS·EOM, PPS·EOP, PPS·PRI-Q, EOR·MPS, EOR·EOM, EOR·EOP and EOR·PRI-Q.)

Format: X011 0100

Note 1 – All machines shall be able to recognize the PIN and PIP signals. The ability to transmit these signals is optional.

Note 2 – In the duration between partial-pages, RTP, RTN, PIP and PIN signals should not be transmitted in the optional T.4 error correction mode.

6) *Partial page request (PPR)* – This digital response is only used in the optional T.4 error correction mode. See 1), § A.4.4.

7) *Receive not ready (RNR)* – This digital response is only used in the optional T.4 error correction mode. See 2), § A.4.4.

8) *Response for end of retransmission (ERR)* – This digital response is only used in the optional T.4 error correction mode. See 3), § A.4.4.

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, VSS, CTC, PPS and PPR 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 "+" character, 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.

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– Table 2/T.30 – replace "Bit No." 11, 12, 13, 14 and 31 by the following:

11, 12, 13, 14	Data signalling rate	Data signalling rate
0, 0, 0, 0	V.27 *ter* fall back mode	2 400 bit/s, V.27 *ter*
0, 1, 0, 0	V.27 *ter*	4 800 bit/s, V.27 *ter*
1, 0, 0, 0	V.29	9 600 bit/s, V.29
1, 1, 0, 0	V.27 *ter* and V.29	7 200 bit/s, V.29
0, 0, 1, 0	Not used	14 400 bit/s, V.33
0, 1, 1, 0	Reserved	12 000 bit/s, V.33
1, 0, 1, 0	Not used	Reserved
1, 1, 1, 0	V.27 *ter*, V.29 and V.33	Reserved
0, 0, 0, 1	Not used	14 400 bit/s, V.17
0, 1, 0, 1	Reserved	12 000 bit/s, V.17
1, 0, 0, 1	Not used	9 600 bit/s, V.17
1, 1, 0, 1	V.27 *ter*, V.29, V.33 and V.17	7 200 bit/s, V.17
0, 0, 1, 1	Not used	Reserved
0, 1, 1, 1	Reserved	Reserved
1, 0, 1, 1	Not used	Reserved
1, 1, 1, 1	Reserved	Reserved

31	T.6 coding capability	T.6 coding enabled

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	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* fallback mode V.27 *ter* V.29 V.27 *ter* and V.29	Data signalling rate 2400 bit/s V.27 *ter* 4800 bit/s V.27 *ter* 9600 bit/s V.29 7200 bit/s V.29
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, 18 (0,0) (0,1) (1,0) (1,1)	Recording width capabilities 1728 picture elements along scan line length of 215 mm ± 1% 1728 picture elements along scan line length of 215 mm ± 1% and 2048 picture elements along scan line length of 255 mm ± 1% and 2432 picture elements along scan line length of 303 mm ± 1% 1728 picture elements along scan line length of 215 mm ± 1% and 2048 picture elements along scan line length of 255 mm ± 1% Invalid (see Note 7)	Recording width 1728 picture elements along scan line length of 215 mm ± 1% 2432 picture elements along scan line length of 303 mm ± 1% 2048 picture elements along scan line length of 255 mm ± 1% Invalid
19, 20 (0,0) (0,1) (1,0) (1,1)	Maximum recording length capability A4 (297 mm) Unlimited A4 (297 mm) and B4 (364 mm) Invalid	Maximum recording length A4 (297 mm) Unlimited B4 (364 mm) Invalid

TABLE 2/T.30 *(cont.)*

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	Error correction mode	Error correction mode
28	Set to "0"	Frame size 0 = 256 octets 1 = 64 octets
29	Error limiting mode	Error limiting mode
30	Reserved for G4 capability on PSTN	Reserved for G4 capability on PSTN
31	Unassigned	
32	Extend field	Extend field
33 (0) (1)	Validity of bits 17, 18 Bits 17, 18 are valid Bits 17, 18 are invalid	Recording width Recording width indicated by bits 17, 18 Recording width indicated by this field bit information
34	Recording width capability 1216 picture elements along scan line length of 151 mm ± 1%	Middle 1216 elements of 1728 picture elements
35	Recording width capability 864 picture elements along scan line length of 107 mm ± 1%	Middle 864 elements of 1728 picture elements
36	Recording width capability 1728 picture elements along scan line length of 151 mm ± 1%	Invalid
37	Recording width capability 1728 picture elements along scan line length of 107 mm ± 1%	Invalid
38	Reserved for future recording width capability	
39	Reserved for future recording width capability	
40	Extend field	Extend field

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- notes to Table 2/T.30 – replace note 4 by the following modifed note 4 and add the following new note 12:

Note 4 – Where the DIS or DTC frame defines V.27 *ter* 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 capabilities, the equipment may be assumed to be operable at either 9600 or 7200 bit/s per V.29, where it defines V.33 capabilities, the equipment may be assumed to be operable at either 14 400 bit/s or 12 000 bit/s per V.33 and where it defines V.17, the equipment may be assumed to be operable at 14 400 bit/s, 12 000 bit/s, 9600 bit/s or 7200 bit/s per V.17.

Note 12 – T.6 coding scheme capability specified by bit 31 is valid only when bit 27 (error correction mode) is set as a "1".

Notes to Table 2/T.30

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* 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 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.

Note 7 – Existing equipment may send the invalid (1,1) condition for bits 17 and 18 of their DIS signal.

If such signal is received, it should be interpreted as (0,1).

Note 8 – The values of bit No. 28 in the DCS command is valid only when the indication of the T.4 error correction mode is invoked by bit 27.

Note 9 – When bit 33 is set to 1 in DCS, the meaning of bit 15 originally defined to indicate 7.7/mm vertical resolution is modified to mean a higher resolution.

Note 10 – When the recording width is A4 only, the field consisting of bits 33-40 need not be present.

Note 11 – The optional T.4 error correction mode of operation requires 0 ms of the minimum scan line time capability. Bits 21-23 in DIS/DTC signals indicate the minimum scan line time of a receiver regardless of the availability of the error correction mode.

In case of error correction mode, the sender sends DCS signal with bits 21-23 set to 1.1.1 indicating 0 ms capability.

In case of normal G3 transmission, the sender sends DCS signal with bits 21-23 set to the appropriateness according to the capabilities of the two machines.

TABLE 3/T.30

Digit	MSB (FB)	Bits	LSB
+	0	010101	1
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 "+" character, 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 "+" character, 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 octet will contain a CCITT country 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 obtaining a registered CCITT code is given in Recommendation T.35.

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 1 – 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.

Note 2 – A terminal may discard a received DIS signal with the identical bit allocation as that terminal has issued.

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.

Time-out T5 is defined for the optional T.4 error correction mode. Time-out T5 defines the amount of time waiting for clearance of the busy condition of the receiving station. T5 is 60 ± 5 seconds and begins on the first detection of the RNR response. T5 is reset when T5 times out or the MCF or PIP response is received or when the ERR or PIN response is received in the flow control process after transmitting the EOR command. If the timer T5 has expired, the DCN command is transmitted for call release.

ANNEX A

(to Recommendation T.30)

Procedure for G3 document facsimile transmission in the general switched telephone network incorporating error correction

A.1 *Introduction*

A.1.1 This Annex is intended to apply to document facsimile apparatus covered by Recommendation T.4, Annex A. It describes the procedures and signals to be used where facsimile equipment incorporates error correction capabilities. When existing equipment is operating in a non-CCITT manner, they shall not interfere with equipment operating in accordance with the Series T Recommendation.

A.1.2 Use of this Annex is optional

A.1.3 *Outline of the error correction method*

The error correction method described in this Annex is based on the half-duplex page selective repeat ARQ (automatic repeat request) technique.

An HDLC frame structure is utilized for all binary coded facsimile message procedures.

The transmitting terminal can decide to use either 256 or 64 octets for the frame size by using DCS command. The receiving terminal must be able to receive 256 and 64 octets of frame size.

The transmitting station divides the coded data specified in Recommendation T.4, § 4 into a number of frames and transmits them with each frame number.

When the previous message has not been satisfactorily received, the receiving station transmits PPR response to indicate that the frames specified in the associated facsimile information field are required to be retransmitted.

When PPR is received, the transmitting station retransmits the requested frames specified in PPR information field.

When PPR is received four times for the same block, either the EOR command is transmitted for end of retransmission or CTC (continue to correct) command is sent for continuous retransmission.

In the case of continuous retransmission, the modem speed may fall back or continue at the same speed in accordance with the decision of the transmitting terminal.

A.2 *Definitions*

A.2.1 The signals and definitions used in the error correction procedure are as defined in the main body of this Recommendation unless specified otherwise.

A.2.2 Frame formats of RCP frame and FCD frame for the in-message procedure are defined in Recommendation T.4, Annex A.

A.2.3 *Relations between a page, blocks, partial pages and frames*

One page of coded data as specified in Recommendation T.4, § 4 is divided into a number of blocks. The block contains a number of frames. A partial page is defined as one transmitted block or a number of retransmitted frames.

A.2.4 *Block size*

The block size is defined as the maximum number of frames that can be sent by the transmitter before receiving the response.

A.3 *Block size and frame size*

A.3.1 For T.4 error correction mode, a transmitting terminal indicates frame size by using DCS signal.

A.3.2 The following values of frame size are applicable: 256 or 64 octets. These values of frame size do not include either FCF or frame number octet. Therefore, the total length of the HDLC information field including both the FCF and the frame number octet is as follows: 258 or 66 octets.

A.3.3 The receiving terminal must have the following condition:

frame size: 256 or 64 octets.

block size: 256 frames.

A.3.4 The transmitting terminal may send the block whose size is less than 256 frames at the end of each page. This block is called a short block.

A.3.5 The frame size should not be changed during a transmission of one page. In order to change the frame size, indication of mode change should be made using PPS · EOM or EOR · EOM command at the page boundary.

A.4 *Information field* (see also § 5.3.6)

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).

1) *Facsimile control field (FCF)* – The facsimile control field is defined to be the first 8 bits or 16 bits of the HDLC information field. FCF of 16 bits should be applied only for the optional T.4 error correction mode. 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.

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 DIS, DCS, DTC, CSI, CIG, TSI, NSC, NSF, NSS, CTC, PPS and PPR signals.

A.4.1 *Command to receive* (see also § 5.3.6.1.3)

From the transmitter to the receiver.

Format: X100 XXXX

1) *Continue to correct (CTC)* – This command indicates that the transmitting station shall continue to correct the previous message. (This is a response to the 4th PPR received, and indicates that the transmitting station shall immediately send the requested frames specified in PPR information field.)

   When the transmitter receives PPR four times, the modem speed may fall back or continue the previous transmission speed using CTC command.

   This command should have the FIF of 2 octets, which corresponds to the bits No. 1-16 of DCS standard command (See Table 2/T.30). The receiving terminal uses only the bits No. 11-14 to determine the data signalling rate.

Format: X100 1000

A.4.2 *Pre-message response signals* (see also § 5.3.6.1.4)

From the receiver to the transmitter.

Format: X010 XXXX

1) *Response for continue to correct (CTR)* – This signal is the digital response to CTC signal, so that the receiving terminal can accept the contents included in CTC signal.

Format: X010 0011

A.4.3 *Post message commands* (see also § 5.3.6.1.6)

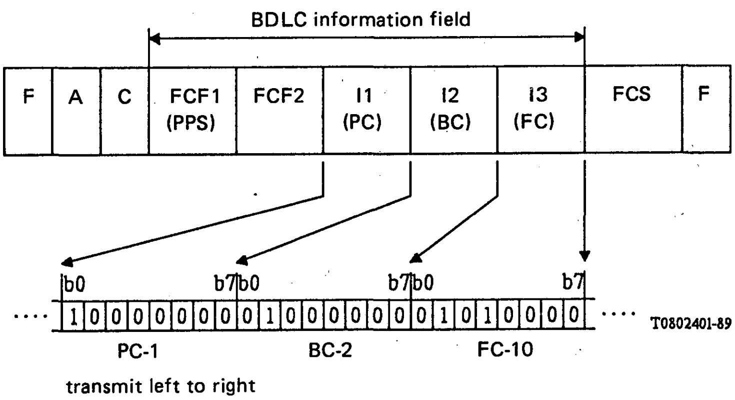
From the transmitter to the receiver.

Format: X111 XXXX

1) *Partial page signal (PPS)* – This command indicates the end of a partial page or a complete page of facsimile information and also indicates to return to the beginning of phase B or C upon receipt of MCF.

Format: X111 1101

The frame construction of PPS command and transmission order of bits included in I1-I3 are shown in Figure A-1/T.30.



FCF1: Facsimile Control Field 1; Extention signal for error correction (PPS).
FCF2: Facsimile Control Field 2; Post message command (NULL, MPS, EOM, EOP and PR1-Q)
I1(PC): Information field 1; Page counter (8 bits); modulo 256)
I2(BC): Information field 2; Block counter (8 bits; modulo 256)
I3(FC): Information field 3: (Number of frames)-1 in each partial page (8 bits: maximum 255)

Note 1 – FCF2 indicates the post message commands in case of the T.4 error correction mode and the format of FCF2 is shown hereafter.

FCF2	Meaning
0000 0000	NULL code which indicates the partial page boundary.
1111 0001	EOM in optional T.4 error correction mode
1111 0010	MPS in optional T.4 error correction mode
1111 0100	EOP in optional T.4 error correction mode
1111 1001	PR1-EOM in optional T.4 error correction mode
1111 1010	PR1-MPS in optional T.4 error correction mode
1111 1100	PR1-EOP in optional T.4 error correction mode

The other bit combinations are not used.

Note 2 – I1; Page counter shows the page sequence modulo number in each call establishment for one direction of message transfer. Page counter is started from "0" and up to "255". The page counter is reset at the start of each call establishment.

Note 3 – I2; Block counter shows the block sequence modulo number in each page. Block counter is started from "0" and up to "255". The block counter is reset at the start of each page.

Note 4 – I3: Frame counter shows the total transmitted frame number minus 1 in each partial page. (maximum 255).

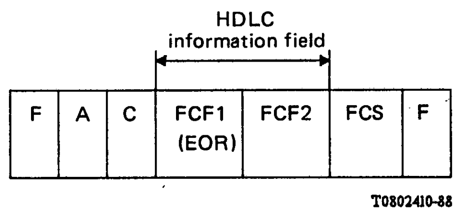
Note 5 – The least significant bit in I1-I3 should be transmitted first.

FIGURE A-1/T.30

2) *End of retransmission (EOR)* – This command indicates that the transmitter decides to terminate the retransmission of error frames in the previous partial page and to transmit the next block upon receipt of ERR response.

Format: X111 0011

The frame construction of EOR command is shown in Figure A-2/T.30.



FCF1: Facsimile Control Field 1; Extention signal for error correction (EOR)
FCF2: Facsimile Control Field 2; Post message command (NULL, MPS, EOM, EOP and PR1-Q)

Note – FCF2 indicates the post message commands in case of the T.4 error correction mode and the format of FCF2 is shown hereafter.

FCF2	Meaning
0000 0000	NULL code which indicates the partial page boundary
1111 0001	EOM in optional T.4 error correction mode
1111 0010	MPS in optional T.4 error correction mode
1111 0100	EOP in optional T.4 error correction mode
1111 1001	PR1-EOM in optional T.4 error correction mode
1111 1010	PR1-MPS in optional T.4 error correction mode
1111 1100	PR1-EOP in optional T.4 error correction mode

The other bit combinations are not used.

FIGURE A-2/T.30

3) *Receive ready (RR)* – This command is used to ask for the status of the receiver.

Format: X111 0110

Note 1 – This command is defined for flow control.

Note 2 – For flow control method, make reference to § A.5.

A.4.4 *Post-message responses* (see also § 5.3.6.1.7)

From the receiver to the transmitter.

Format: X011 XXXX

1) *Partial page request (PPR)* – This signal indicates that the previous message has not been satisfactorily received and that the frames specified in the associated facsimile information field are required to be retransmitted.

Format: X011 1101

The facsimile information field of the PPR signal is a fixed length of 256 bits, each bit corresponds to an FCD frame i.e., the first bit to the first frame etc. For FCD frames which are received correctly, the corresponding bit in the PPR information field will be set to "0"; those that are received incorrectly or not received will have their bit set to "1".

If more than one PPR signal is transmitted, the bit corresponding to an FCD frame which has been received correctly must always be set to "0".

The frame construction of PPR response is shown in Figure A-3/T.30.

The process of an error correction is shown in Figure A-4/T.30.

Note 1 – The number of frames in a partial page is less than or equal to 256 frames. Therefore, in some circumstances there may be extra bits that do not correspond to any frames. These bits are set to "1" (see Figure A-5/T.30).

Note 2 – The first bit in the FIF corresponds to the first frame (frame No. 0).

2) *Receive not ready (RNR)* – This signal is used to indicate that the receiver is not ready to receive more data.

Format: X011 0111

Note 1 – This signal is defined for flow control.

Note 2 – For flow control, make reference to § A.5.

3) *Response for end of retransmission (ERR)* – This signal is the digital response to EOR signal.

Format: X011 1000

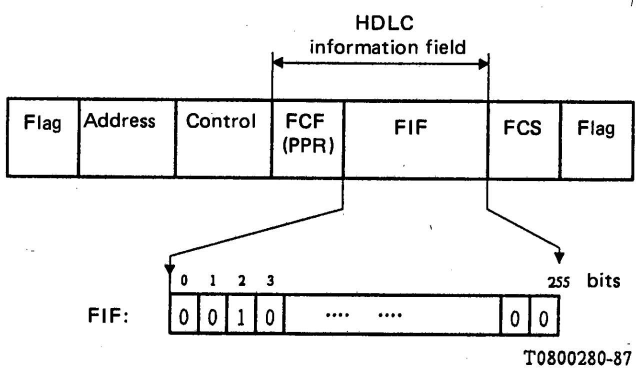


FIGURE A-3/T.30

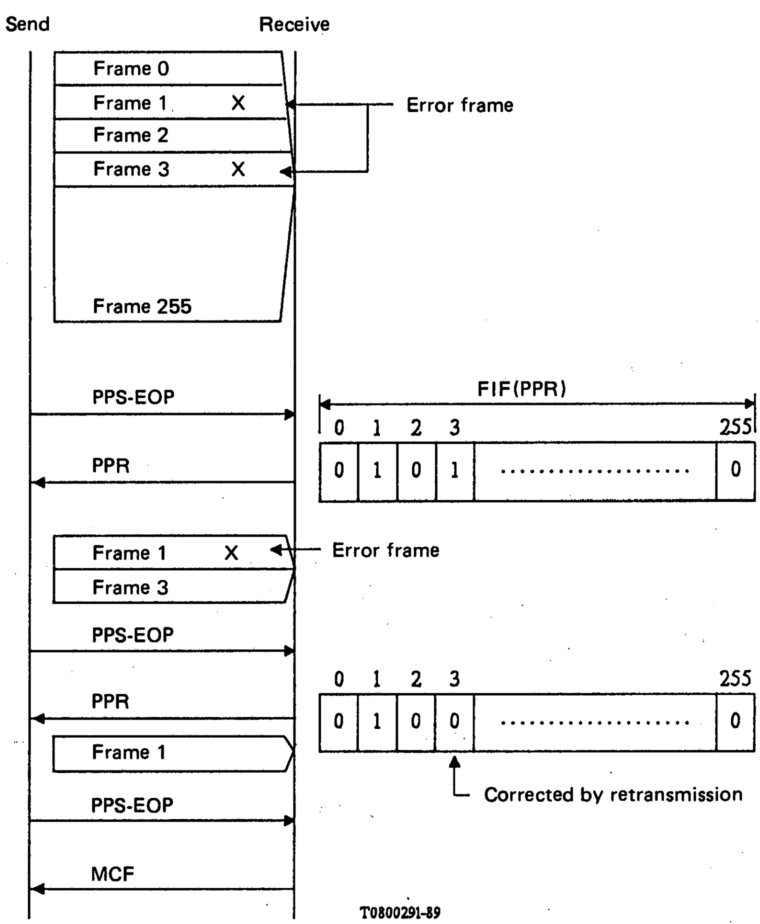
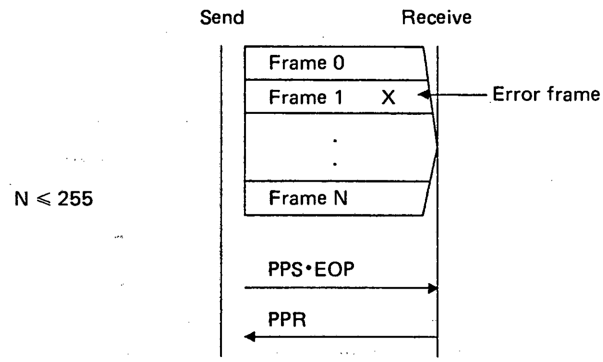


FIGURE A-4/T.30



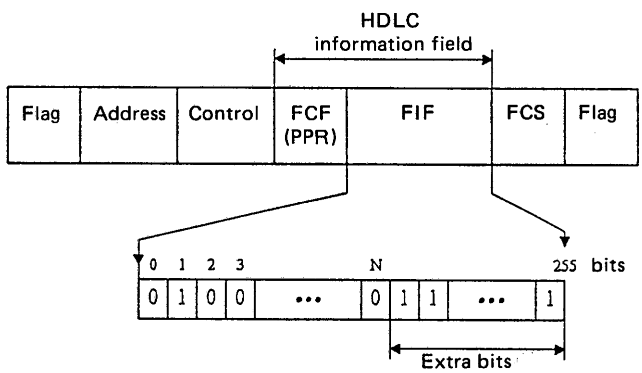


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FIGURE A-5/T.30

A.5 *Flow control procedure*

A.5.1 Flow control in the transmitting station is made by continuous flag transmission between frames or before the first frame.

A.5.2 The maximum transmission time of flags should be less than the value of timer T1.

A.5.3 In case of transmission on a noisy channel, a long flag sequence may be destroyed by noise. Therefore, it is recommended that the receiver implement a control procedure to discard invalid frames which are obtained from erroneous flag sequences.

A.5.4 Flow control in the receiving station is made using RR/RNR signals as shown in Figure A-6/T.30.

A.5.4.1 Inactivity timer T5 is defined as follows:

T5 = 60 s ± 5 s.

Note – As the use of the T5 timer reduces transmission efficiency, implementation which minimizes its effect is desirable.

A.5.4.2 The timer T5 is started at the timing of the first RNR response recognition.

A.5.4.3 If the timer T5 has expired, the transmitter sends a DCN command for call release.

A.5.4.4 If RNR response is not received correctly, an RR command is retransmitted to the receiver. After three unsuccessful attempts, the transmitter sends a DCN command for call release.

A.5.4.5 After receiving RNR response, the transmitter immediately sends an RR command until an MCF/PIP response or an ERR/PIN response is received correctly.

A.5.4.6 An MCF or ERR response indicates that the busy condition is cleared and the receiver ready to receive the data which follows the interruption.

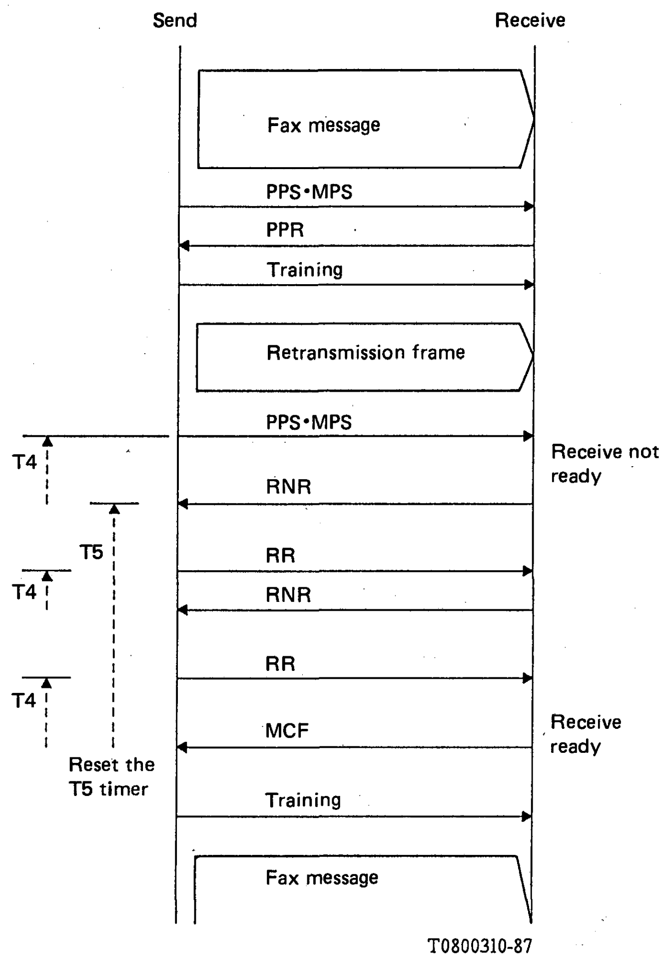


FIGURE A-6/T.30

A.6 *Procedure interrupt*

A.6.1 Procedure interrupt signals are not allowed at the partial page boundaries.

A.6.2 Procedure interrupt after detection or transmission of PIP and PIN signals is accomplished by using the procedure defined in the main body of this Recommendation. This procedure is outside the scope of the error correction mode specified in this Annex A.

A.7 *Flow Diagrams*

The following flow diagrams shows the phase B, pre-message procedures, phase C, message procedure, phase D, post-message procedures and phase E, call release, for both the transmitting and receiving stations.

For the Notes and an explanation of terms to the flow diagrams, see § A.7.1.

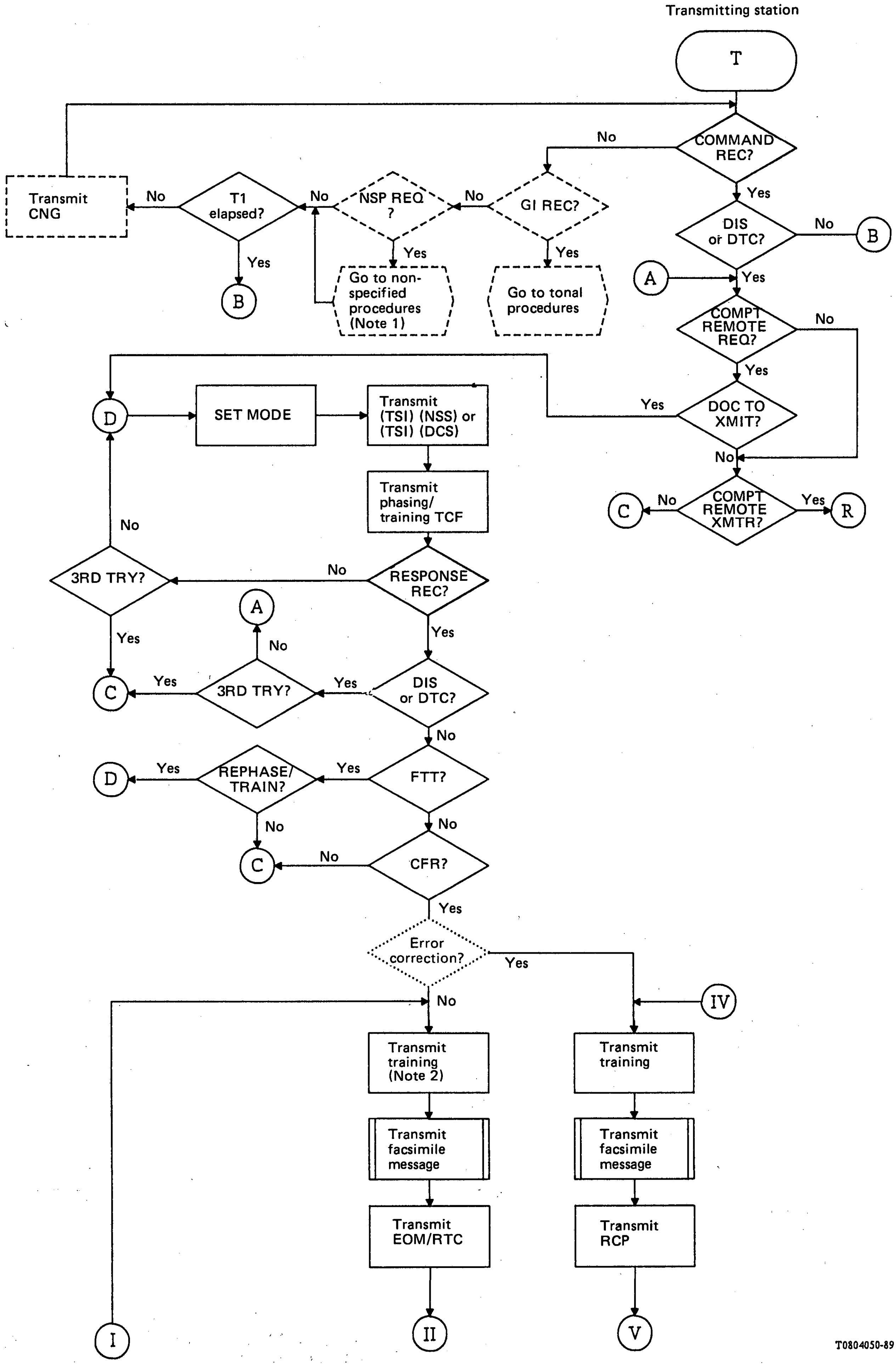
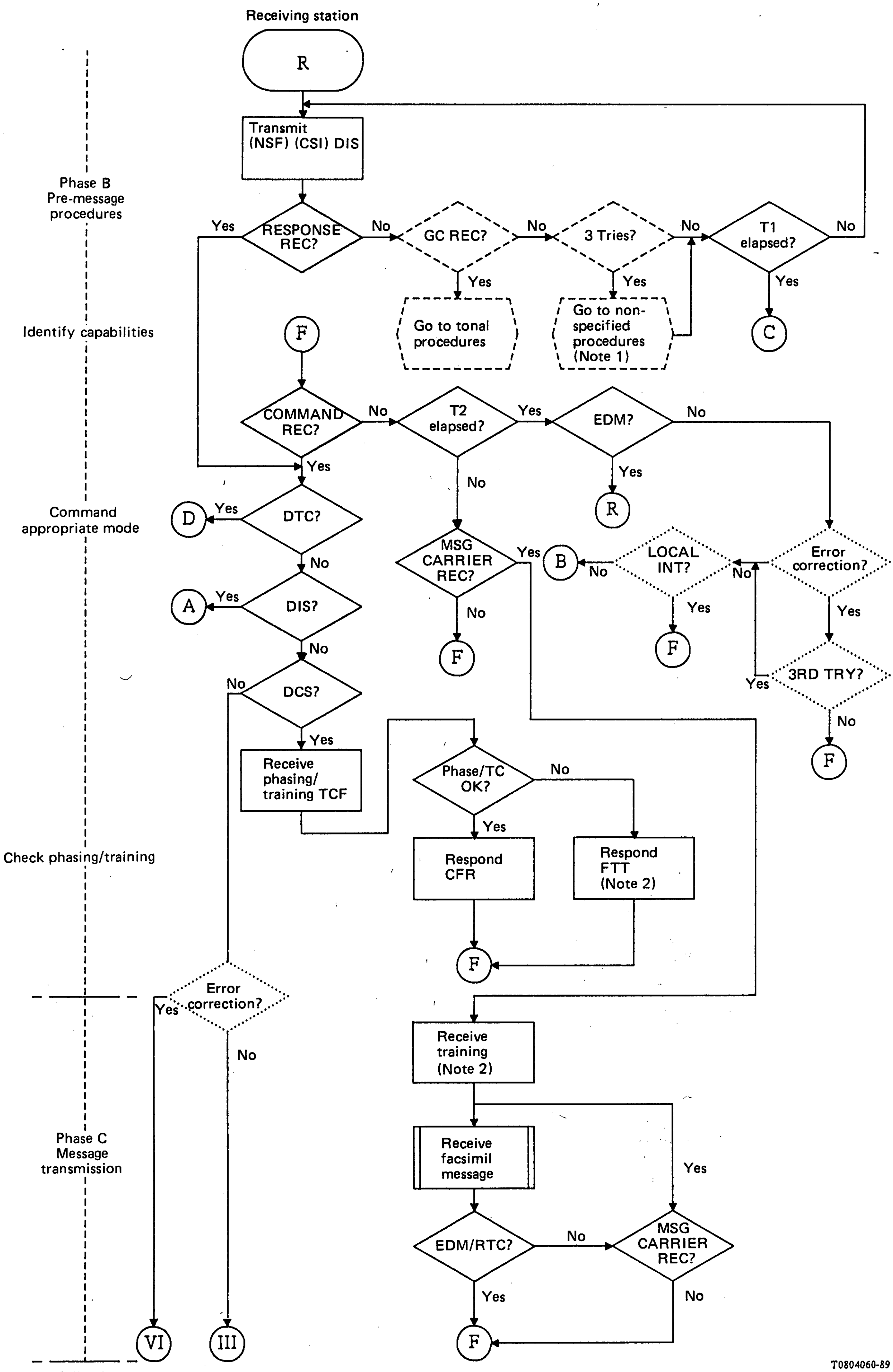
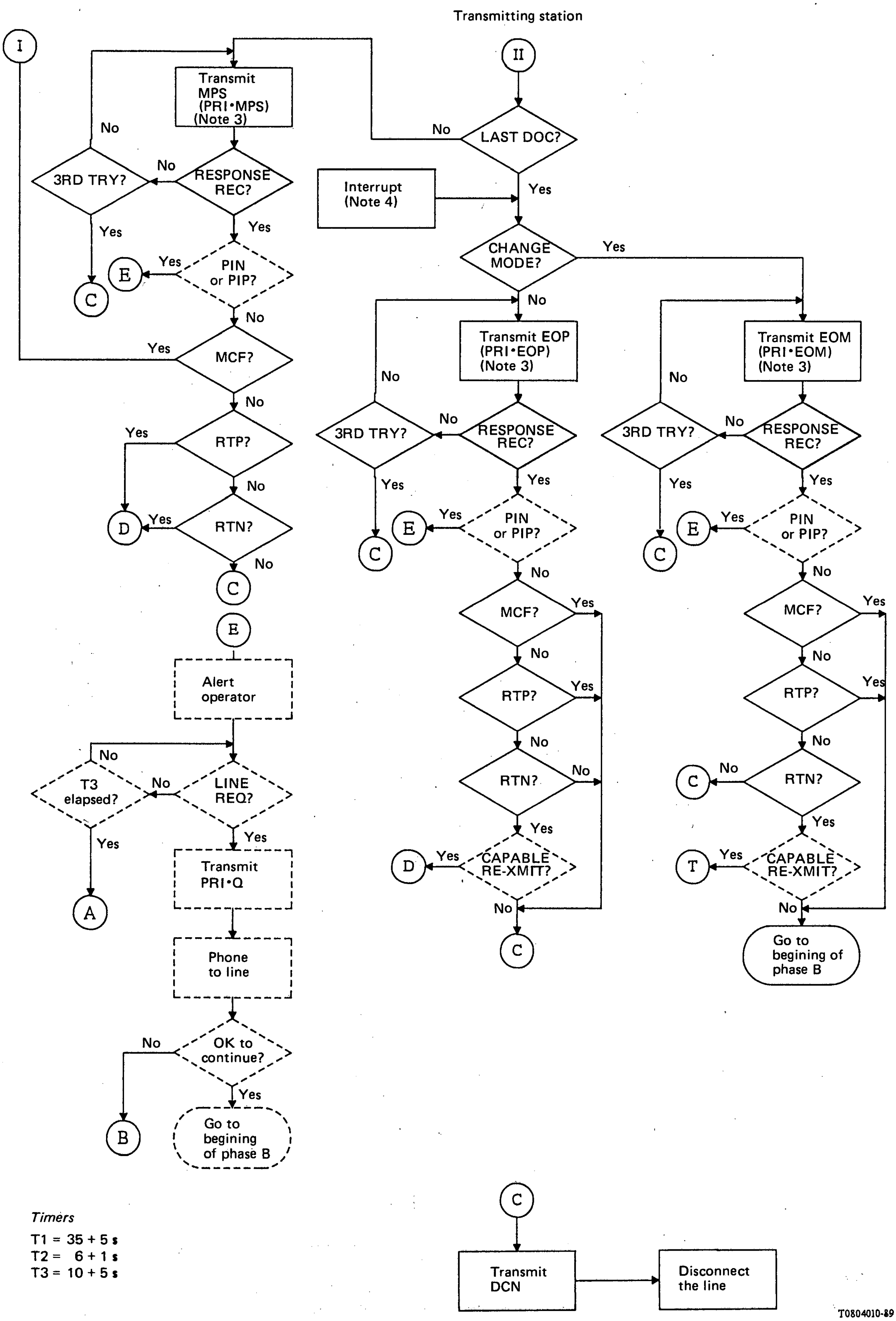


FIGURE A-7/T.30 (sheet 1 of 2)



Note – The last command, except RR, was one of EON, PPS•EOM or EOR•EOM?

FIGURE A-7/T.30 (sheet 1 of 2)



Timers

T1 = 35 + 5 s
T2 = 6 + 1 s
T3 = 10 + 5 s

FIGURE A-7/T.30 (Sheet 2 of 2)

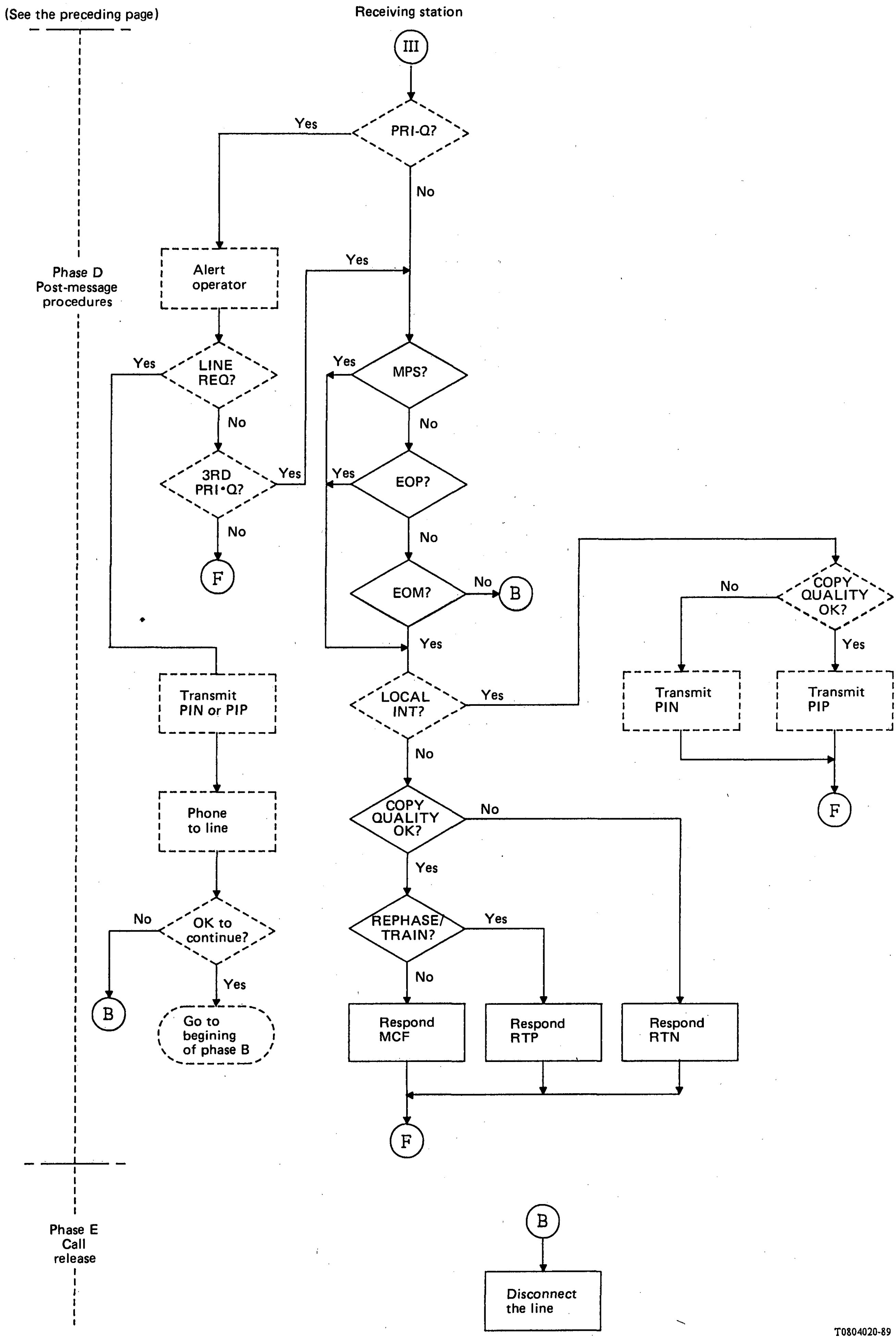


FIGURE A-7/T.30 (Sheet 2 of 2)

Transmitting station

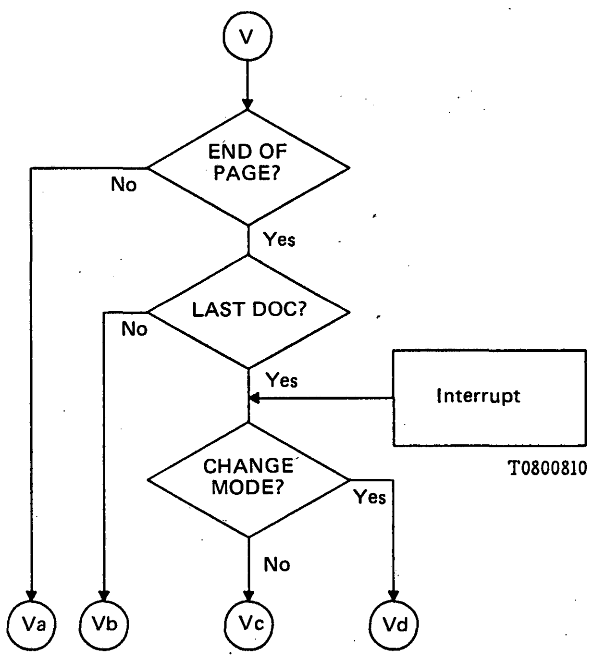


FIGURE A-8/T.30

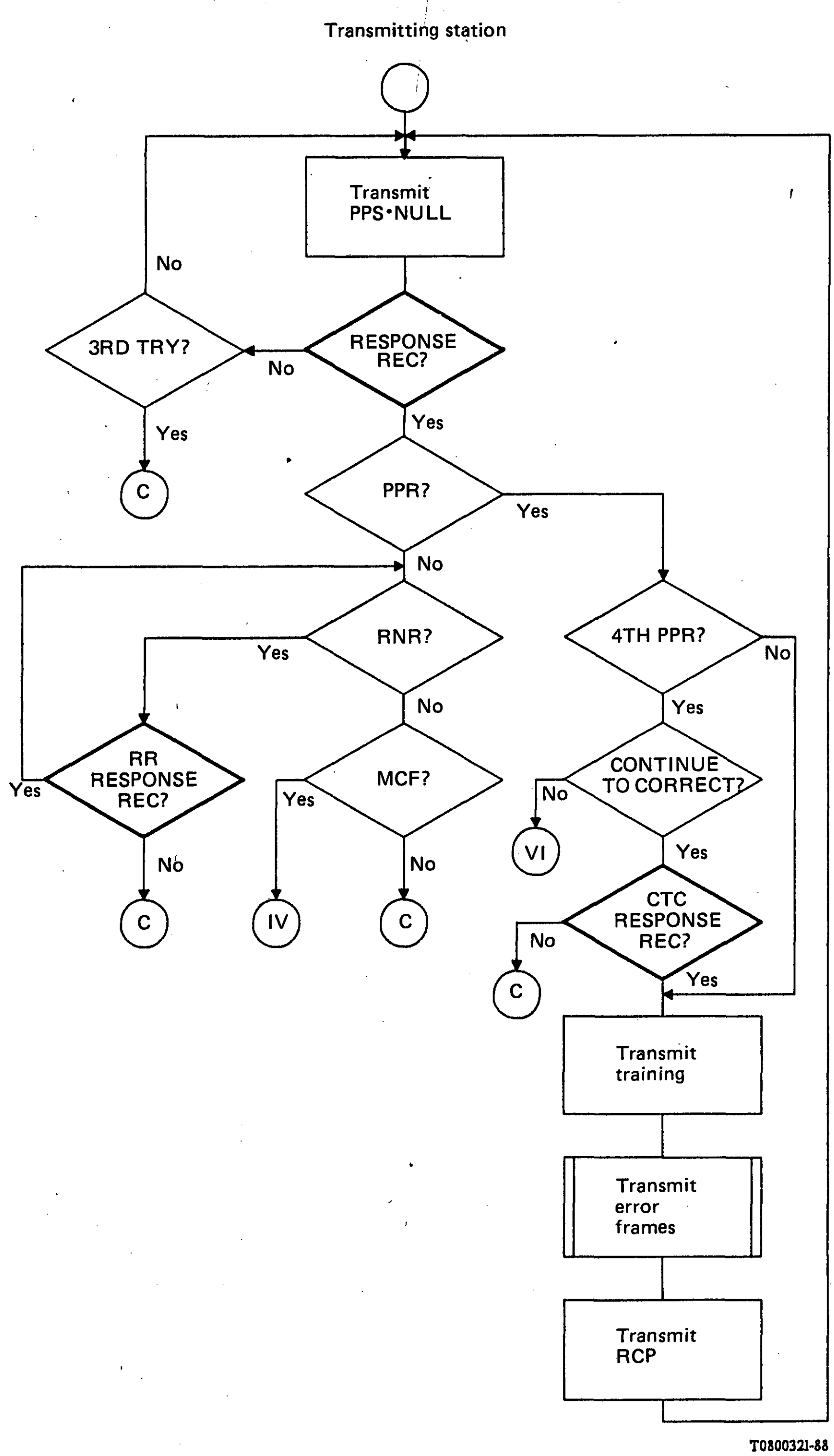


FIGURE A-9/T.30

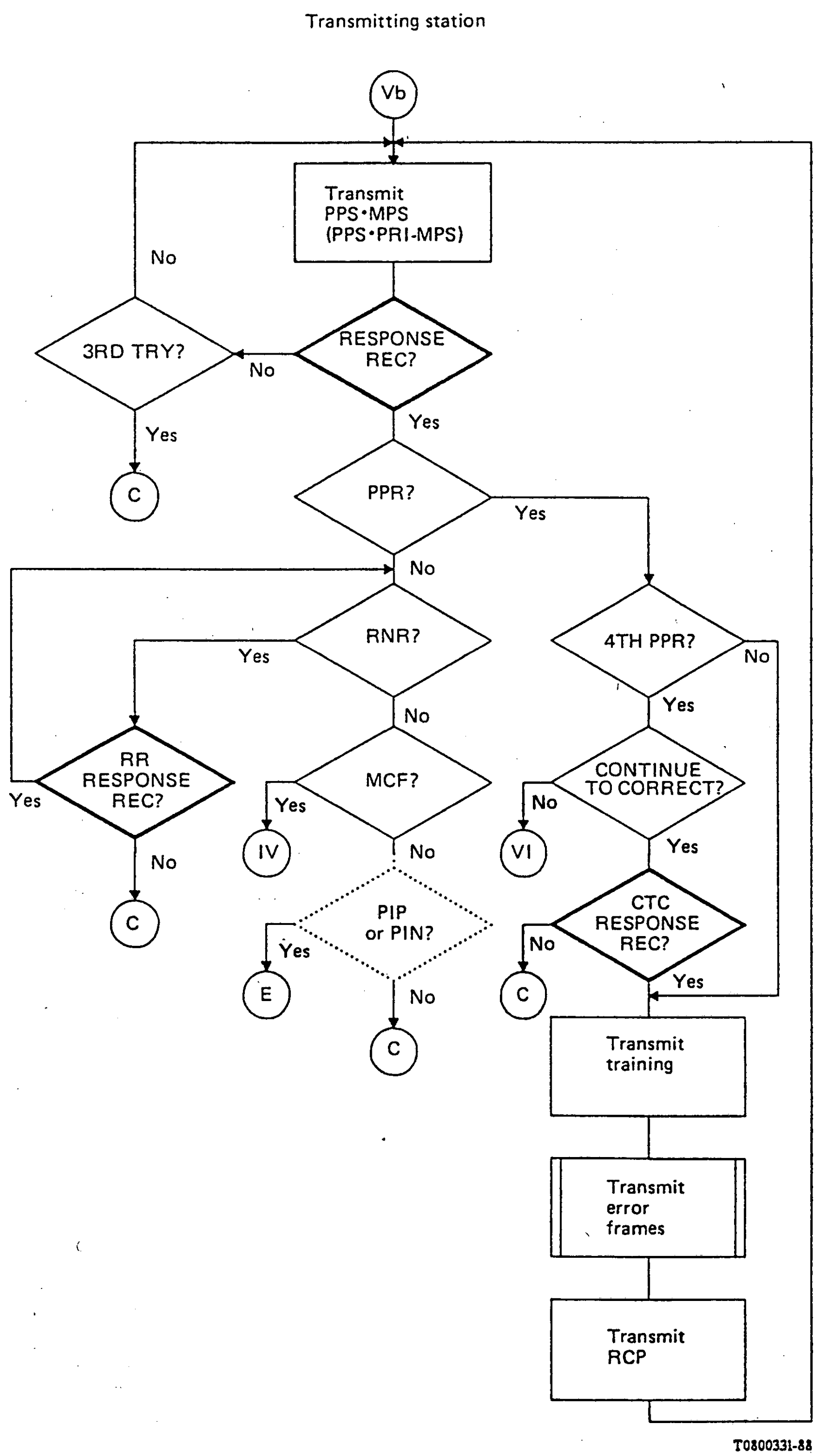


FIGURE A-10/T.30

Transmitting station

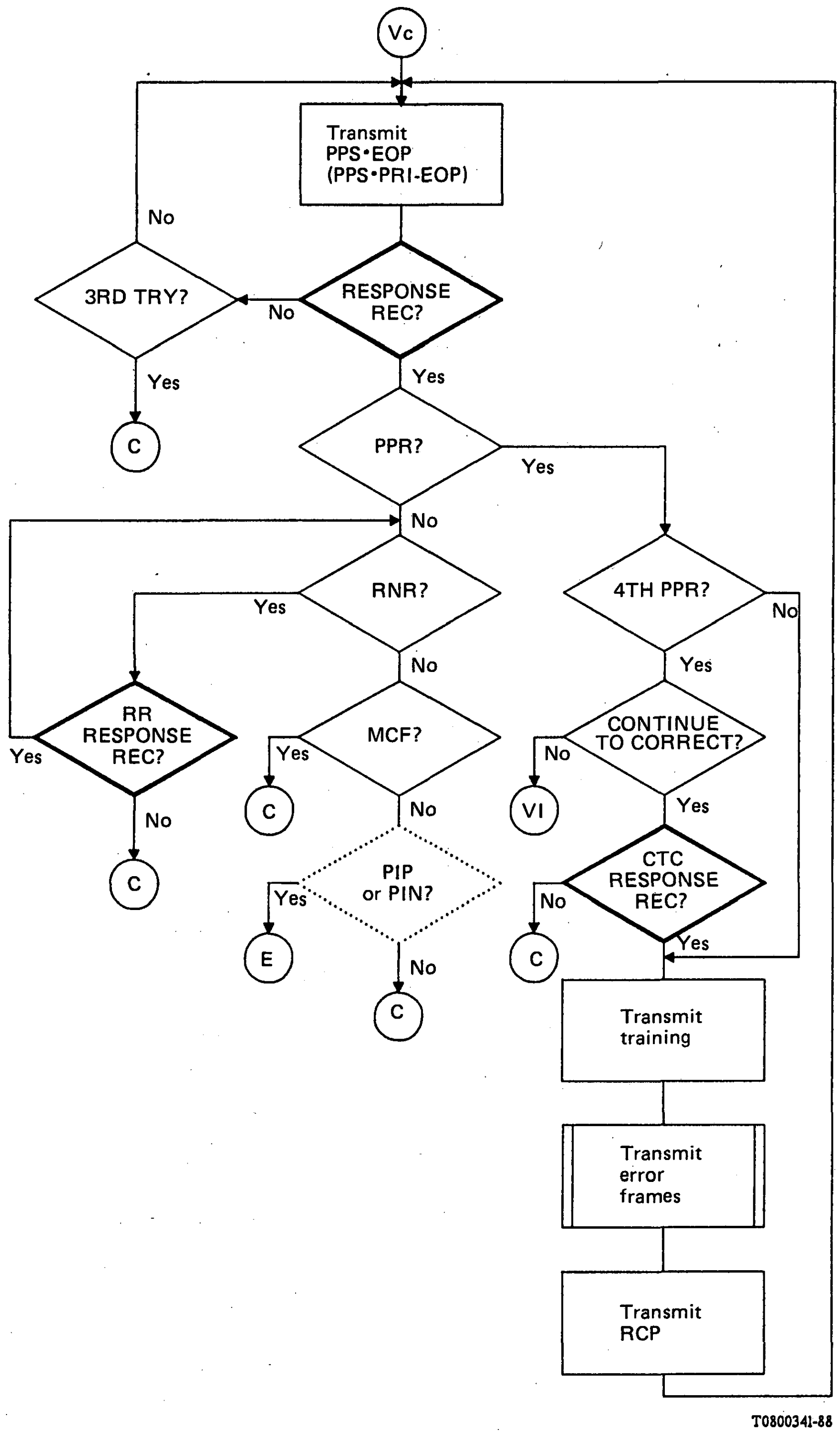


FIGURE A-11/T.30

Transmitting station

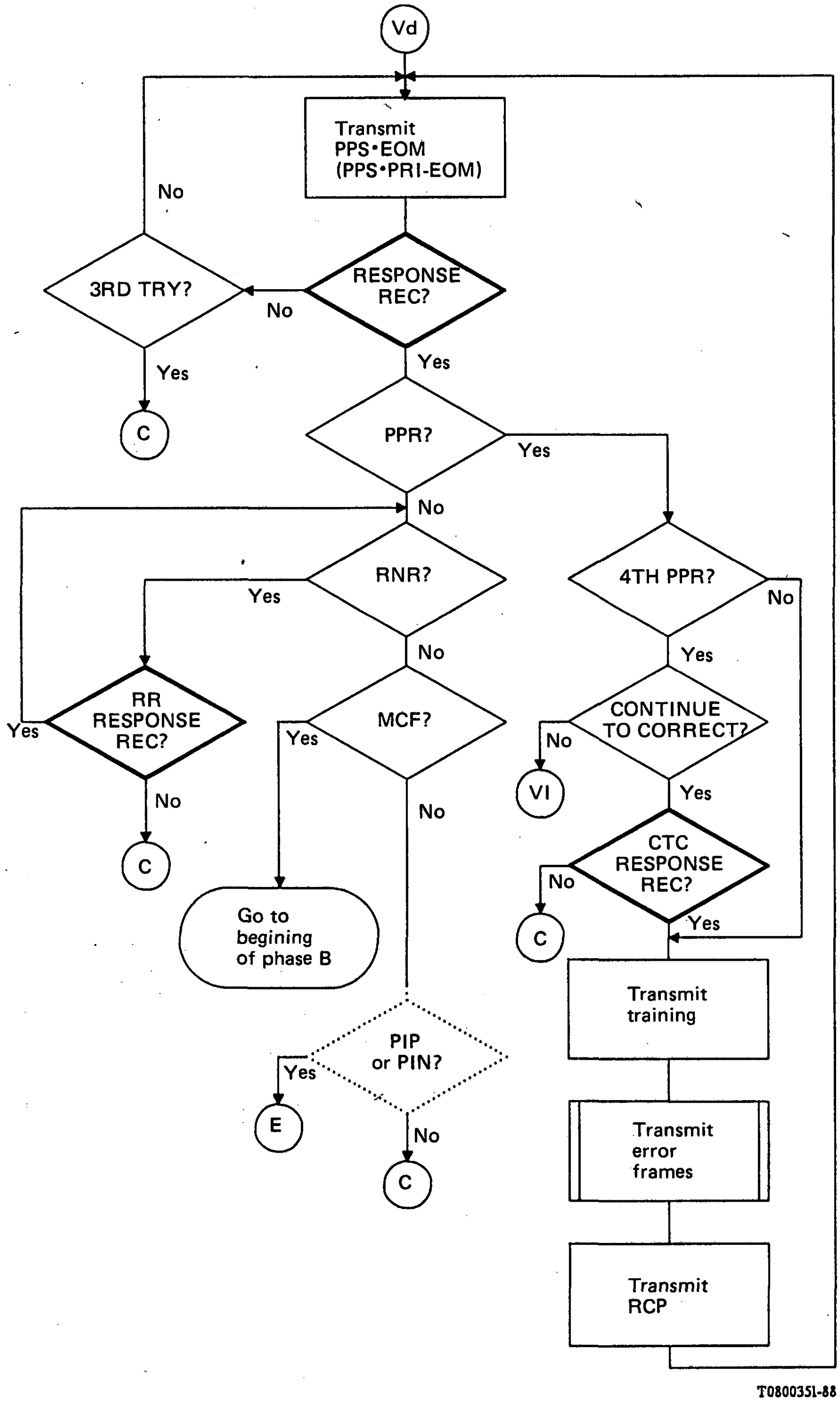


FIGURE A-12/T.30

Transmitting station

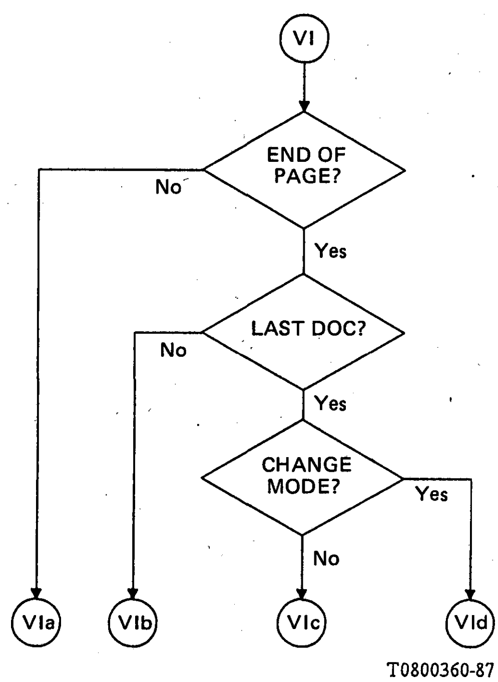


FIGURE A-13/T.30

Transmitting station

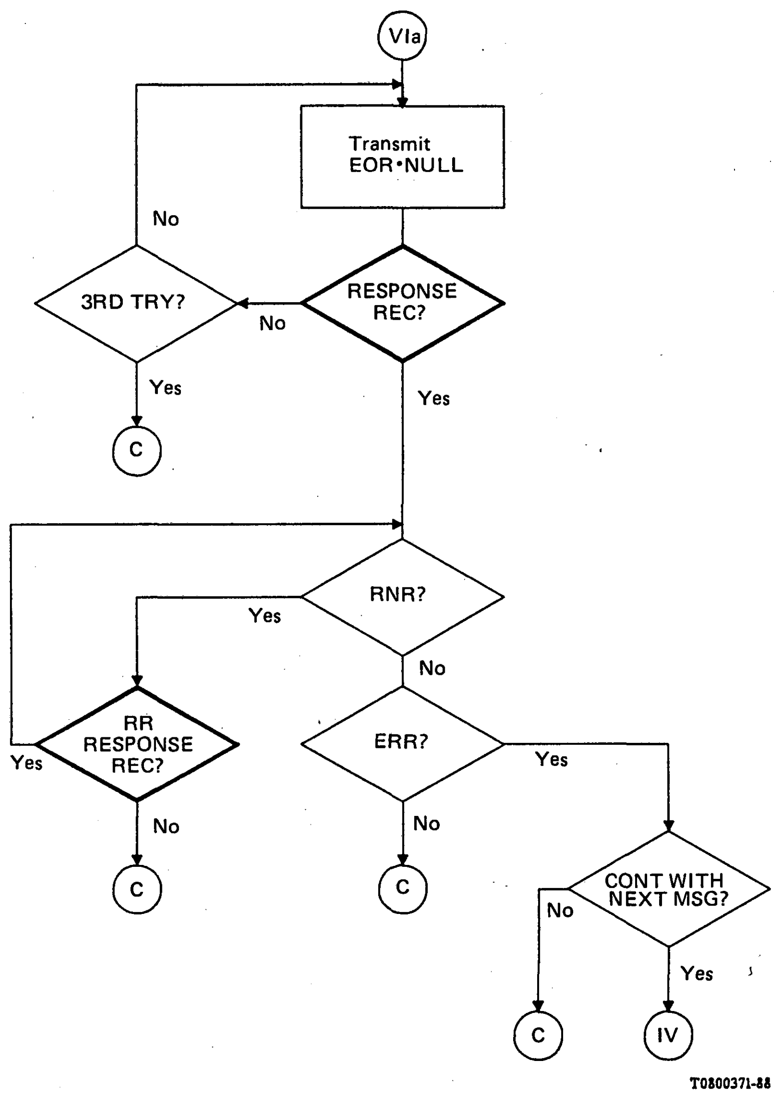


FIGURE A-14/T.30

Transmitting station

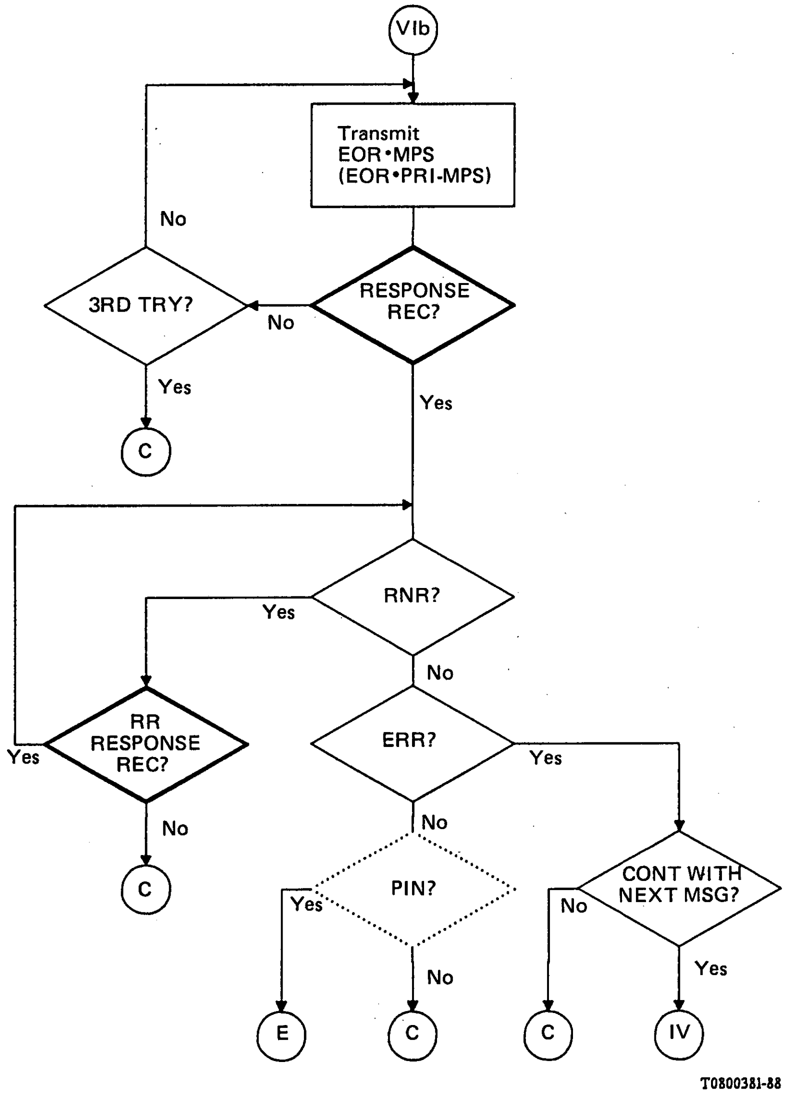


FIGURE A-15/T.30

Transmitting station

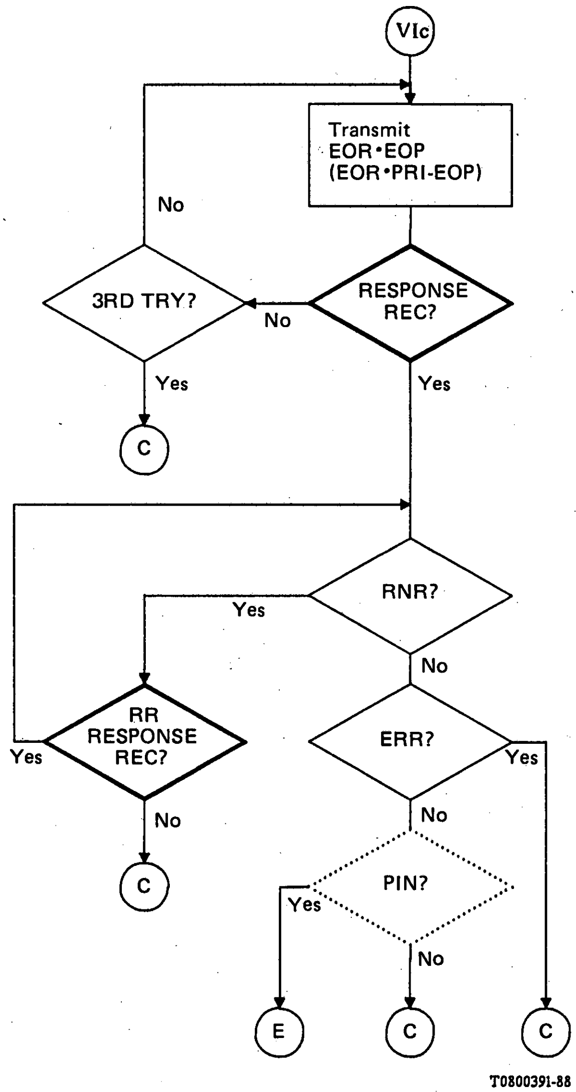


FIGURE A-16/T.30

Transmitting station

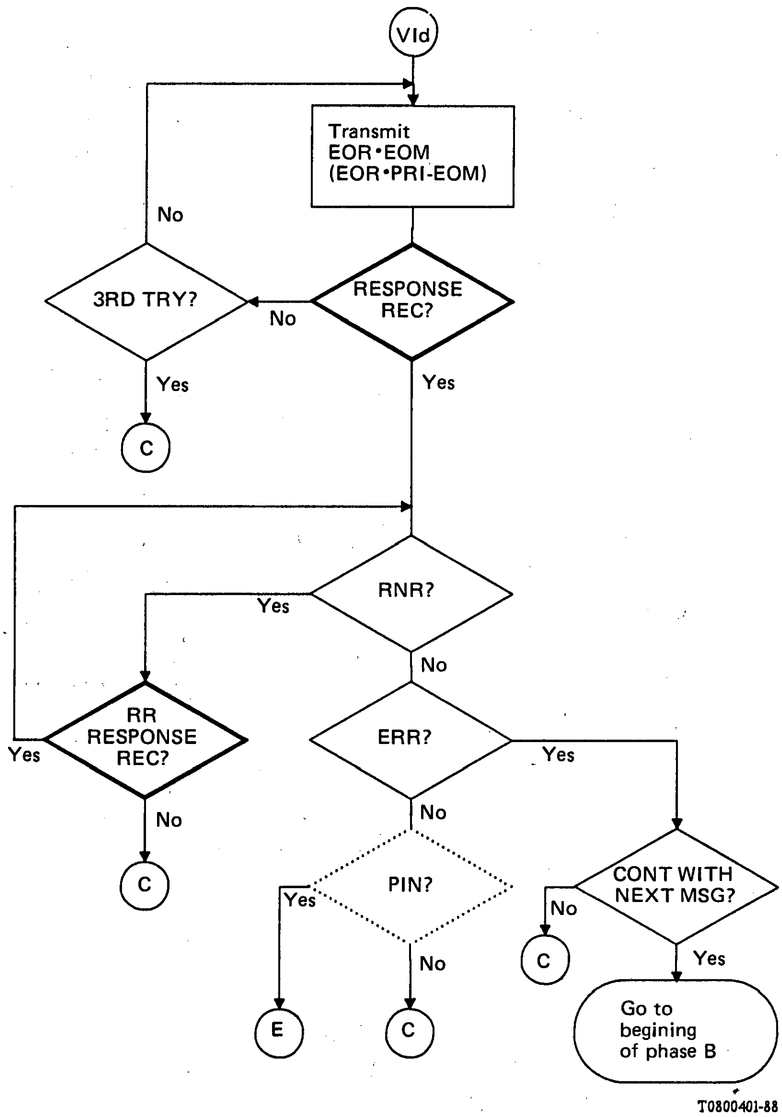


FIGURE A-17/T.30

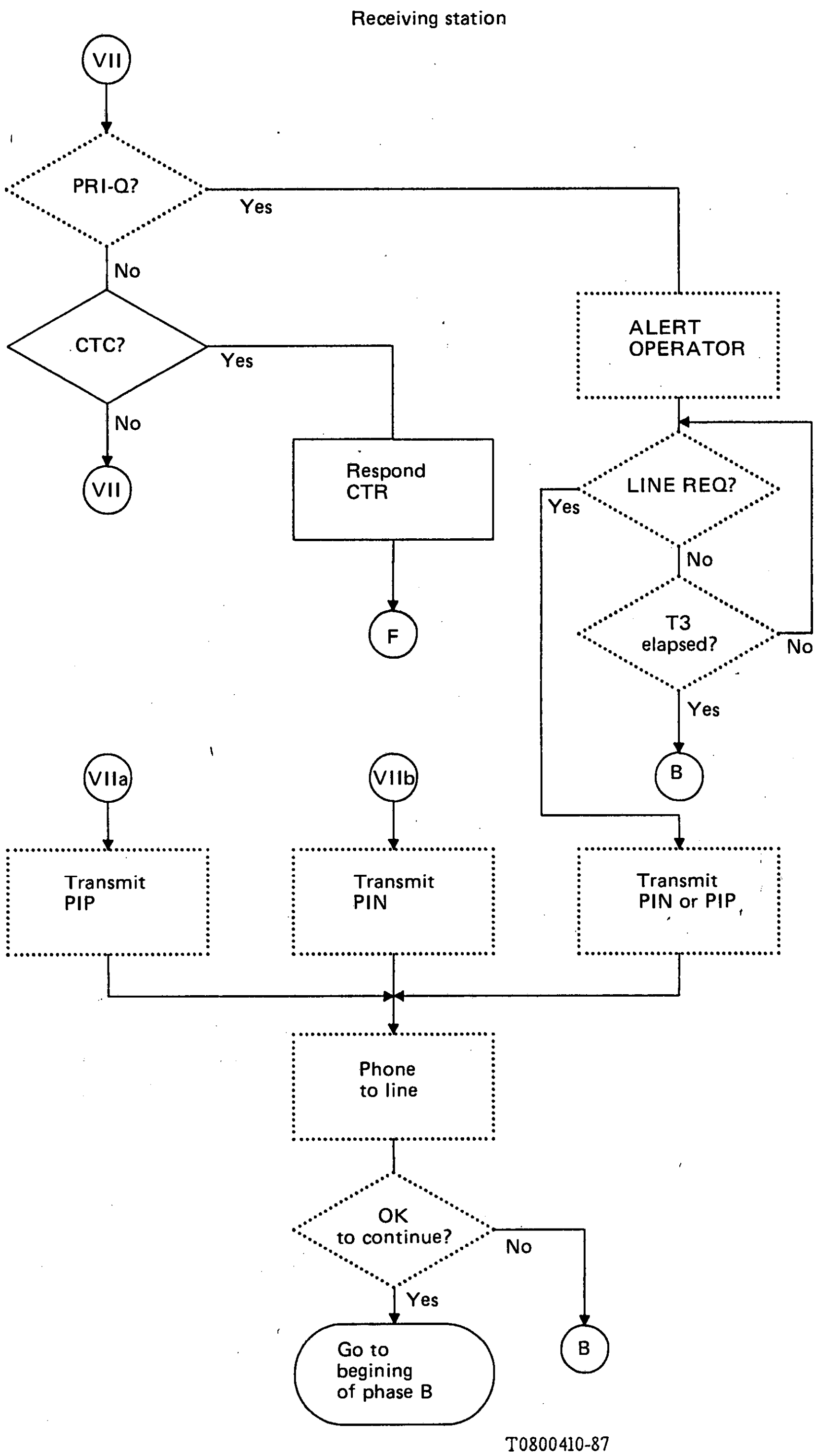


FIGURE A-18/T.30

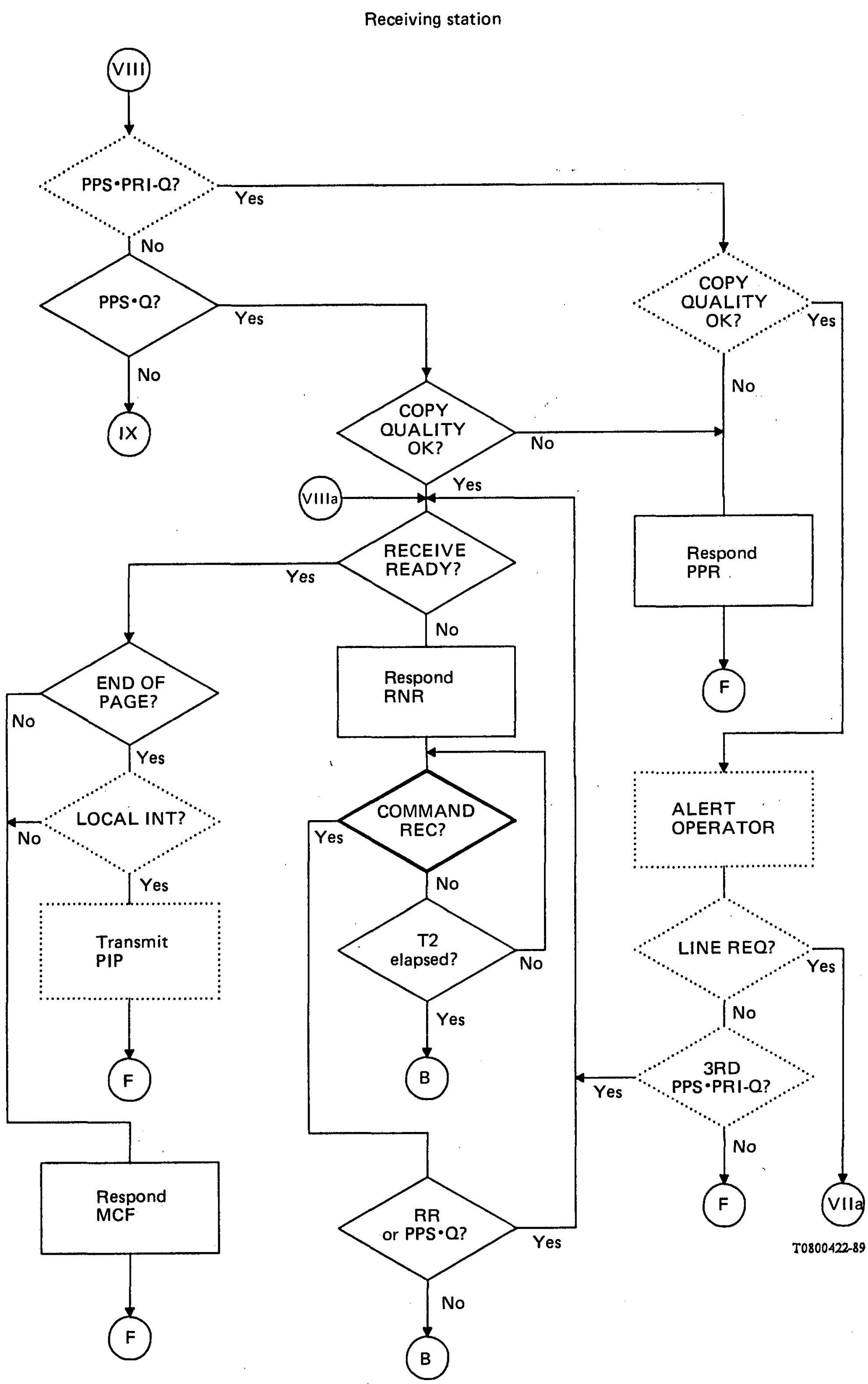


FIGURE A-19/T.30

Receiving station

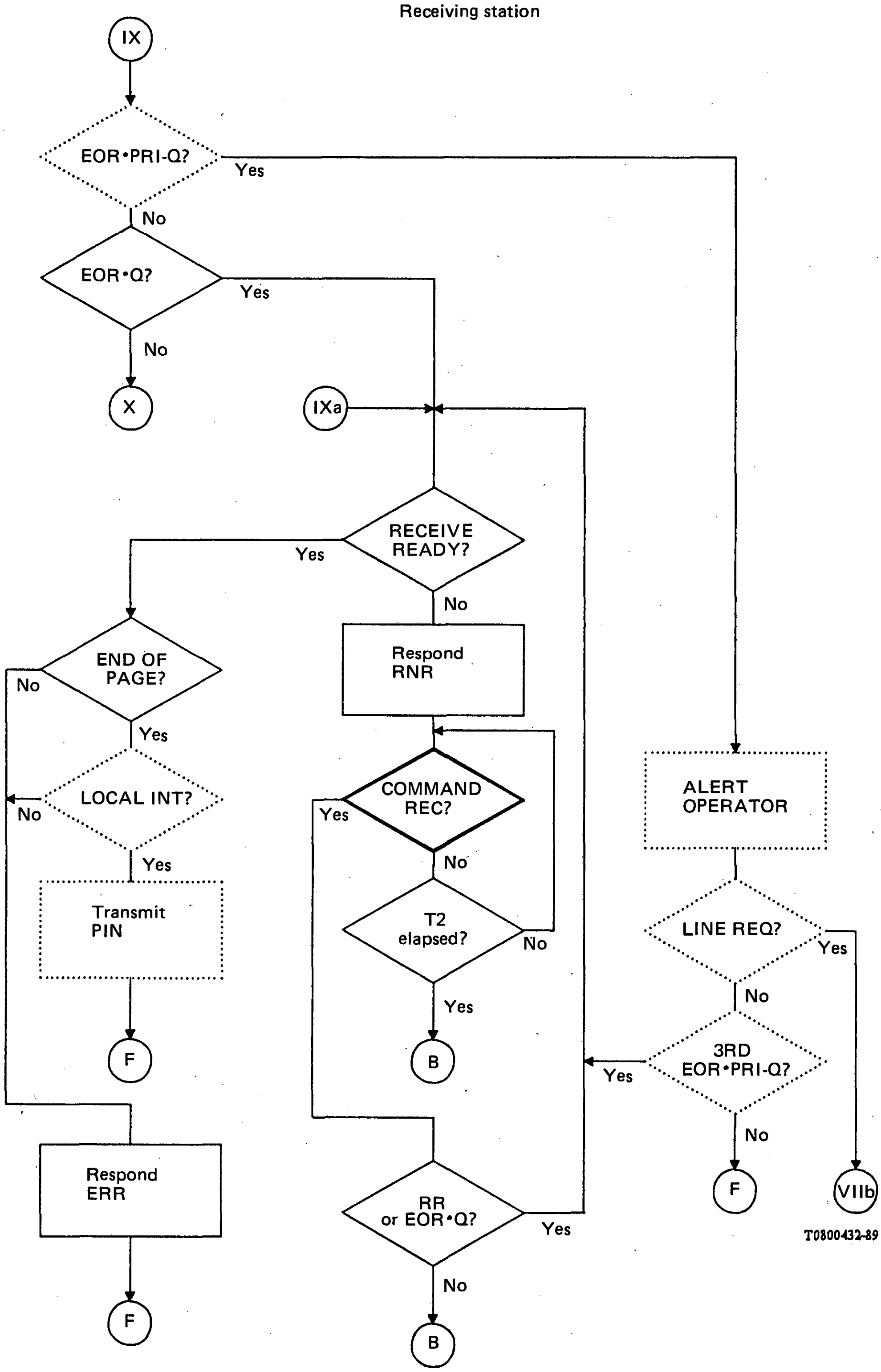


FIGURE A-20/T.30

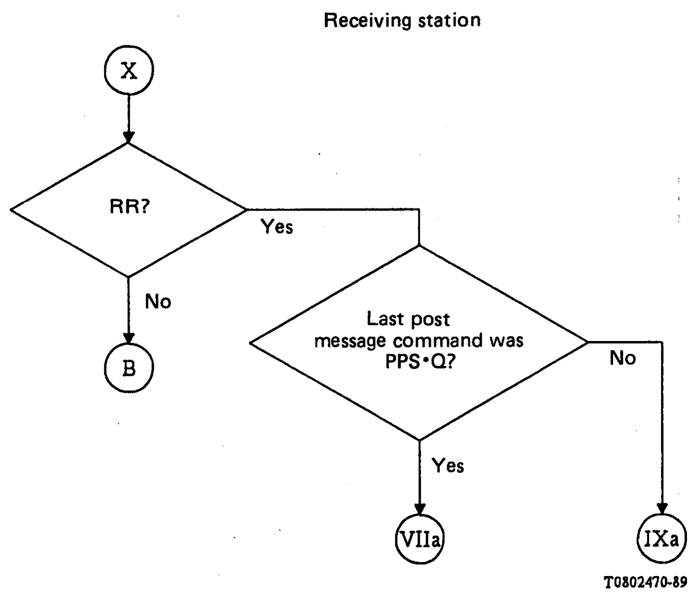


FIGURE A-21/T.30

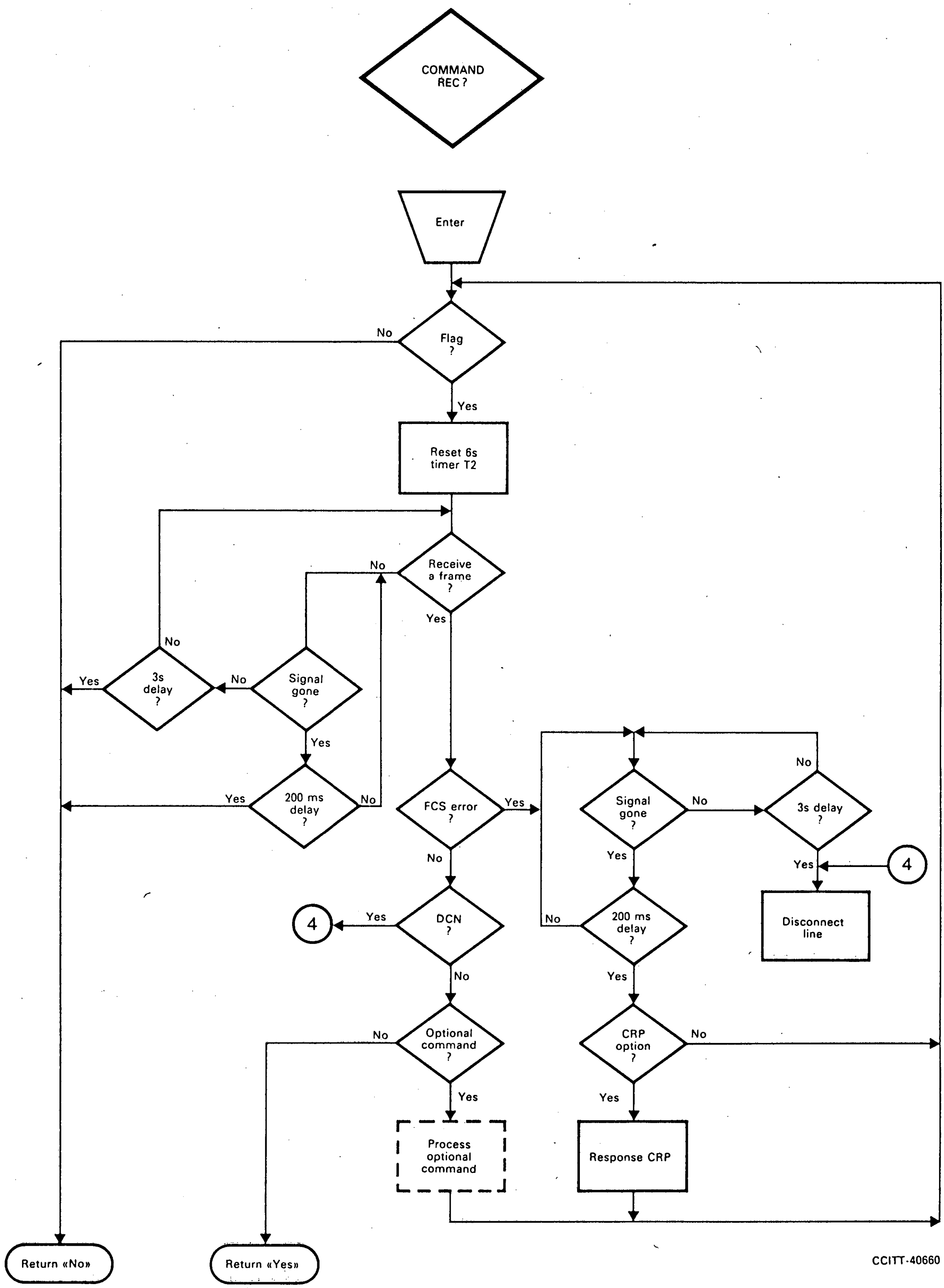
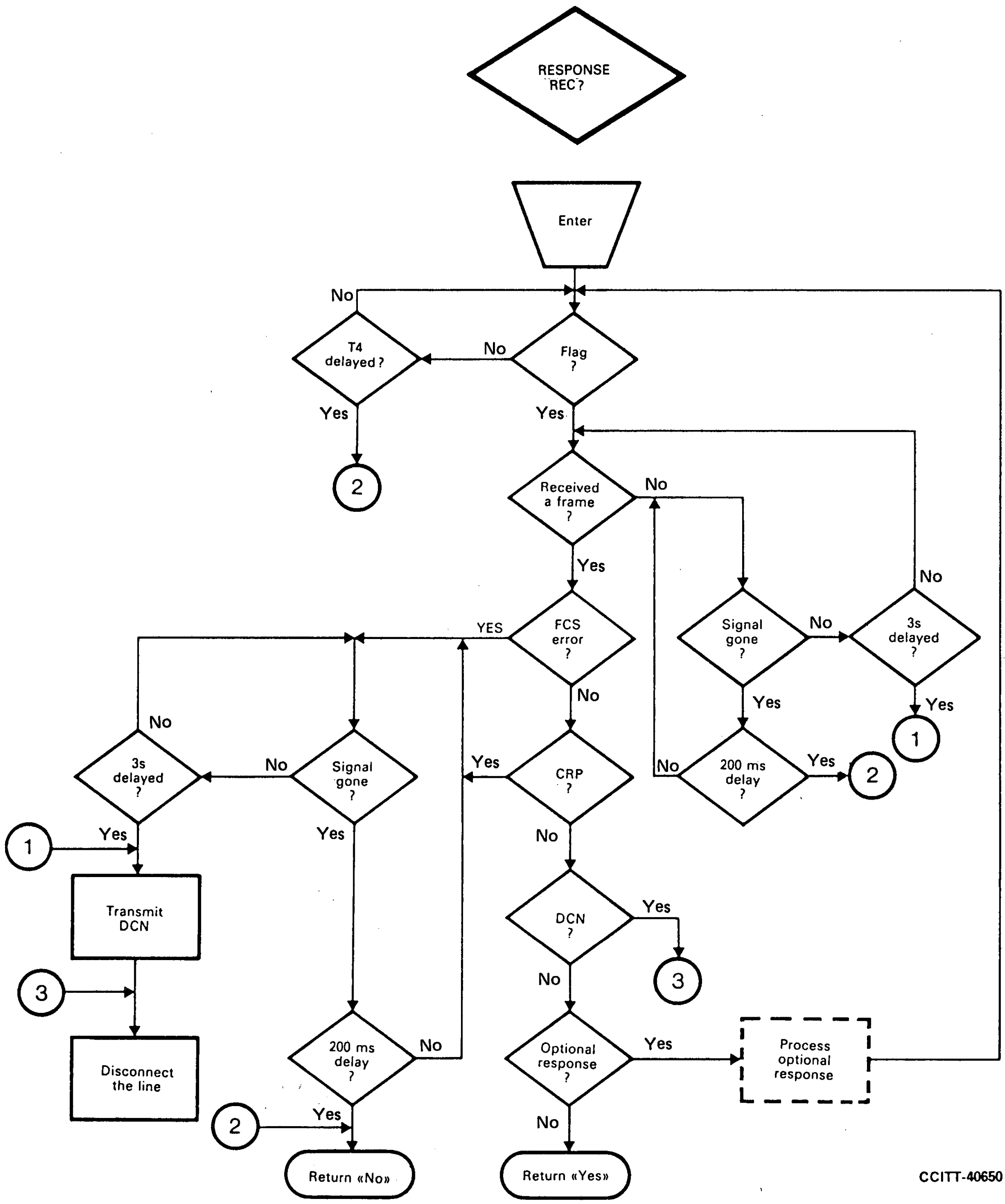
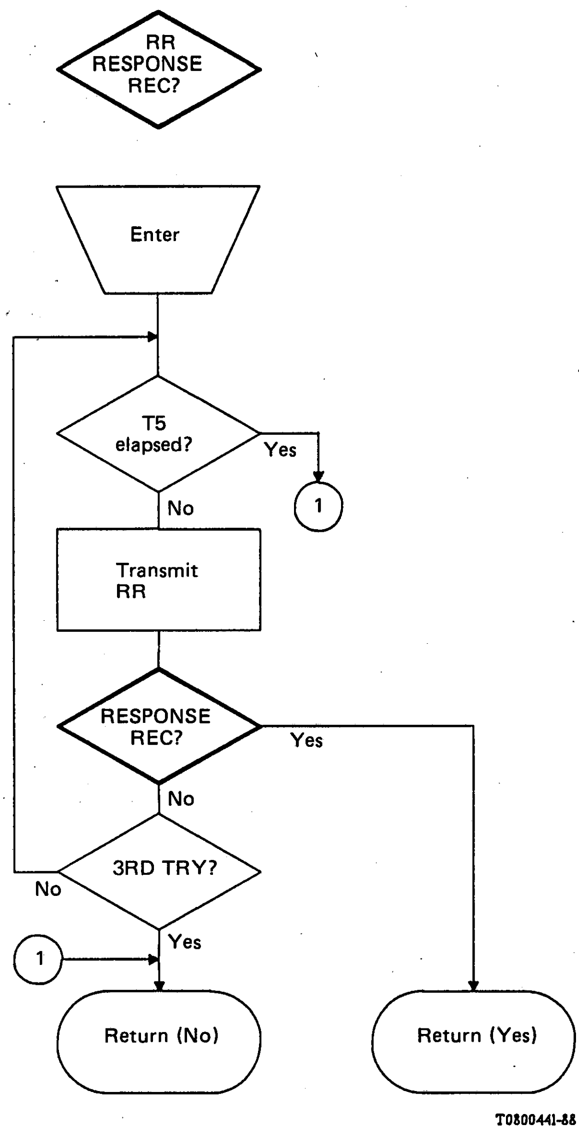


FIGURE A-22/T.30



T4 = 4.5s ± 15%, for manual units
T4 = 3.0s ± 15%, for automatic units

FIGURE A-23/T.30



T5 = 60 s ± 5 s

FIGURE A-24/T.30

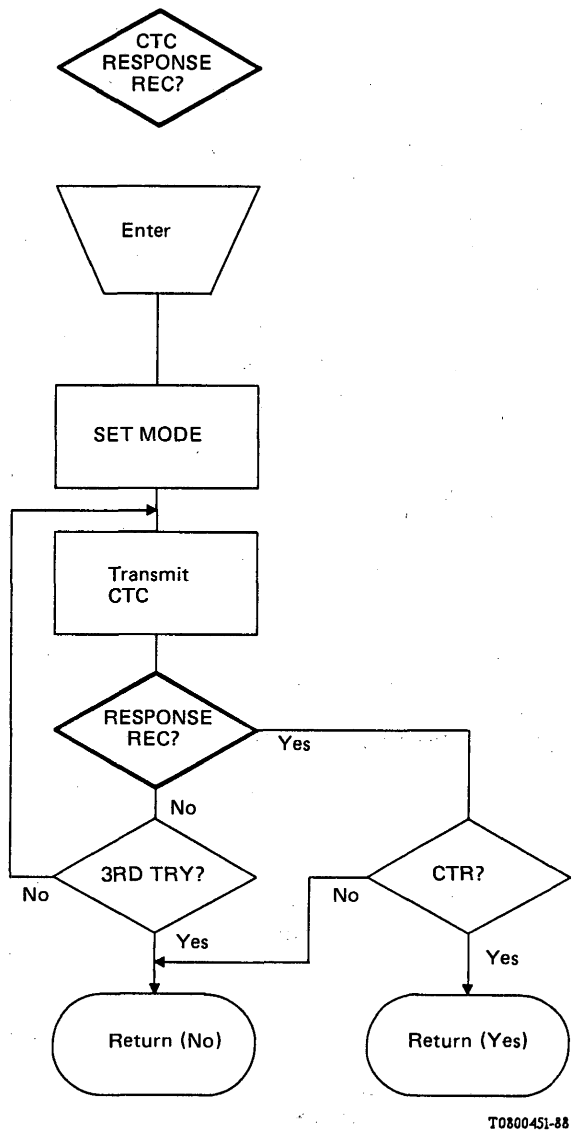


FIGURE A-25/T.30

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- Annexe A paragraph A.7.1 – replace the term TRANSMIT ERROR FRAMES by the following modified version:

TRANSMIT ERROR FRAMES	The frame defined in the information field associated with PPR are transmitted using the V.27 *ter*/V.29/V.33/V.17 modulation system.

A.7.1 *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 REQ	This means that the local operator has "requested" that the telephone line be connected to the 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.
END OF PAGE?	The transmitting station may have further data to transmit to complete the page.
4TH PPR?	PPR has been received 4 times.
TRANSMIT ERROR FRAMES	The frames defined in the information field associated with PPR are transmitted using the V.27 *ter*/V.29 modulation system.
CONTINUE TO CORRECT?	The transmitting station by some algorithm decides to continue correcting the previous message.

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- Annex A paragraph A.8 – replace the second alinea of paragraph A.8 by the following modifed version:

The notations used in these diagrams are as follows:

- the dashed lines indicate transmission at the message data rate (Recommendations V.27 *ter*, V.29, V.33, V.17), and (X, Y) means (page modulo number, block modulo number).

CONT WITH NEXT MSG?	The transmitting station by some algorithm decides to continue and transmit the next message. The previous message was not satisfactorily transmitted.
PPS·PRI-Q?	The terminal has "received either PPS·PRI-EOM, PPS·PRI-MPS, or PPS·PRI-EOP post-message command".
PPS·Q?	The terminal has "received either PPS·EOM, PPS·MPS, PPS·EOP or PPS·Null post-message command."
EOR·PRI-Q?	The terminal has "received either EOR·PRI-EOM, EOR·PRI-MPS, or EOR·PRI-EOP post-message command."
EOR·Q?	The terminal has "received either EOR·EOM, EOR·MPS, EOR·EOP or EOR·Null post-message command".
RECEIVE READY?	The receiving station is ready to receive the next message.
RR RESPONSE REC?	The "RR response received" subroutine searches for an error-free response for the RR command.
CTC RESPONSE REC?	The "CTC response received" subroutine searches for an error-free response for the CTC command.

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.

A.8 *Signal sequence examples in case of error correction procedure*

The examples below are based on the flow diagrams and for illustrative and instructional purposes 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.

In these diagrams the dashed lines indicate transmission at the message data rate (Recommendation V.27 *ter*, V.29), and (X, Y) means (page modulo number, block modulo number).

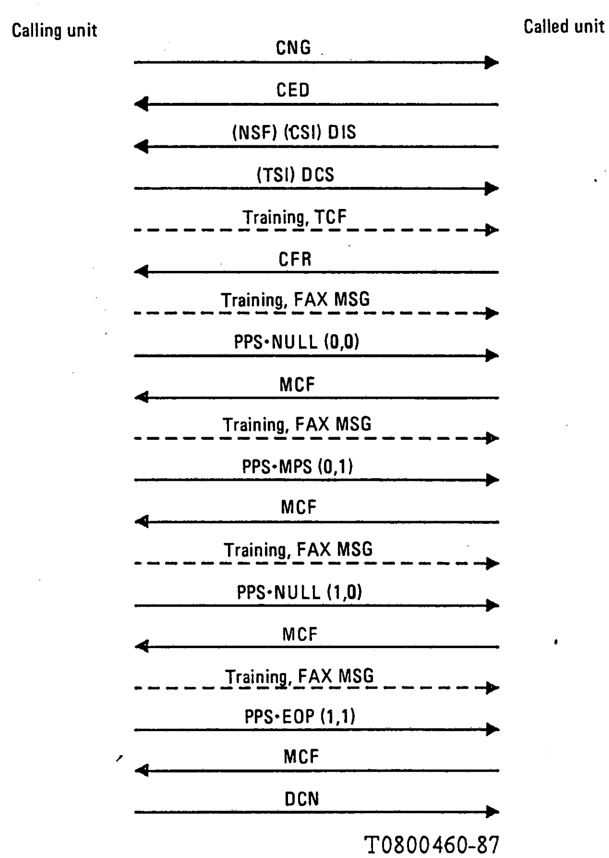


FIGURE A-26/T.30 (Sheet 1 of 13)

Example 1 – An auto calling unit wishing to transmit to an auto answer unit: example of T.4 error correction.

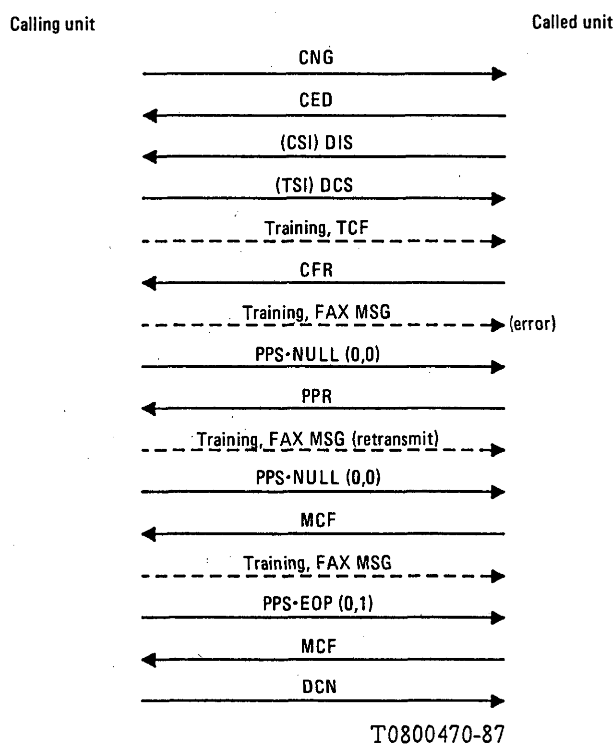


FIGURE A-26/T.30 (Sheet 2 of 13)

Example 2 – An auto calling unit wishing to transmit to an auto answer unit: example of PPR sequence with errors.

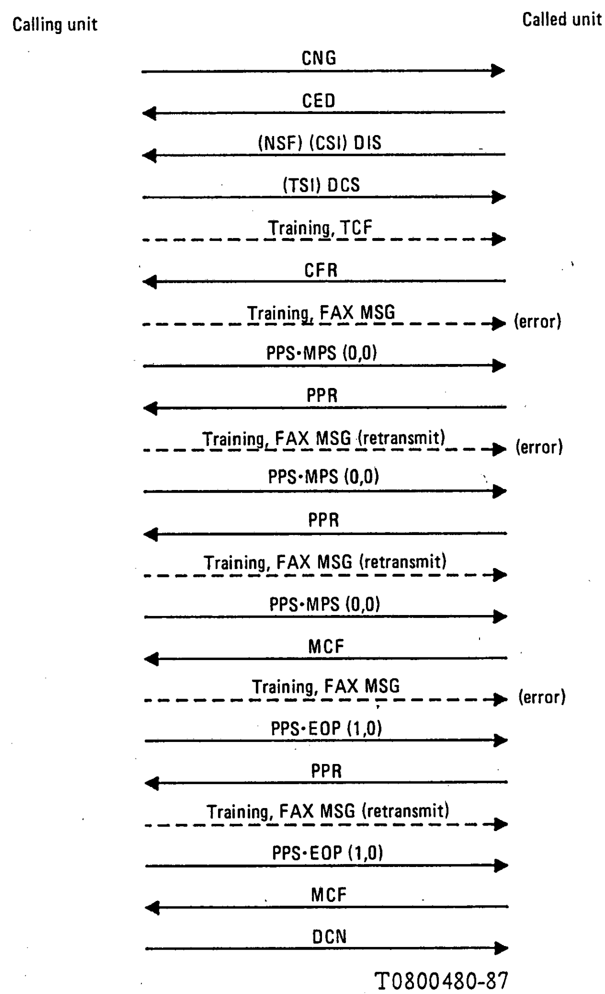


FIGURE A-26/T.30 (Sheet 3 of 13)

Example 3 – An auto calling unit wishing to transmit to an auto answer unit: example of post-message commands with errors.

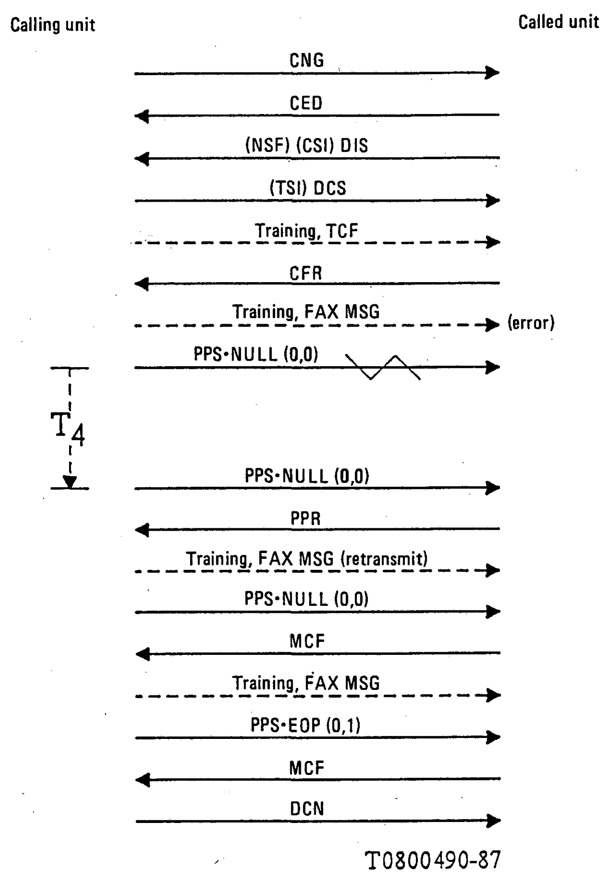


FIGURE A-26/T.30 (Sheet 4 of 13)

Example 4 – An auto calling unit wishing to transmit to an auto answer unit: example of first command failure with message errors.

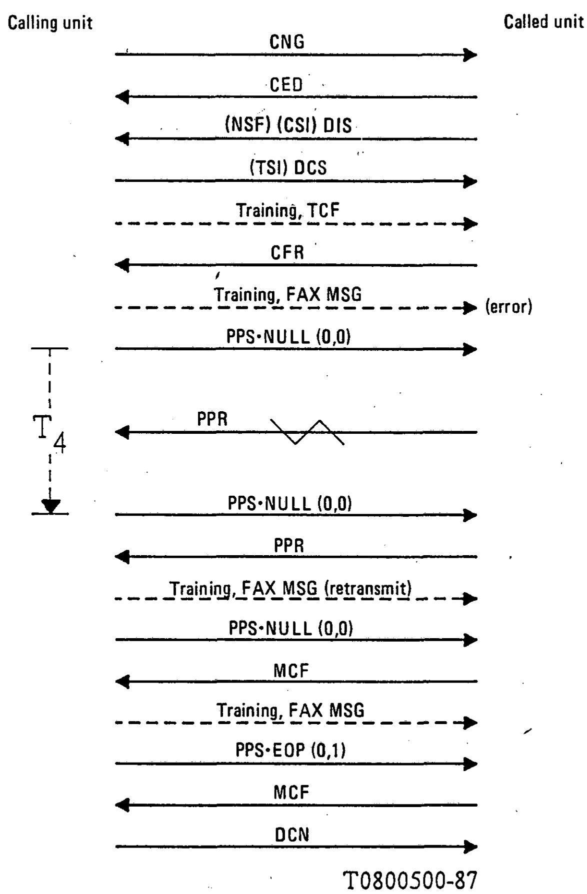


FIGURE A-26/T.30 (Sheet 5 of 13)

Example 5 – An auto calling unit wishing to transmit to an auto answer unit: example of response failure with message errors.

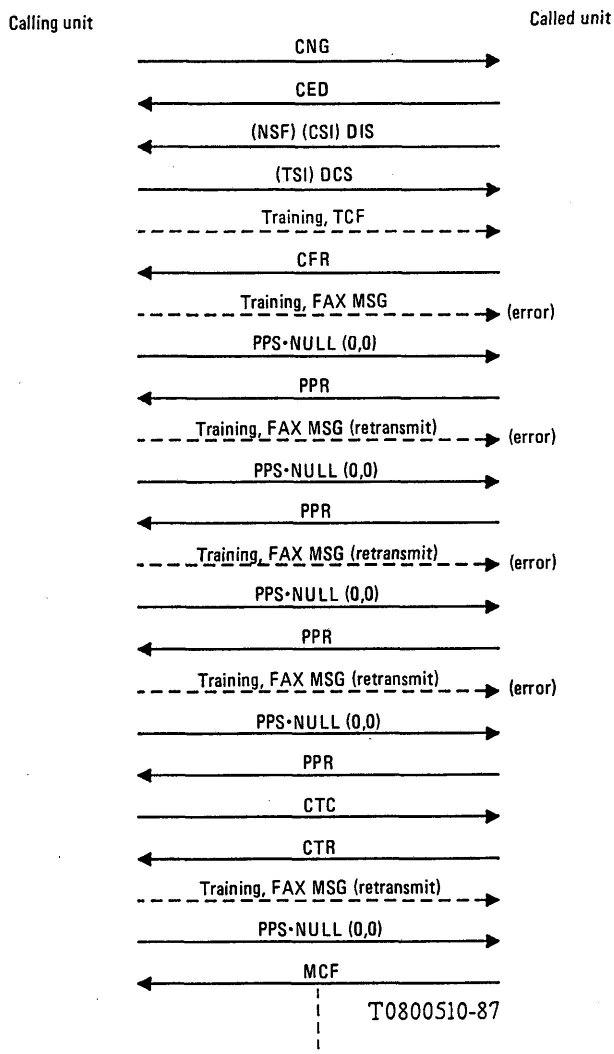


FIGURE A-26/T.30 (Sheet 6 of 13)

Example 6 – An auto calling unit wishing to transmit to an auto answer unit: example of fallback (CTC).

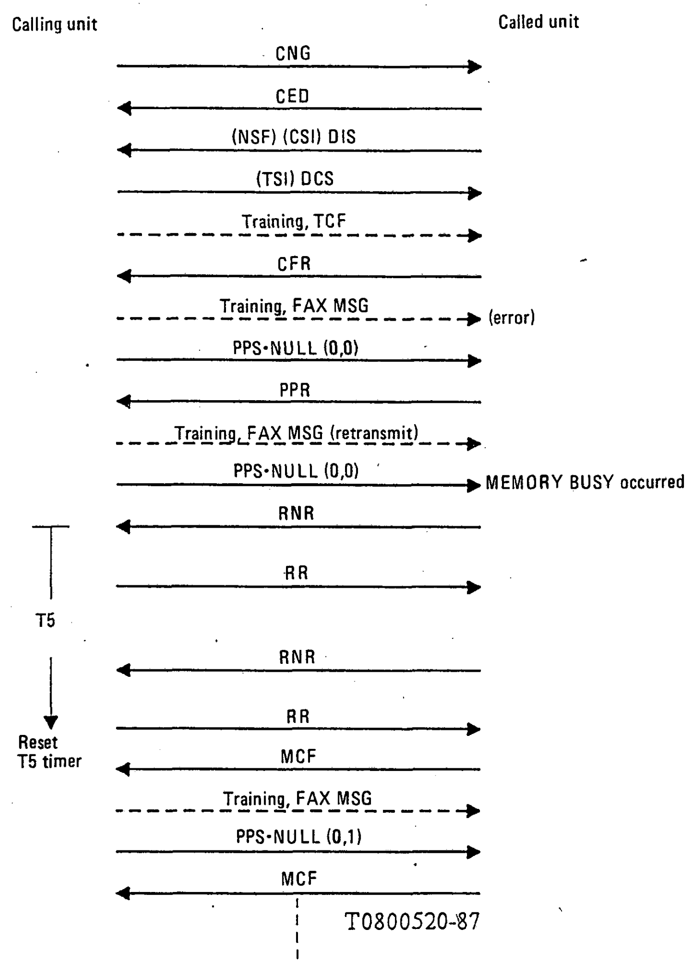


FIGURE A-26/T.30 (Sheet 7 of 13)

Example 7 – An auto calling unit wishing to transmit to an auto answer unit: example of flow control.

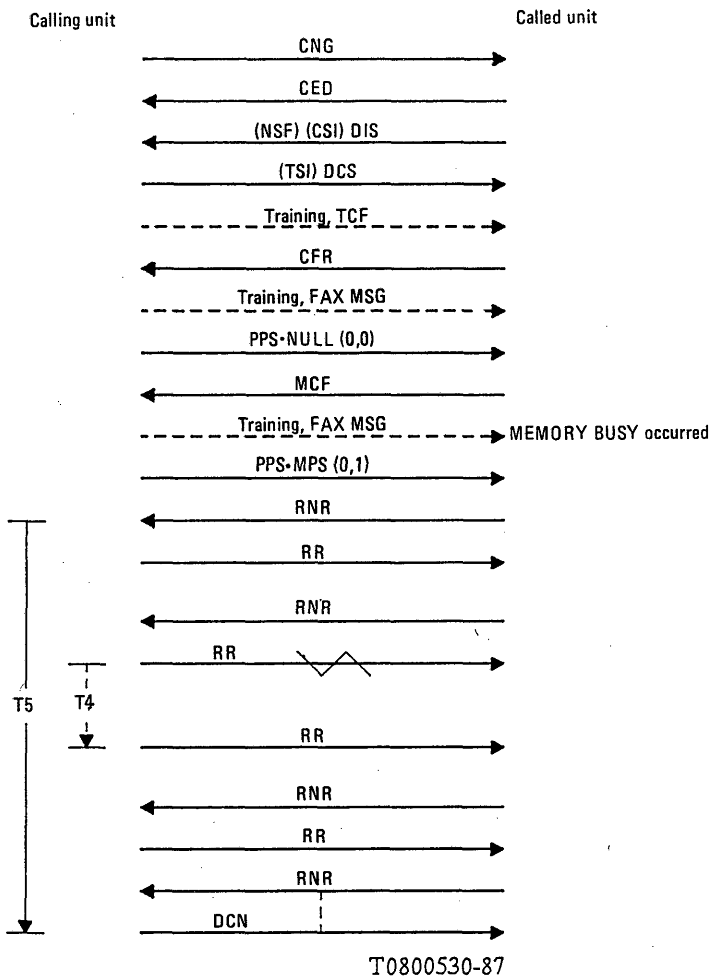


FIGURE A-26/T.30 (Sheet 8 of 13)

Example 8 – An auto calling unit wishing to transmit to an auto answer unit: example of T5 time out during flow control.

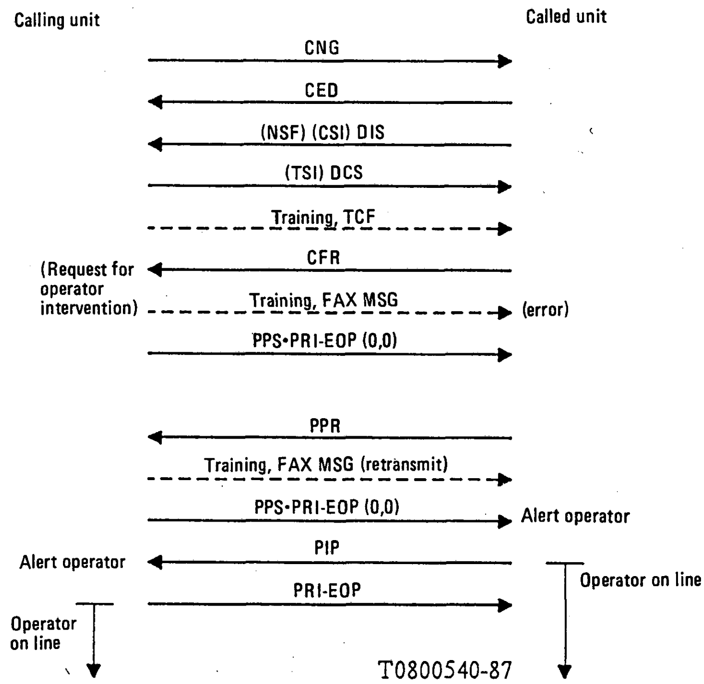


FIGURE A-26/T.30 (Sheet 9 of 13)

Example 9 – An auto calling unit wishing to transmit to an auto answer unit: example of procedural interrupt.

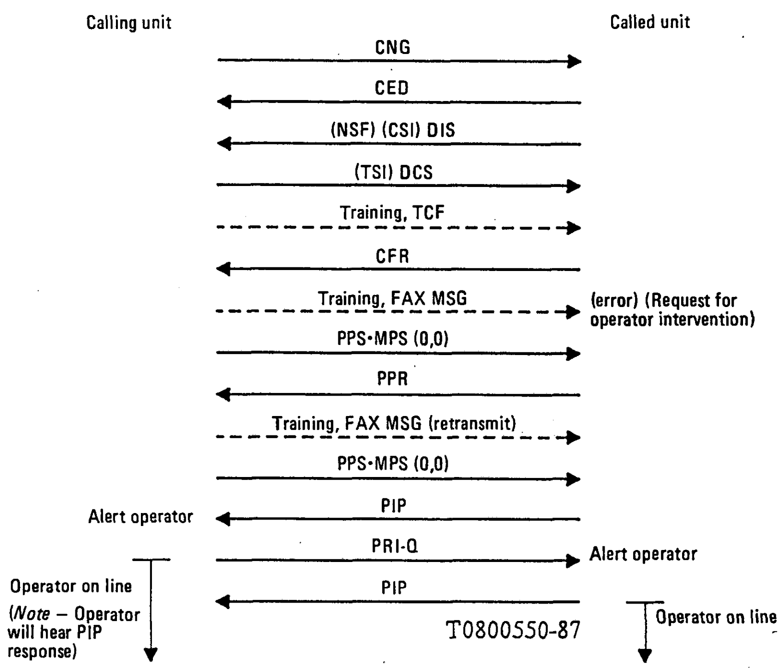


FIGURE A-26/T.30 (Sheet 10 of 13)

Example 10 – An auto calling unit wishing to transmit to an auto answer unit: example of post-message response.

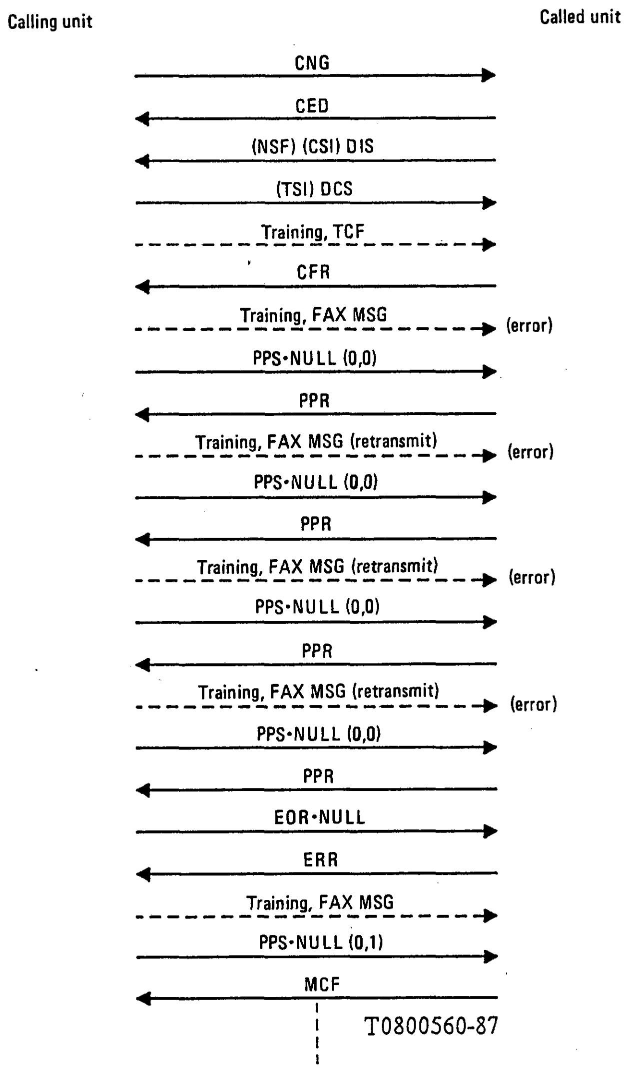


FIGURE A-26/T.30 (Sheet 11 of 13)

Example 11 – An auto calling unit wishing to transmit to an auto answer unit: example of EOR (first block message was not satisfactorily received).

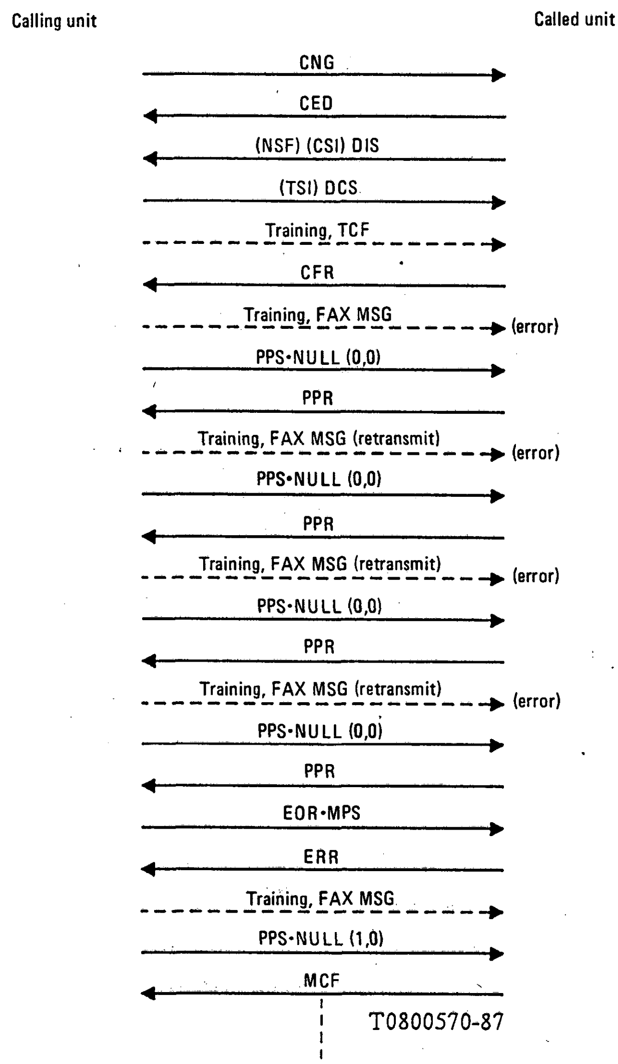


FIGURE A-26/T.30 (Sheet 12 of 13)

Example 12 – An auto calling unit wishing to transmit to an auto answer unit: example of EOR (first page was not satisfactorily received.

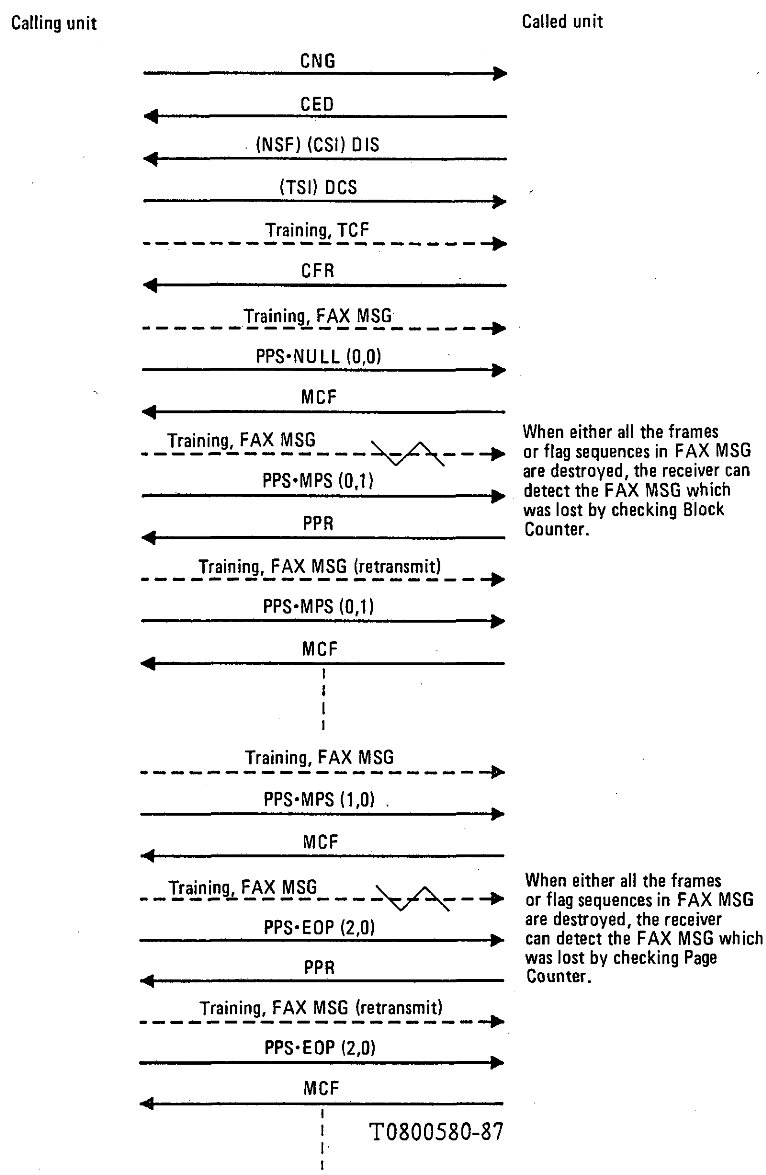


FIGURE A-26/T.30 (Sheet 13 of 13)

Example 13 – An auto calling unit wishing to transmit to an auto answer unit: example of all frames and flag sequences in FAX MSG failure to receive.

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.

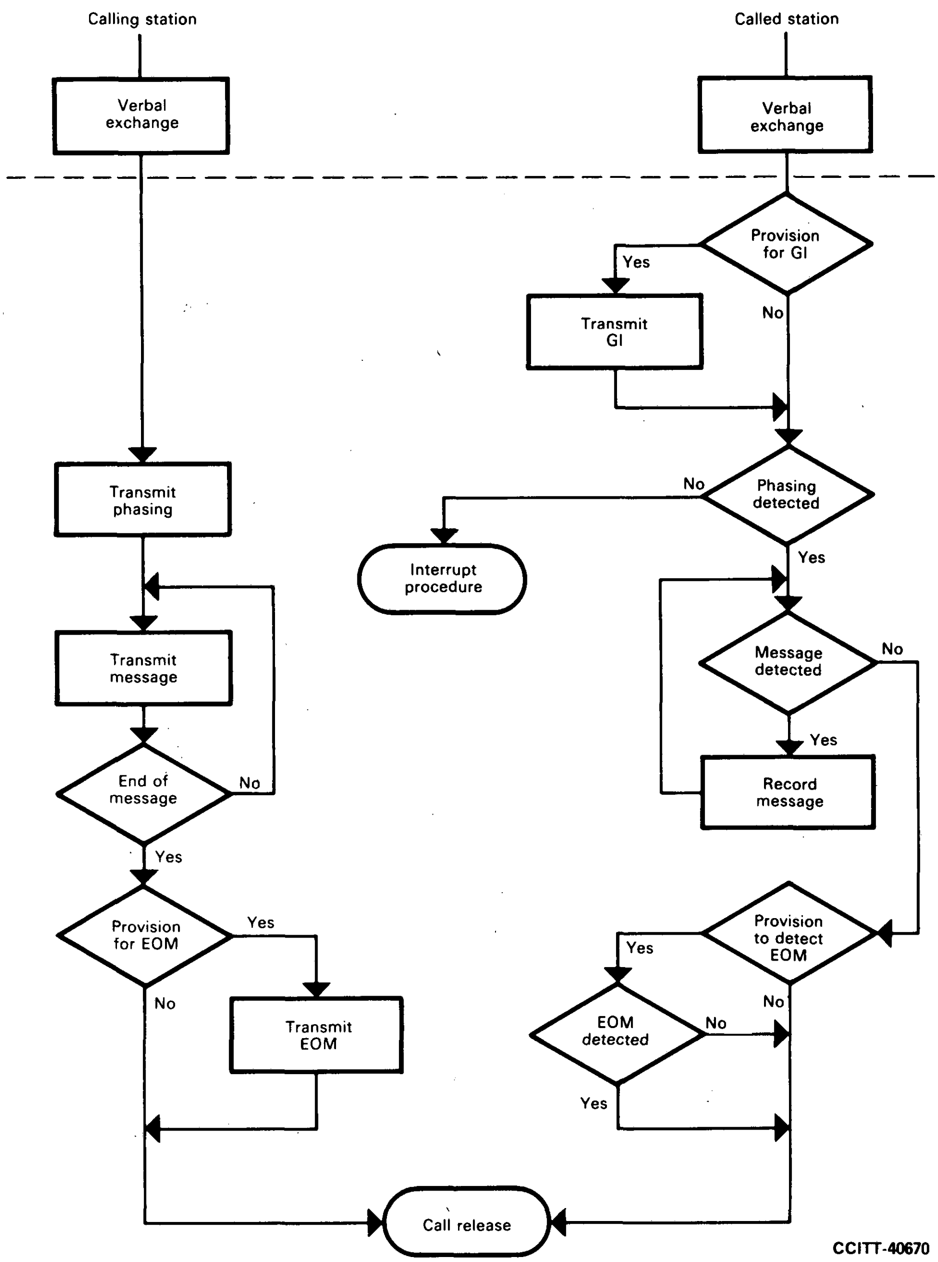


FIGURE I-1/T.30

APPENDIX II

(to Recommendation T.30)

Index of abbreviations used in Recommendation T.30

Abbreviation	Function	Signal format	Reference
CED	Called station identification	2100 Hz	4.3.3.2
CFR	Confirmation to receive	X010 0001	5.3.6.1.4, 1)
		1850 or 1650 Hz for 3s	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)
CTC	Continue to correct	X100 1000	A.4.1
CTR	Response to continue to correct	X010 0011	A.4.2
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)
EOR	End of retransmission	X111 0011	A.4.3
ERR	Response for end of retransmission	X011 1000	A.4.4
FCD	Facsimile coded date	0110 0000	A.2.2
FCF	Facsimile control field	–	5.3.6.1
FIF	Facsimile informtion 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	4.3.2.1
		2100 Hz for 1.5-10.0 s	
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	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)

Index of abbreviations used in Recommendation T.30 *(end)*

Abbreviation	Function	Signal format	Reference
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
PPS	Partial page signal	X111 1101	A.4.3
PPR	Partial page request	X011 1101	A.4.4
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)
RCP	Return to control for partial page	0110 0001	A.2.2
RNR	Receive not ready	X011 0111	A.4.4
RR	Receive ready	X111 0110	A.4.3
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 receiver. This command is always followed by phasing/training.	CFR FTT (NSC) (CIG) DTC (NSF) (CSI) DIS (CRP)
CTC	Mode setting command: from the transmitter to the receiver.	(CTR) (CRP)
(EOR·NULL)	Indicate the next block transmission: from the transmitter to the receiver.	(ERR) (RNR) (CRP)
(EOR·MPS) or (EOR·EOP) or (EOR·EOM) or (EOR·PRI·MPS) or (EOR·PRI-EOP) or (EOR·PRI-EOM)	Indicate the next message transmission: from the transmitter to the receiver.	(ERR) (RNR) PIN (CRP)
MPS or EOP or EOM or (PRI-MPS) or (PRI-EOP) or (PRI-EOM)	Post message commands.	MCF RTP RTN PIP PIN (CRP)
(PPS·NULL)	Post-message command for a partial page: from the transmitter to the receiver.	(PPR) MCF (RNR) (CRP)
(PPS·MPS) or (PPS·EOP) or (PPS·EOM) or (PPS·PRI-MPS) or (PPS·PRI-EOP) or (PPS·PRI-EOM)	Post-message commands for a complete page: from the transmitter to the receiver.	(PPR) MCF (RNR) PIP PIN (CRP)

List of commands and appropriate responses *(end)*

Commands	Comments	Appropriate responses
(RR)	Ask for the status of the receiver: from the transmitter to the receiver.	(RNR) (ERR) MCF PIP PIN (CRP)
DCN	Phase E command	None

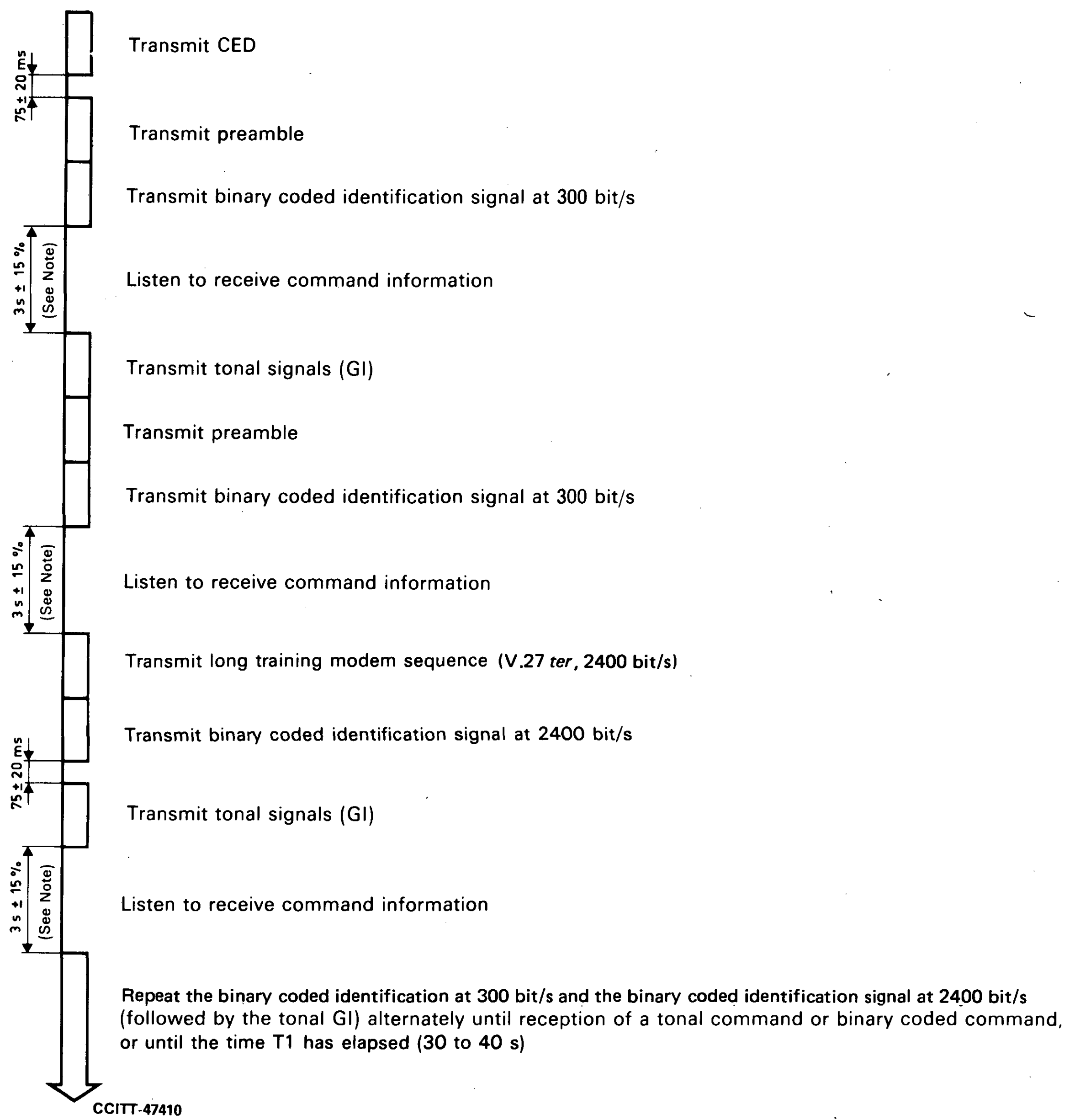
Note – Where the symbols ( ) are used, the signals within these symbols are optional.

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)

Page 168

- Appendix V – replace the third indent of the second alinea by the following modifed version:
- the dashed lines indicate transmission at the message data rate (Recommendations V.27 *ter*, V.29, V.33, V.17);

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*, V.29);
– 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.

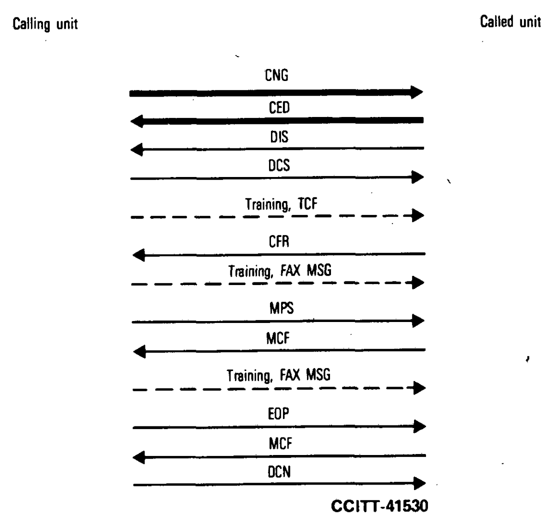


FIGURE V-1/T.30

Example 1 – An auto calling unit wishing to transmit to an auto answer unit: example of post-message commands.

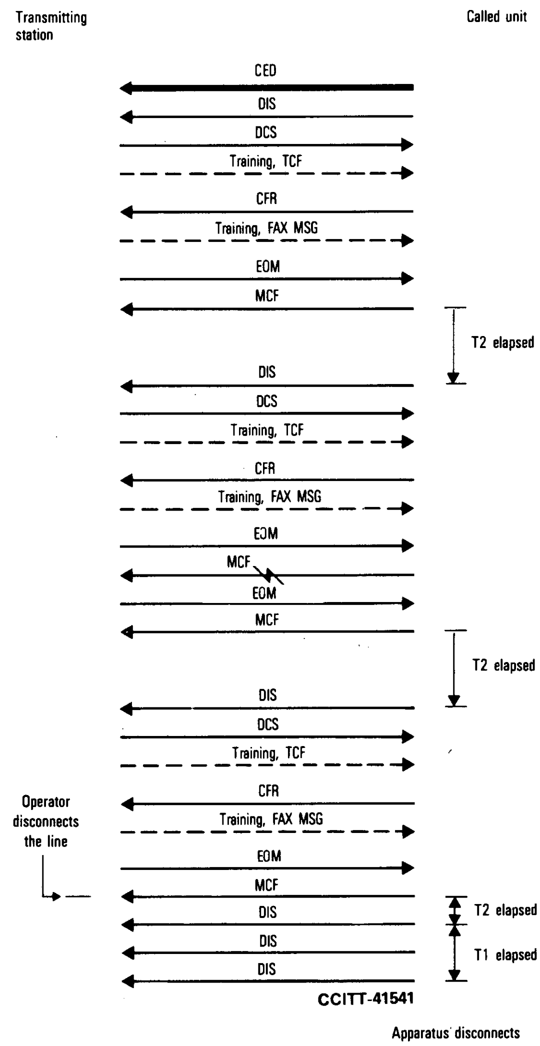


FIGURE V-2/T.30

Example 2 – A single page transmitter wishing to transmit to an auto answer unit: example of EOM.

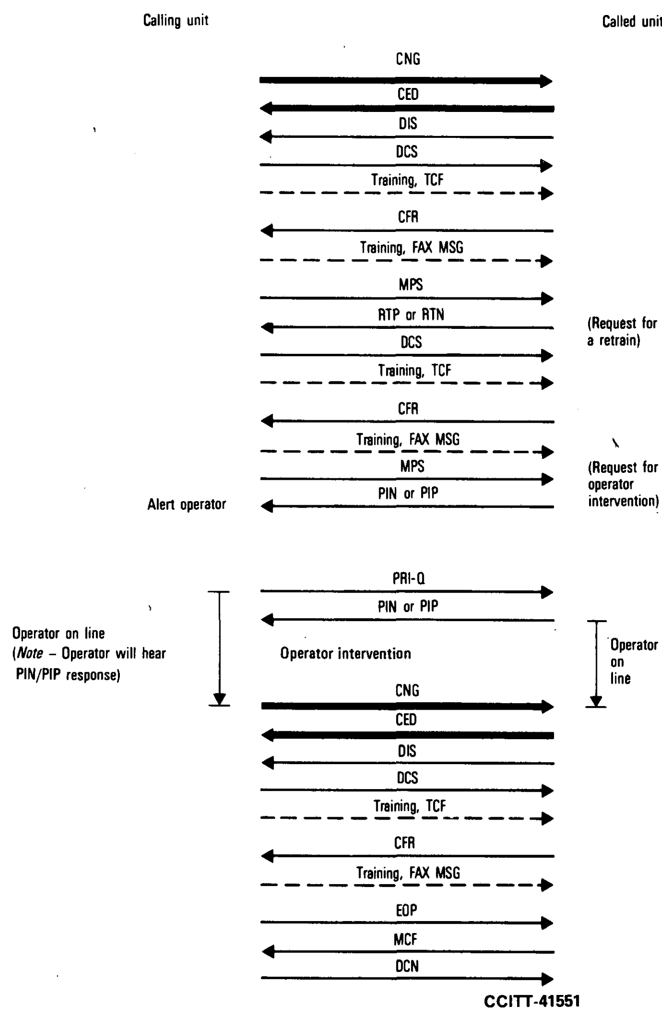


FIGURE V-3/T.30

Example 3 – An auto calling unit wishing to transmit to an auto answer unit : example of post-message responses.

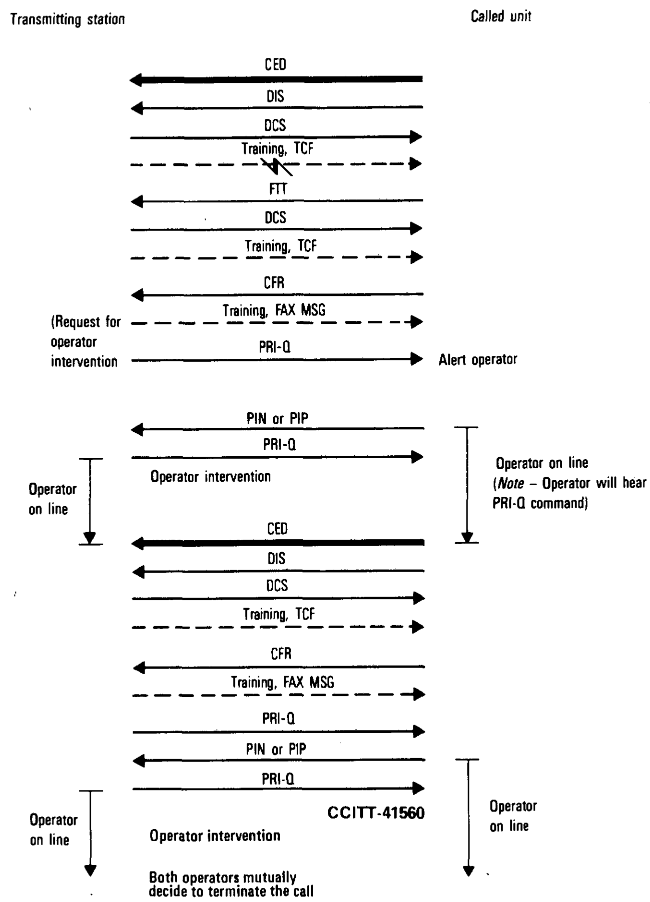


FIGURE V-4/T.30

Example 4 – Manual transmitter wishing to transmit to an auto answer unit: example of initial training failure and procedural interrupts.

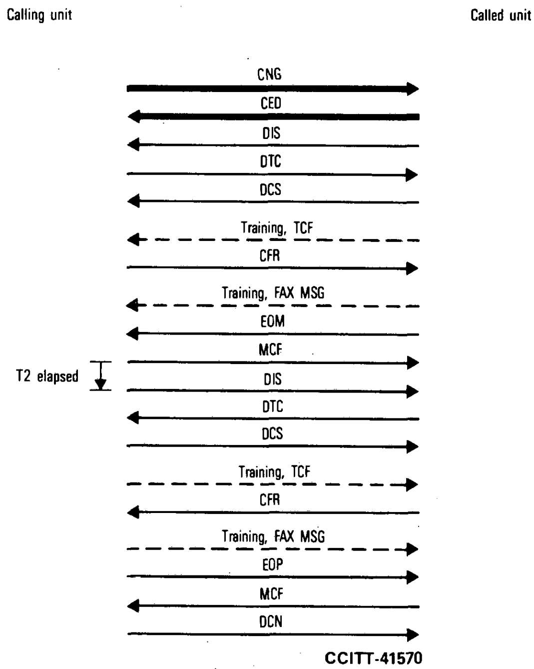


FIGURE V-5/T.30

Example 5 – Auto calling unit wishing to first receive from, then transmit to, an auto answer unit.

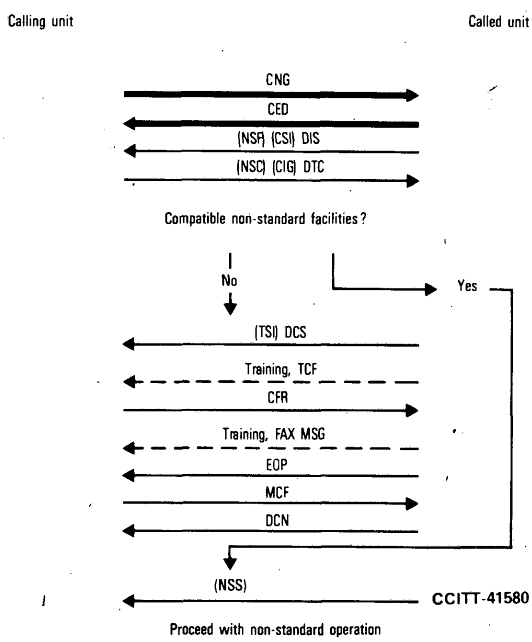


FIGURE V-6/T.30

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.

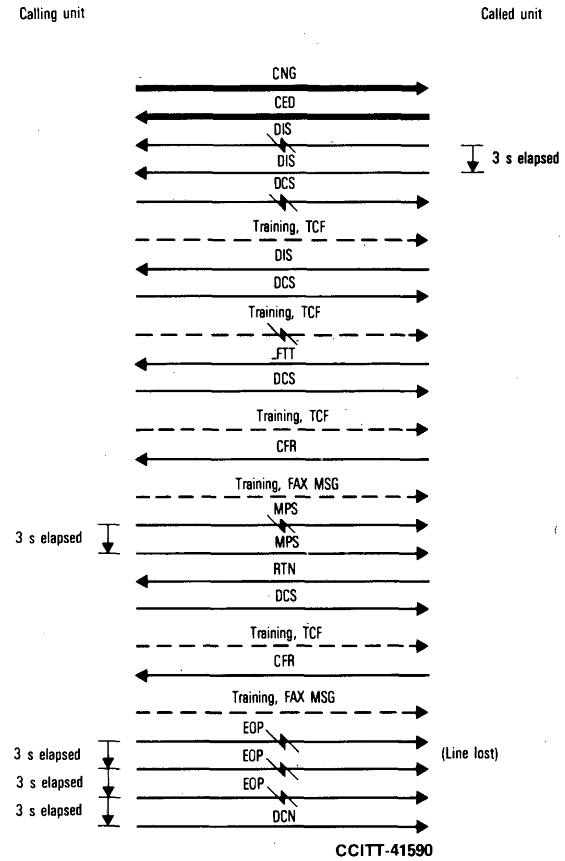


FIGURE V-7/T.30

Example 7 – An auto calling unit wishing to transmit to an auto answer unit: example of standard error recovery techniques.

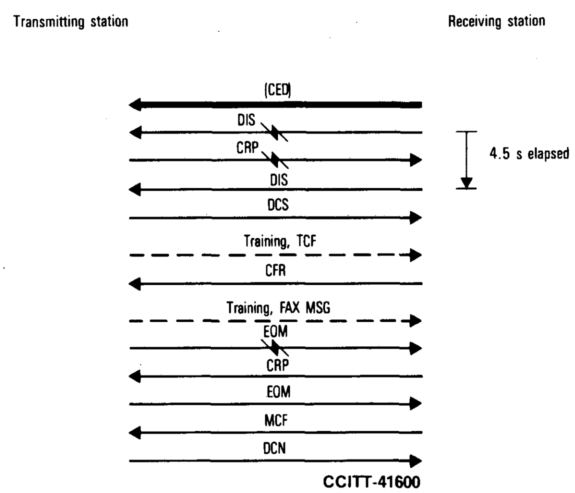


FIGURE V-8/T.30

Example 8 – Manual transmitter wishing to transmit to a manual receiver: example of error recovery technique using the optional CRP response.

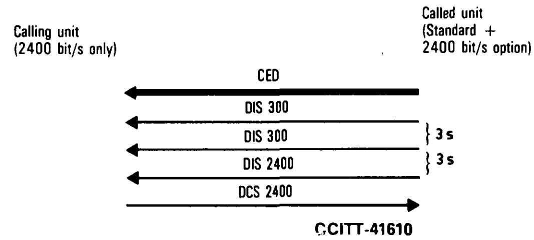


FIGURE V-9/T.30

Example 9 – A 2400 bit/s only machine wishing to transmit to a standard machine including the recognized option for binary coded handshaking procedure.

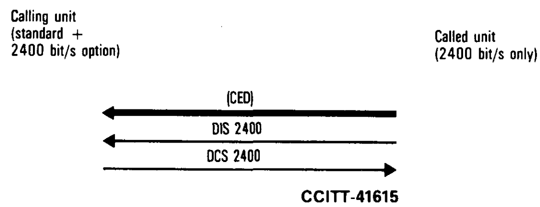


FIGURE V-10/T.30

Example 10 – A standard machine including the recognized option for binary coded handshaking procedure wishing to transmit to a 2400 bit/s only machine.

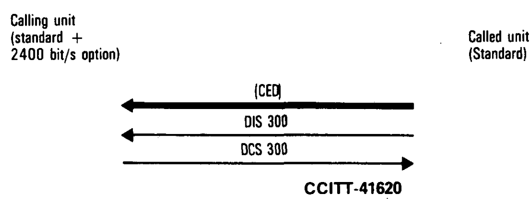


FIGURE V-11/T.30

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).

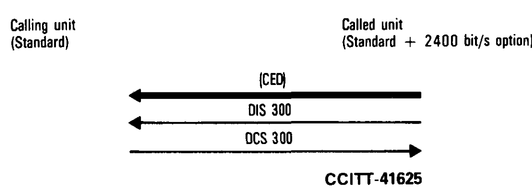


FIGURE V-12/T.30

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.

PROCEDURE FOR THE ALLOCATION OF CCITT MEMBERS' CODES [1]

(Malaga-Torremolinos, 1984)

1 CCITT has defined Recommendation T.30 which details the control procedures for facsimile apparatus. The binary coded control procedures provide for the inclusion of non-standard facilities in addition to the standard facilities given in the appropriate Series T Recommendations and require a unique code to be allocated to each registered CCITT member [1] who includes such non-standard facilities.

For the assignment of these codes, registered CCITT members [1] may apply to the appropriate Administration, who will forward their request to the Director of the CCITT.

If authorized by an Administration, the Director of the CCITT will accept such requests direct from registered CCITT members [1] of the appropriate country.

2 For Group 3 facsimile apparatus, the country codes should be as given in Annex A to this Recommendation.

The code 1111 1111 in Annex A should be reserved for further study.

The allocation of codes to subsequent octets should be carried out nationally.

3 For Group 4 facsimile, teletex and mixed-mode, the allocation of country codes should also be as given in Annex A with the code 1111 1111 again being reserved for further study.

4 The Member countries of the International Telecommunication Union not mentioned in this list who wish to obtain a country code should ask the Director of the CCITT for the assignment of an available country code. In their request, they may indicate the available code preferred.

Assignments by the Director of the CCITT of country codes as well as assignments by countries of the members' codes [1] will be published in the Operational Bulletin of the International Telecommunication Union.

Note – Non-standard facilities are not defined in CCITT Recommendations but are laid down by Administrations and/or individual manufacturers. On request a CCITT member [1] may be required to disclose the functional description related to the bit assignments contained within the Facsimile Information Field of the non-standard facilities frame.

[1] In the context of this Recommendation the term "CCITT member" should be understood to mean a scientific or an industrial organization having been admitted in accordance with the provisions of Article 68 of the International Telecommunication Convention, Nairobi, 1982, to participate in an advisory capacity in meetings of the CCITT. It is understood that Administrations or RPOAs can apply directly to the Director of the CCITT for a registered CCITT code for their own purposes.

ANNEX A

(to Recommendation T.35)

List of country or area codes for non-standard facilities in telematic services

Code								Countries or areas
Bit								
b_8	b_7	b_6	b_5	b_4	b_3	b_2	b_1	
0	0	0	0	0	0	0	0	Japan
0	0	0	0	0	0	0	1	Albania
0	0	0	0	0	0	1	0	Algeria
0	0	0	0	0	0	1	1	American Samoa
0	0	0	0	0	1	0	0	Germany (Federal Republic of)
0	0	0	0	0	1	0	1	Anguilla
0	0	0	0	0	1	1	0	Antigua and Barbuda
0	0	0	0	0	1	1	1	Argentina
0	0	0	0	1	0	0	0	Ascension (see S. Helena)
0	0	0	0	1	0	0	1	Australia
0	0	0	0	1	0	1	0	Austria
0	0	0	0	1	0	1	1	Bahamas
0	0	0	0	1	1	0	0	Bahrain
0	0	0	0	1	1	0	1	Bangladesh
0	0	0	0	1	1	1	0	Barbados
0	0	0	0	1	1	1	1	Belgium
0	0	0	1	0	0	0	0	Belize
0	0	0	1	0	0	0	1	Benin
0	0	0	1	0	0	1	0	Bermudas
0	0	0	1	0	0	1	1	Bhutan
0	0	0	1	0	1	0	0	Bolivia
0	0	0	1	0	1	0	1	Botswana
0	0	0	1	0	1	1	0	Brazil
0	0	0	1	0	1	1	1	British Antarctic Territory
0	0	0	1	1	0	0	0	British Indian Ocean Territory
0	0	0	1	1	0	0	1	British Virgin Islands
0	0	0	1	1	0	1	0	Brunei
0	0	0	1	1	0	1	1	Bulgaria
0	0	0	1	1	1	0	0	Burma
0	0	0	1	1	1	0	1	Burundi
0	0	0	1	1	1	1	0	Byelorussia
0	0	0	1	1	1	1	1	Cameroon
0	0	1	0	0	0	0	0	Canada
0	0	1	0	0	0	0	1	Cape Verde
0	0	1	0	0	0	1	0	Cayman Islandas
0	0	1	0	0	0	1	1	Central African Republic
0	0	1	0	0	1	0	0	Chad
0	0	1	0	0	1	0	1	Chile
0	0	1	0	0	1	1	0	China
0	0	1	0	0	1	1	1	Colombia
0	0	1	0	1	0	0	0	Comoros
0	0	1	0	1	0	0	1	Congo
0	0	1	0	1	0	1	0	Cook Islands
0	0	1	0	1	0	1	1	Costa Rica
0	0	1	0	1	1	0	0	Cuba
0	0	1	0	1	1	0	1	Cyprus
0	0	1	0	1	1	1	0	Czechoslovakia
0	0	1	0	1	1	1	1	Democratic Kampuchea

Code								Countries or areas
Bit								
b_8	b_7	b_6	b_5	b_4	b_3	b_2	b_1	
0	0	1	1	0	0	0	0	Democratic People's Republic of Korea
0	0	1	1	0	0	0	1	Denmark
0	0	1	1	0	0	1	0	Djibouti
0	0	1	1	0	0	1	1	Dominican Republic
0	0	1	1	0	1	0	0	Dominica
0	0	1	1	0	1	0	1	Ecuador
0	0	1	1	0	1	1	0	Egypt
0	0	1	1	0	1	1	1	El Salvador
0	0	1	1	1	0	0	0	Equatorial Guinea
0	0	1	1	1	0	0	1	Ethiopia
0	0	1	1	1	0	1	0	Falkland Islands
0	0	1	1	1	0	1	1	Fiji
0	0	1	1	1	1	0	0	Finland
0	0	1	1	1	1	0	1	France
0	0	1	1	1	1	1	0	French Polynesia
0	0	1	1	1	1	1	1	French Southern and Antarctic Lands
0	1	0	0	0	0	0	0	Gabon
0	1	0	0	0	0	0	1	Gambia
0	1	0	0	0	0	1	0	German Democratic Republic
0	1	0	0	0	0	1	1	Angola
0	1	0	0	0	1	0	0	Ghana
0	1	0	0	0	1	0	1	Gibraltar
0	1	0	0	0	1	1	0	Greece
0	1	0	0	0	1	1	1	Grenada
0	1	0	0	1	0	0	0	Guam
0	1	0	0	1	0	0	1	Guatemala
0	1	0	0	1	0	1	0	Guernsey
0	1	0	0	1	0	1	1	Guinea
0	1	0	0	1	1	0	0	Guinea-Bissau
0	1	0	0	1	1	0	1	Guyana
0	1	0	0	1	1	1	0	Haiti
0	1	0	0	1	1	1	1	Honduras
0	1	0	1	0	0	0	0	Hongkong
0	1	0	1	0	0	0	1	Hungary
0	1	0	1	0	0	1	0	Iceland
0	1	0	1	0	0	1	1	India
0	1	0	1	0	1	0	0	Indonesia
0	1	0	1	0	1	0	1	Iran (Islamic Republic of)
0	1	0	1	0	1	1	0	Iraq
0	1	0	1	0	1	1	1	Ireland
0	1	0	1	1	0	0	0	Israel
0	1	0	1	1	0	0	1	Italy
0	1	0	1	1	0	1	0	Côte d'Ivoire
0	1	0	1	1	0	1	1	Jamaica
0	1	0	1	1	1	0	0	Afghanistan
0	1	0	1	1	1	0	1	Jersey
0	1	0	1	1	1	1	0	Jordan
0	1	0	1	1	1	1	1	Kenya
0	1	1	0	0	0	0	0	Kiribati
0	1	1	0	0	0	0	1	Korea (Republic of)
0	1	1	0	0	0	1	0	Kuwait
0	1	1	0	0	0	1	1	Lao (People's Democratic Republic)
0	1	1	0	0	1	0	0	Lebanon

Code								Countries or areas
Bit								
b_8	b_7	b_6	b_5	b_4	b_3	b_2	b_1	
0	1	1	0	0	1	0	1	Lesotho
0	1	1	0	0	1	1	0	Liberia
0	1	1	0	0	1	1	1	Libya
0	1	1	0	1	0	0	0	Liechtenstein
0	1	1	0	1	0	0	1	Luxembourg
0	1	1	0	1	0	1	0	Macao
0	1	1	0	1	0	1	1	Madagascar
0	1	1	0	1	1	0	0	Malyasia
0	1	1	0	1	1	0	1	Malawi
0	1	1	0	1	1	1	0	Maldives
0	1	1	0	1	1	1	1	Mali
0	1	1	1	0	0	0	0	Malta
0	1	1	1	0	0	0	1	Mauritania
0	1	1	1	0	0	1	0	Mauritius
0	1	1	1	0	0	1	1	Mexico
0	1	1	1	0	1	0	0	Monaco
0	1	1	1	0	1	0	1	Mongolia
0	1	1	1	0	1	1	0	Montserrat
0	1	1	1	0	1	1	1	Morocco
0	1	1	1	1	0	0	0	Mozambique
0	1	1	1	1	0	0	1	Nauru
0	1	1	1	1	0	1	0	Nepal
0	1	1	1	1	0	1	1	Netherlands
0	1	1	1	1	1	0	0	Netherlands Antilles
0	1	1	1	1	1	0	1	New Caledonia
0	1	1	1	1	1	1	0	New Zealand
0	1	1	1	1	1	1	1	Nicaragua
1	0	0	0	0	0	0	0	Niger
1	0	0	0	0	0	0	1	Nigeria
1	0	0	0	0	0	1	0	Norway
1	0	0	0	0	0	1	1	Oman
1	0	0	0	0	1	0	0	Pakistan
1	0	0	0	0	1	0	1	Panama
1	0	0	0	0	1	1	0	Papua New Guinea
1	0	0	0	0	1	1	1	Paraguay
1	0	0	0	1	0	0	0	Peru
1	0	0	0	1	0	0	1	Philippines
1	0	0	0	1	0	1	0	Poland
1	0	0	0	1	0	1	1	Portugal
1	0	0	0	1	1	0	0	Puerto Rico
1	0	0	0	1	1	0	1	Qatar
1	0	0	0	1	1	1	0	Romania
1	0	0	0	1	1	1	1	Rwanda
1	0	0	1	0	0	0	0	Saint Kitts and Nevis
1	0	0	1	0	0	0	1	Saint Croix
1	0	0	1	0	0	1	0	Saint Helena and Ascension
1	0	0	1	0	0	1	1	Saint Lucia
1	0	0	1	0	1	0	0	San Marino
1	0	0	1	0	1	0	1	Saint Thomas
1	0	0	1	0	1	1	0	Sao Tomé and Principe
1	0	0	1	0	1	1	1	Saint Vincent and the Grenadines
1	0	0	1	1	0	0	0	Saudi Arabia
1	0	0	1	1	0	0	1	Senegal
1	0	0	1	1	0	1	0	Seychelles

Code								Countries or areas
Bit								
b_8	b_7	b_6	b_5	b_4	b_3	b_2	b_1	
1	0	0	1	1	0	1	1	Sierra Leone
1	0	0	1	1	1	0	0	Singapore
1	0	0	1	1	1	0	1	Solomon Islands
1	0	0	1	1	1	1	0	Somalia
1	0	0	1	1	1	1	1	South Africa
1	0	1	0	0	0	0	0	Spain
1	0	1	0	0	0	0	1	Sri Lanka
1	0	1	0	0	0	1	0	Sudan
1	0	1	0	0	0	1	1	Suriname
1	0	1	0	0	1	0	0	Swaziland
1	0	1	0	0	1	0	1	Sweden
1	0	1	0	0	1	1	0	Switzerland
1	0	1	0	0	1	1	1	Syria
1	0	1	0	1	0	0	0	Tanzania
1	0	1	0	1	0	0	1	Thailand
1	0	1	0	1	0	1	0	Togo
1	0	1	0	1	0	1	1	Tonga
1	0	1	0	1	1	0	0	Trinidad and Tobago
1	0	1	0	1	1	0	1	Tunisia
1	0	1	0	1	1	1	0	Turkey
1	0	1	0	1	1	1	1	Turks and Caicos Islands
1	0	1	1	0	0	0	0	Tuvalu
1	0	1	1	0	0	0	1	Uganda
1	0	1	1	0	0	1	0	Ukrainia
1	0	1	1	0	0	1	1	United Arab Emirates
1	0	1	1	0	1	0	0	United Kingdom
1	0	1	1	0	1	0	1	United States
1	0	1	1	0	1	1	0	Burkina Faso
1	0	1	1	0	1	1	1	Uruguay
1	0	1	1	1	0	0	0	U.S.S.R.
1	0	1	1	1	0	0	1	Vanuatu
1	0	1	1	1	0	1	0	Vatican City State
1	0	1	1	1	0	1	1	Venezuela
1	0	1	1	1	1	0	0	Viet Nam
1	0	1	1	1	1	0	1	Wallis and Futuna
1	0	1	1	1	1	1	0	Western Samoa
1	0	1	1	1	1	1	1	~~Yemen Arab Republic~~
1	1	0	0	0	0	0	0	Yemen (~~People's Democratic~~ Republic of)
1	1	0	0	0	0	0	1	Yugoslavia
1	1	0	0	0	0	1	0	Zaire
1	1	0	0	0	0	1	1	Zambia
1	1	0	0	0	1	0	0	Zimbabwe
1	1	0	0	0	1	0	1	
1	1	0	0	0	1	1	0	
1	1	0	0	0	1	1	1	
1	1	0	0	1	0	0	0	
1	1	0	0	1	0	0	1	
1	1	0	0	1	0	1	0	
1	1	0	0	1	0	1	1	
1	1	0	0	1	1	0	0	
1	1	0	0	1	1	0	1	
1	1	0	0	1	1	1	0	
1	1	0	0	1	1	1	1	
1	1	1	1	1	1	1	1	Reserved for further study

Recommendation T.50 [1)]

INTERNATIONAL ALPHABET No. 5

(former Recommendation V.3, Mar del Plata, 1968; amended at Geneva, 1972 and Malaga-Torremolinos, 1984)

Introduction

A seven-unit alphabet capable of meeting the requirements of private users on leased circuits and of users of data transmission by means of connections set up by switching on the general telephone network or on telegraph networks has been established jointly by the CCITT and the International Organization for Standardization (ISO).

This alphabet – International Alphabet No. 5 (IA5) – is not intended to replace International Telegraph Alphabet No. 2 (ITA2). It is a supplementary alphabet for the use of those who might not be satisfied with the more limited possibilities of International Telegraph Alphabet No. 2. In such cases it is considered as the alphabet to be used as common basic language for data transmission and for elaborated message systems.

International Alphabet No. 5 does not exclude the use of any other alphabet that might be better adapted to special needs.

1 Scope and field of application

1.1 This Recommendation specifies a set of 128 characters (control characters and graphic characters such as letters, digits and symbols) with their coded representation. Most of these characters are mandatory and unchangeable, but provision is made for some flexibility to accommodate national and other requirements.

1.2 This Recommendation specifies a 7-bit coded character set with a number of options. It also provides guidance on how to exercise the options to define specific national versions and application-orientated versions. Furthermore it specifies the International Reference Version (IRV) in which such options have been exercised.

1.3 This character set is primarily intended for the interchange of information among data processing systems and associated equipment, and within data communication systems. The need for graphic characters and control functions in data processing has also been taken into account in determining this character set.

1.4 This character set is applicable to all alphabets of Latin letters.

1.5 This character set includes control characters for code extension where its 128 characters are insufficient for particular applications. Procedures for the use of these control characters are specified in ISO Standard 2022.

1.6 The definitions of some control characters in this Recommendation assume that data associated with them are to be processed serially in a forward direction. When they are included in strings of data which are processed other than serially in a forward direction or when they are included in data formatted for fixed-record processing they may have undesirable effects or may require additional special treatment to ensure that they result in their desired function.

2 Conformance and implementation

2.1 *Conformance*

A coded character set is in conformance with this Recommendation if it is a version in accordance with § 6. Equipment claimed to implement this Recommendation shall be able to interchange information by means of a version of the 7-bit coded character set, this version shall be identified in any such claim.

[1)] This Recommendation corresponds to International Standard ISO 646 (1983).

2.2 *Implementation*

The use of this character set requires definitions of its implementation in various media. For example, these could include punched tapes, punched cards, magnetic media and transmission channels, thus permitting interchange of data to take place either indirectly by means of an intermediate recording in a physical medium, or by local connection of various units (such as input and output devices and computers) or by means of data transmission equipment.

The implementation of this coded character set in physical media and for transmission, taking into account the need for error checking, is the subject of ISO publications.

3 Definitions

For the purpose of this Recommendation the following definitions apply.

3.1 bit combination

An ordered set of bits used for the representation of characters.

3.2 character

A member of a set of elements used for the organization, control or representation of data.

3.3 coded character set; code

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

3.4 code extension

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

3.5 code table

A table showing the character allocated to each bit combination in a code.

3.6 control character

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

3.7 control function

An action that affects the recording, processing, transmission or interpretation of data and that has a coded representation consisting of one or more bit combinations.

3.8 graphic character

A character, other than a control function, that has a visual representation normally handwritten, printed or displayed.

3.9 position

That part of a code table identified by its column and row co-ordinates.

4 Specification of the coded character set

The bits of the bit combinations of the 7-bit code are identified by b_7, b_6, b_5, b_4, b_3, b_2 and b_1, where b_7 is the highest-order, or most-significant, bit and b_1 is the lowest-order, or least-significant, bit.

The bit combinations may be interpreted to represent integers in the range 0 to 127 in binary notation by attributing the following weights to the individual bits:

Bit:	b_7	b_6	b_5	b_4	b_3	b_2	b_1
Weight:	64	32	16	8	4	2	1

In this Recommendation, the bit combinations are identified by notation of the form x/y, where x is a number in the range 0 to 7 and y is a number in the range 0 to 15. The correspondence between the notations of the form x/y and the bit combinations consisting of the bits b_7 to b_1 is as follows:

- x is the number represented by b_7, b_6 and b_5 where these bits are given the weights 4, 2 and 1 respectively;
- y is the number represented by b_4, b_3, b_2 and b_1 where these bits are given the weights 8, 4, 2 and 1 respectively.

The notations of the form x/y are the same as those used to identify code table positions, where x is the column number and y the row number (see § 7).

The 128 bit combinations of the 7-bit code represent control characters and graphic characters. The allocation of characters to bit combinations is based on the following principles:

- the bit combinations 0/0 to 1/15 represent 32 control characters;
- the bit combination 2/0 represents the character SPACE, which is interpreted both as a control character and as a graphic character;
- the bit combinations 2/1 to 7/14 represent up to 94 graphic characters as one or more of these bit combinations may be declared to be unused (see § 4.3);
- the bit combination 7/15 represents the control character DELETE.

The allocation of individual characters to the bit combinations of the 7-bit code is specified in §§ 4.1, 4.2 and 4.3 below.

This Recommendation assigns at least one name to each character. In addition, it specifies an acronym for each control character and for the character SPACE, and a graphic symbol for each graphic character. By convention, only capital letters and hyphens are used for writing the names of the characters, except for small letters. For acronyms only capital letters and digits are used. It is intended that the acronyms and this convention be retained in all translations of the text.

The names chosen to denote graphic characters are intended to reflect their customary meaning. However, this Recommendation does not define and does not restrict the meanings of graphic characters. Neither does it specify a particular style or font design for the graphic characters when imaged.

4.1 *Control characters*

The control characters of the 7-bit coded character set are classified in the following categories:

a) *Transmission control characters*

Transmission control characters are intended to control or facilitate transmission of information over telecommunication networks. Procedures for the use of the transmission control characters on telecommunication networks are the subject of other ISO publications.

b) *Format effectors*

Format effectors are mainly intended for the control of the layout and positioning of information on character-imaging devices such as printing and display devices.

c) *Code extension control characters*

Code extension control characters are used to extend the character set of the code. They may alter the meaning of one or more bit combinations that follow them in the data stream. Procedures for the use of the code extension control characters are specified in ISO Standard 2022.

d) *Device control characters*

Device control characters are intended for the control of local or remote devices or ancillary devices connected to a data processing or data communication system. These control characters are not intended to control data communication systems; this should be achieved by the use of transmission control characters.

e) *Information separators*

Information separators are used to separate and qualify data logically. There are four such characters. They may be used either in hierarchical order or non-hierarchically; in the latter case, their specific meanings depend on the application.

f) *Other control characters*

These are the control characters that fall outside the preceding categories.

The composition of each category, and the allocation of the individual control characters in each category to bit combinations of the 7-bit code are specified in §§ 4.1.1 to 4.1.6. Each of these sub-clauses contains a table consisting of three columns. The first column specifies the acronym of each control character, the second column specifies the standard name of the control character and the third column, labelled "Coded representation", specifies the bit combination representing the control character concerned.

Detailed functional descriptions of all control characters are given in § 8.

4.1.1 *Transmission control characters*

The transmission control characters and their coded representations are specified in Table 1/T.50.

TABLE 1/T.50

Transmission control characters – coded representation

Acronym	Name	Coded representation
SOH	Start of heading	0/1
STX	Start of text	0/2
ETX	End of text	0/3
EOT	End of transmission	0/4
ENQ	Enquiry	0/5
ACK	Acknowledge	0/6
DLE	Data link escape	1/0
NAK	Negative acknowledge	1/5
SYN	Synchronous idle	1/6
ETB	End of transmission block	1/7

4.1.2 *Format effectors*

The format effectors and their coded representations are specified in Table 2/T.50.

TABLE 2/T.50

Format effectors – coded representation

Acronym	Name	Coded representation
BS	Backspace	0/8
HT	Horizontal tabulation	0/9
LF	Line feed	0/10
VT	Vertical tabulation	0/11
FF	Form feed	0/12
CR	Carriage return	0/13

4.1.2.1 *Concepts*

The definitions of the format effectors use the following concepts:

a) A page is composed of a number of lines, each being composed of a number of character positions.

b) Each character position is capable of imaging SPACE or a graphic symbol.

c) The graphic symbol imaged at a character position represents a graphic character, a control function, or a combination of one or more graphic characters and/or control functions.

d) The active position is the character position at which the action required by the next character in the data stream is to be effected. If the next character is a graphic character, it is imaged at that position; if it is a control character, the corresponding function is performed relative to that position.

e) Movements of the active position are effected as follows:

   1) The active position is advanced one character position immediately after imaging a SPACE or a graphic character, and upon the execution of the function corresponding to a control character for which a graphic symbol is required to be imaged.

   2) The active position is moved to a specified character position upon the execution of the function corresponding to a control character that is defined to cause a movement of the active position (i.e. a format effector).

f) The active position is not moved upon execution of the function corresponding to a control character that is neither required to be imaged by a graphic symbol nor defined to cause a movement of the active position.

g) The effect of an attempt to move the active position beyond the boundaries of a line or a page is not defined by this Recommendation.

4.1.2.2 *Combined horizontal and vertical movements of the active position*

The format effectors are defined for applications in which horizontal and vertical movements of the active position are effected separately. If a single control character is required to effect the action of CARRIAGE RETURN in combination with a vertical movement, the format effector for that vertical movement shall be used. For example, if the function "new line" (equivalent to the combination of CARRIAGE RETURN and LINE FEED) is required as a single control character, bit combination 0/10 shall be used to represent it. This substitution requires agreement between the sender and the recipient of the data, and the format effectors (LINE FEED, VERTICAL TABULATION and/or FORM FEED) that are affected shall be identified (see § 6).

In order to avoid the need for such prior agreement, to facilitate interchange and to avoid conflicts with specifications in other ISO publications, the use of format effectors for vertical movements is to effect combined horizontal and vertical movements deprecated. It is strongly recommended to use two control characters, for example CARRIAGE RETURN (CR) and LINE FEED (LF) to obtain the effect of "new line".

4.1.3 *Code extension control characters*

The code extension control characters and their coded representations are specified in Table 3/T.50.

TABLE 3/T.50

Code extension control characters — coded representation

Acronym	Name	Coded representation
SO	Shift-out	0/14
SI	Shift-in	0/15
ESC	Escape	1/11

4.1.4 *Device control characters*

The device control characters and their coded representations are specified in Table 4/T.50.

TABLE 4/T.50

Device control characters – coded representation

Acronym	Name	Coded representation
DC1	Device control one	1/1
DC2	Device control two	1/2
DC3	Device control three	1/3
DC4	Device control four	1/4

4.1.5 *Information separators*

The information separators and their coded representations are specified in Table 5/T.50.

TABLE 5/T.50

Information separators – coded representation

Acronym	Name	Coded representation
IS4 (FS)	Information separator four (file separator)	1/12
IS3 (GS)	Information separator three (group separator)	1/13
IS2 (RS)	Information separator two (record separator)	1/14
IS1 (US)	Information separator one (unit separator)	1/15

Each information separator is given two names. The names INFORMATION SEPARATOR FOUR, INFORMATION SEPARATOR THREE, INFORMATION SEPARATOR TWO and INFORMATION SEPARATOR ONE are the general names. The names FILE SEPARATOR, GROUP SEPARATOR, RECORD SEPARATOR and UNIT SEPARATOR are the specific names and are intended mainly for applications where the information separators are used hierarchically. The ascending order is then US, RS, GS, FS. In this case, data normally delimited by a particular separator cannot be split by a higher-order separator but will be considered as delimited by any higher-order separator.

4.1.6 *Other control characters*

The control characters outside the categories in §§ 4.1.1 to 4.1.5 and their coded representation, are specified in Table 6/T.50.

TABLE 6/T.50

Other control characters – coded representation

Acronym	Name	Coded representation
NUL	Null	0/0
BEL	Bell	0/7
CAN	Cancel	1/8
EM	End of medium	1/9
SUB	Substitute character	1/10
DEL	Delete	7/15

4.2 *Character SPACE*

The acronym of the character SPACE is SP and its coded representation is 2/0. This character is interpreted both as a graphic character and as a control character. As a graphic character, it has a visual representation consisting of the absence of a graphic symbol. As a control character, it acts as a format effector that causes the active position to be advanced one character position.

4.3 *Graphic characters*

The 94 bit combinations 2/1 to 7/14 are used for the representation of graphic characters as specified in §§ 4.3.1, 4.3.2 and 4.3.3 below. Each of the §§ 4.3.1 and 4.3.2 contains a table consisting of three columns. The first column is labelled "Graphic" and specifies the graphic symbol of each graphic character, the second column specifies the standard name of the graphic character and the third column, labelled "Coded representation", specifies the bit combination representing the graphic character concerned.

All graphic characters of any version of the 7-bit coded character set are spacing characters, i.e. they cause the active position to advance.

4.3.1 *Unique graphic character allocations*

A unique graphic character is allocated to each of the 82 bit combinations 2/1, 2/2, 2/5 to 3/15, 4/1 to 5/10, 5/15 and 6/1 to 7/10. These characters are specified in Table 7/T.50.

4.3.2 *Alternative graphic character allocations*

Two alternative graphic characters are allocated to each of the bit combinations 2/3 and 2/4. These characters are specified in Table 8/T.50.

Either the character POUND SIGN or the character NUMBER SIGN shall be allocated to bit combination 2/3 and either the character DOLLAR SIGN or the character CURRENCY SIGN shall be allocated to bit combination 2/4 (see § 6).

Unless otherwise agreed between sender and recipient, the graphic symbols £, $ and ¤ do not designate the currency of a specific country.

4.3.3 *National or application-oriented graphic character allocations*

No specific graphic character is allocated to the ten bit combinations 4/0, 5/11 to 5/14, 6/0, and 7/11 to 7/14. These bit combinations are available for national or application-orientated use. A unique graphic character shall be allocated to each of these bit combinations, or the bit combination shall be declared unused (see § 6).

TABLE 7/T.50

Unique graphic character allocations

Graphic	Name	Coded representation
!	Exclamation mark	2/1
"	Quotation mark	2/2
%	Percent sign	2/5
&	Ampersand	2/6
'	Apostrophe	2/7
(	Left parenthesis	2/8
)	Right parenthesis	2/9
*	Asterisk	2/10
+	Plus sign	2/11
,	Comma	2/12
–	Hyphen, minus sign	2/13
.	Full stop	2/14
/	Solidus	2/15
0	Digit zero	3/0
1	Digit one	3/1
2	Digit two	3/2
3	Digit three	3/3
4	Digit four	3/4
5	Digit five	3/5
6	Digit six	3/6
7	Digit seven	3/7
8	Digit eight	3/8
9	Digit nine	3/9
:	Colon	3/10
;	Semicolon	3/11
<	Less-than sign	3/12
=	Equals sign	3/13
>	Greater-than sign	3/14
?	Question mark	3/15
A	Capital letter A	4/1
B	Capital letter B	4/2
C	Capital letter C	4/3
D	Capital letter D	4/4
E	Capital letter E	4/5
F	Capital letter F	4/6
G	Capital letter G	4/7
H	Capital letter H	4/8
I	Capital letter I	4/9
J	Capital letter J	4/10
K	Capital letter K	4/11
L	Capital letter L	4/12
M	Capital letter M	4/13
N	Capital letter N	4/14
O	Capital letter O	4/15
P	Capital letter P	5/0
Q	Capital letter Q	5/1
R	Capital letter R	5/2
S	Capital letter S	5/3
T	Capital letter T	5/4
U	Capital letter U	5/5
V	Capital letter V	5/6
W	Capital letter W	5/7
X	Capital letter X	5/8
Y	Capital letter Y	5/9
Z	Capital letter Z	5/10
_	Low line, underline	5/15
a	Small letter a	6/1
b	Small letter b	6/2
c	Small letter c	6/3
d	Small letter d	6/4
e	Small letter e	6/5
f	Small letter f	6/6
g	Small letter g	6/7
h	Small letter h	6/8
i	Small letter i	6/9
j	Small letter j	6/10
k	Small letter k	6/11
l	Small letter l	6/12
m	Small letter m	6/13
n	Small letter n	6/14
o	Small letter o	6/15
p	Small letter p	7/0
q	Small letter q	7/1
r	Small letter r	7/2
s	Small letter s	7/3
t	Small letter t	7/4
u	Small letter u	7/5
v	Small letter v	7/6
w	Small letter w	7/7
x	Small letter x	7/8
y	Small letter y	7/9
z	Small letter z	7/10

TABLE 8/T.50

Alternative graphic character allocations

Graphic	Name	Coded representation
£	Pound sign	2/3
#	Number sign	2/3
$	Dollar sign	2/4
¤	Currency sign	2/4

5 Composite graphic characters

In any version of the 7-bit coded character set specified according to this Recommendation, all graphic characters are spacing characters which cause the active position to move forward. However, by using BACKSPACE or CARRIAGE RETURN, it is possible to image two or more graphic characters at the same character position.

For example, SOLIDUS and EQUALS SIGN can be combined to image "not equals". The character LOW LINE, that may be used as a free-standing character, can also be associated with other character(s) to represent the graphic rendition "underlined".

Diacritical marks may be allocated to the bit combinations specified in § 4.3.3 and be available for composing accented letters. For such composition, it is recommended to use a sequence of three characters, the first or last of which is the letter to be accented and the second of which is BACKSPACE. Furthermore, QUOTATION MARK, APOSTROPHE or COMMA can be associated with a letter by means of BACKSPACE for the composition of an accented letter with a diaeresis, an acute accent or a cedilla, respectively.

6 Versions of the coded character set

6.1 *General*

In order to use the 7-bit coded character set for information interchange, it is necessary to exercise the options left open in § 4:

- to each of the bit combinations 2/3 and 2/4 one of the alternative graphic characters specified in § 4.3.2 shall be allocated;
- each of the bit combinations 4/0, 5/11 to 5/14, 6/0, and 7/11 to 7/14 shall have a unique graphic character allocated to it, or be declared unused;
- the format effectors, if any, to which the facility of § 4.1.2.2 applies, shall be identified.

A graphic character allocated to a bit combination specified in §§ 4.3.1 and 4.3.2 shall not be allocated to any other bit combination. For example the POUND SIGN, if not allocated to bit combination 2/3, shall not be allocated to any other bit combination.

A character set completed in this way is called a "version of ISO Standard 646/CCITT T.50" (see Appendix I).

6.2 *National versions*

6.2.1 The responsibility for defining national versions lies with the national standardization bodies. These bodies shall exercise the options available and make the required selection (see Appendix I).

6.2.2 If so required, more than one national version can be defined within a country. The different versions shall be separately identified. In particular when for a given bit combination, for example 5/12, alternative graphic characters are required, two different versions shall be identified, even if they differ only by this single character.

6.2.3 If there is in a country no special demand for specific graphic characters, it is strongly recommended that the characters of the International Reference Version (IRV) (see § 6.4) be selected and allocated to the same bit combinations as in the IRV.

However, when graphic characters that are different from the characters of the IRV are required, they shall have distinct forms and be given distinctive names which are not in conflict with any of the forms or the names of any of the graphic characters in the IRV.

6.3 *Application-orientated versions*

Within national or international industries, organizations or professional groups, application-orientated versions can be used. They require precise agreement among the interested parties, who will have to exercise the options available and to make the required selection.

6.4 *International Reference Version (IRV)*

This version is available for use when there is no requirement to use a national or an application-orientated version. In information interchange, the IRV is assumed unless a particular agreement exists between sender and recipient of the data. The graphic characters allocated to the IRV are specified in Table 9/T.50.

TABLE 9/T.50

IRV graphic character allocations

Graphic	Name	Coded representation
#	Number sign	2/3
¤	Currency sign	2/4
@	Commercial at	4/0
[	Left square bracket	5/11
\	Reverse solidus	5/12
]	Right square bracket	5/13
^	Circumflex accent	5/14
`	Grave accent	6/0
{	Left curly bracket	7/11
|	Vertical line	7/12
}	Right curly bracket	7/13
‾	Tilde, overline	7/14

It should be noted that no substitution is allowed when using the IRV and that the facility of § 4.1.2.2 does not apply to any format effector.

According to § 5 it is permitted to use composite graphic characters and there is no limit to their number. Because of this freedom, their processing and imaging may cause difficulties at the receiving end. Therefore agreement between sender and recipient of the data is recommended if composite characters are used.

7 Code tables

A 7-bit code table consists of 128 positions arranged in 8 columns and 16 rows. The columns are numbered 0 to 7, and the rows are numbered 0 to 15.

The code table positions are identified by notations of the form x/y, where x is the column number and y is the row number.

The 128 positions of the code table are in one-to-one correspondence with the bit combinations of the 7-bit code. The notation of a code table position, of the form x/y, is the same as that of the corresponding bit combination (see § 4).

Each code table position contains a symbol and/or a reference to a clause of this Recommendation. When a code table position corresponds to a bit combination that represents a control character or the character SPACE, the symbol is the acronym of the character allocated; otherwise it is the graphic symbol representing the character allocated, if any. A reference to §§ 4.1.2.2, 4.3.2 or 4.3.3 is denoted by 1, 2 or 3 respectively.

Table 10/T.50 is the basic 7-bit code table. It shows the 7-bit coded character set specified in § 4 and indicates the options related to format effectors (§ 4.1.2.2), alternative graphic characters (§ 4.3.2) and national or application-orientated use (§ 4.3.3).

Table 11/T.50 is the code table for the IRV of the 7-bit coded character set. It shows the result of exercising the three identified options in the manner specified in § 6.4.

TABLE 10/T.50

Basic 7-bit code table

				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	DLE	SP	0	③	P	③	p
0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
0	0	1	0	2	STX	DC2	"	2	B	R	b	r
0	0	1	1	3	ETX	DC3	# / £ ②	3	C	S	c	s
0	1	0	0	4	EOT	DC4	¤ / $ ②	4	D	T	d	t
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
1	0	0	0	8	BS	CAN	(	8	H	X	h	x
1	0	0	1	9	HT	EM	)	9	I	Y	i	y
1	0	1	0	10	LF ①	SUB	*	:	J	Z	j	z
1	0	1	1	11	VT ①	ESC	+	;	K	③	k	③
1	1	0	0	12	FF ①	IS4	,	<	L	③	l	③
1	1	0	1	13	CR ①	IS3	–	=	M	③	m	③
1	1	1	0	14	SO	IS2	.	>	N	③	n	③
1	1	1	1	15	SI	IS1	/	?	O	_	o	DEL

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① See § 4.1.2.2.

② See § 4.3.2.

③ See § § 4.3.3 and 6.2.3.

TABLE 11/T.50

International Reference Version (IRV)

				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	DLE	SP	0	@	P	`	p
0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
0	0	1	0	2	STX	DC2	"	2	B	R	b	r
0	0	1	1	3	ETX	DC3	#	3	C	S	c	s
0	1	0	0	4	EOT	DC4	¤	4	D	T	d	t
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
1	0	0	0	8	BS	CAN	(	8	H	X	h	x
1	0	0	1	9	HT	EM	)	9	I	Y	i	y
1	0	1	0	10	LF	SUB	*	:	J	Z	j	z
1	0	1	1	11	VT	ESC	+	;	K	[	k	{
1	1	0	0	12	FF	IS4	,	<	L	\	l	|
1	1	0	1	13	CR	IS3	-	=	M	]	m	}
1	1	1	0	14	SO	IS2	.	>	N	^	n	‾
1	1	1	1	15	SI	IS1	/	?	O	_	o	DEL

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8 Description of the control characters

The control characters are listed below in the alphabetical order of their acronyms.

8.1 *ACK Acknowledge*

A transmission control character transmitted by a receiver as an affirmative response to the sender.

8.2 *BEL Bell*

A control character that is used when there is a need to call for attention; it may control alarm or attention devices.

8.3 *BS Backspace*

A format effector which causes the active position to move one character position backwards.

8.4 *CAN Cancel*

A character, or the first character of a sequence, indicating that the data preceding it is in error. As a result, this data shall be ignored. The specific meaning of this character shall be defined for each application and/or between sender and recipient.

8.5 *CR Carriage Return*

A format effector which causes the active position to move to the first character position on the same line.

8.6 *DC1 Device Control One*

A device control character which is primarily intended for turning on or starting an ancillary device. If it is not required for this purpose, it may be used to restore a device to the basic mode of operation (see also DC2 and DC3), or for any other device control function not provided by other DCs.

8.7 *DC2 Device Control Two*

A device control character which is primarily intended for turning on or starting an ancillary device. If it is not required for this purpose, it may be used to set a device to a special mode of operation (in which case DC1 is used to restore the device to the basic mode), or for any other device control function not provided by other DCs.

8.8 *DC3 Device Control Three*

A device control character which is primarily intended for turning off or stopping an ancillary device. This function may be a secondary level stop, for example wait, pause, stand-by or halt (in which case DC1 is used to restore normal operation). If it is not required for this purpose, it may be used for any other ancillary device control function not provided by other DCs.

8.9 *DC4 Device Control Four*

A device control character which is primarily intended for turning off, stopping or interrupting an ancillary device. If it is not required for this purpose, it may be used for any other device control function not provided by other DCs.

8.10 *DEL Delete*

A character used primarily to erase or obliterate an erroneous or unwanted character in punched tape. DEL characters may also serve to accomplish media-fill or time-fill. They may be inserted into, or removed from, a stream of data without affecting the information content of that stream, but such action may affect the information layout and/or the control of equipment.

8.11 *DLE Data Link Escape*

A transmission control character which will change the meaning of a limited number of contiguously following bit combinations. It is used exclusively to provide supplementary transmission control functions. Only graphic characters and transmission control characters can be used in DLE sequences.

8.12 *EM End of Medium*

A control character that may be used to identify the physical end of a medium, or the end of the used portion of a medium, or the end of the wanted portion of data recorded on a medium. The position of this character does not necessarily correspond to the physical end of the medium.

8.13 *ENQ Enquiry*

A transmission control character used as a request for a response from a remote station – the response may include station identification and/or station status. When a "Who are you" function is required on the general switched transmission network, the first use of ENQ after the connection is established shall have the meaning "Who are you" (station identification). Subsequent use of ENQ may, or may not, include the function "Who are you", as determined by agreement.

8.14 *EOT End Of Transmission*

A transmission control character used to indicate the conclusion of the transmission of one or more texts.

8.15 *ESC Escape*

A control character which is used to provide additional characters. It alters the meaning of a limited number of contiguously following bit combinations. The use of this character is specified in ISO Standard 2022.

8.16 *ETB End of Transmission Block*

A transmission control character used to indicate the end of a transmission block of data where data is divided into such blocks for transmission purposes.

8.17 *ETX End of Text*

A transmission control character which terminates a text.

8.18 *FF Form Feed*

A format effector which causes the active position to advance to the corresponding character position on a pre-determined line of the next form or page.

8.19 *HT Horizontal Tabulation*

A format effector which causes the active position to advance to the next pre-determined character position.

8.20 *IS1 (US) Information Separator One (Unit Separator)*

A control character used to separate and qualify data logically; its specific meaning has to be defined for each application. If this character is used in hierarchical order as specified in the general definition of IS, it delimits a data item called a unit.

8.21 *IS2 (RS) Information Separator Two (Record Separator)*

A control character used to separate and qualify data logically; its specific meaning has to be defined for each application. If this character is used in hierarchical order as specified in the general definition of IS, it delimits a data item called a record.

8.22 *IS3 (GS) Information Separator Three (Group Separator)*

A control character used to separate and qualify data logically; its specific meaning has to be defined for each application. If this character is used in hierarchical order as specified in the general definition of IS, it delimits a data item called a group.

8.23 *IS4 (FS) Information Separator Four (File Separator)*

A control character used to separate and qualify data logically; its specific meaning has to be defined for each application. If this character is used in hierarchical order as specified in the general definition of IS, it delimits a data item called a file.

8.24 *LF Line Feed*

A format effector which causes the active position to advance to the corresponding character position of the next line.

8.25 *NAK Negative Acknowledge*

A transmission control character transmitted by a receiver as a negative response to the sender.

8.26 *NUL Null*

A control character used to accomplish media-fill or time-fill. NUL characters may be inserted into, or removed from, a stream of data without affecting the information content of that stream, but such action may affect the information layout and/or the control of equipment.

8.27 *SI Shift-In*

A control character which is used in conjunction with SO and ESC to extend the graphic character set of the code. It may reinstate the standard meanings of the bit combinations which follow it. The effect of this character when using code extension techniques is described in ISO Standard 2022.

8.28 *SO Shift-Out*

A control character which is used in conjunction with SI and ESC to extend the graphic character set of the code. It may alter the meaning of the bit combinations 2/1 to 7/14 which follow it until a SI character is reached. The effect of this character when using code extension techniques is described in ISO 2022.

8.29 *SOH Start Of Heading*

A transmission control character used as the first character of a heading of an information message.

8.30 *STX Start of Text*

A transmission control character which precedes a text and which is used to terminate a heading.

8.31 *SUB Substitute character*

A control character used in the place of a character that has been found to be invalid or in error. SUB is intended to be introduced by automatic means.

8.32 *SYN Synchronous idle*

A transmission control character used by a synchronous transmission system in the absence of any other character (idle condition) to provide a signal from which synchronism may be achieved or retained between data terminal equipment.

8.33 *VT Vertical Tabulation*

A format effector which causes the active position to advance to the corresponding character position on the next pre-determined line.

APPENDIX I

(to Recommendation T.50)

Guidelines for standards derived from
Recommendation T.50 (ISO Standard 646)

I.1 *General*

When national or application-orientated standards based on Recommendation T.50/ISO 646 are drafted, it is recommended to take account of the following considerations.

I.2 *Structure of a standard*

It is recommended to adopt the same structure and editorial style as implemented for Recommendation T.50/ISO 646. All facilities, restrictions and specifications of the standard should be stated clearly in sentences using plain language, rather than be summarized by tables with notes.

I.2.1 *Control functions*

The standard should contain explicit descriptions of the control functions. Even where those descriptions are identical to the descriptions in § 8, they should be explicit descriptions, not just referenced to Recommendation T.50/ISO 646. For application-orientated standards specific meanings of the Information Separators and of the Device Controls should be defined.

I.2.2 *Graphic characters* (see § 6.2.3)

Where there is no need for particular characters, the graphic characters of the International Reference Version (IRV) should be allocated to the same positions and with the same name as in Recommendation T.50/ISO 646.

I.2.3 *Composite graphic characters and repertoire* (see § 5)

Recommendation T.50/ISO 646 permits the construction of composite graphic characters by using the control characters BACKSPACE and CARRIAGE RETURN so as to image two or more graphic characters at the same character position.

The total number of graphic characters which can be obtained from any version of the character set, with or without using this facility, is called the repertoire. Recommendation T.50/ISO 646 does not define a particular repertoire. However, as the interpretation and/or the imaging of composite characters may cause difficulties, agreement between sender and recipient of the data may be required. In order to avoid the necessity of such agreement and to facilitate interchange, national or application-orientated standards may specify a standard repertoire of graphic characters and thus recognize only a limited number of composite graphic characters. Such limitations are considered fully compatible with Recommendation T.50/ISO 646.

I.2.4 *Versions*

In a standard one or more versions can be specified. It should be noted that a version is not a standard but only part of a standard. The standard itself consists of the well defined version or versions and a set of clauses as mentioned above. The definition of a version requires that the options mentioned in § 6.1 be accurately exercised.

CODED CHARACTER SETS FOR TELEMATIC SERVICES

(Malaga-Torremolinos, 1984; amended at Melburne, 1988)

1 Scope

1.1 The CCITT

considering

(a) the increasing interdependence of the various CCITT character sets and coding schemes in various telematic services;

(b) the introduction of new facilities such as code conversion and interworking between various telematic services;

(c) the convenience of having all relevant CCITT Recommendations on character sets and coding schemes compiled in one series of Recommendations;

(d) that Recommendations T.61 and T.100/T.101 define the character coding systems for Teletex and Videotex;

(e) that Recommendation T.50 specifies the International Reference Version (IRV) of the 7-bit coded character set,

provides the following Recommendation as a reference document

from which coded character subsets and elements of code extension mechanisms can be derived for individual telematic services.

1.2 This Recommendation specifies a primary set and two supplementary sets of graphic characters which are to be the respective supersets of primary and supplementary character sets used in various telematic services. When various telematic services restrict their primary and supplementary sets to be respective subsets of those given in this Recommendation, it will be ensured that no code position in any of the specified code tables is assigned more than one meaning within different telematic services.

1.3 This Recommendation gives the escape sequences for designating the primary and supplementary sets of graphic characters, to be used according to the code extension techniques specified.

1.4 Additional sets of graphic characters will be subject to further inclusion in this Recommendation once they become applicable to more than one CCITT telematic service.

1.5 This Recommendation describes those code extension mechanisms that are relevant to existing telematic services. Additional mechanisms will be included in this Recommendation as the need for such is identified for one or more telematic services. The purpose of this Recommendation is to include an up-to-date reference superset of all code extension mechanisms used by character coding systems in various telematic services.

1.6 In this Recommendation 7-bit code tables are described which can be used either in a 7-bit or in an 8-bit environment, with applicable code extension mechanisms that are given in other Recommendations specific to given telematic services.

1.7 This Recommendation gives a superset of the repertoire of Latin based alphanumeric characters used in CCITT telematic services, (see Annex A).

1.8 This Recommendation gives a table of character and control sets used in CCITT telematic services, (see Annex B).

1.9 There is no conformance clause in this Recommendation specifying the mandatory and optional subsets of code extension mechanisms and coded character sets. Conformance requirements will be the subject of other CCITT Recommendations specific to particular telematic services.

2 Graphic character sets

2.1 *Primary set*

2.1.1 The primary set of graphic characters specified in Figure 1/T.51 is identical with the set of graphic characters of the International Reference Version (IRV) of the 7-bit coded character set of Recommendation T.50.

A number of notes are associated with this primary set which are specific to Teletex or Videotex.

2.1.2 The primary set is designated as G0 by the sequence ESC 2/8 4/0. It can also be alternatively designated as G1, G2 or G3 by the sequences ESC 2/9 4/0, ESC 2/10 4/0 or ESC 2/11 4/0 respectively. See § 3 of this Recommendation for details on code extension techniques.

2.2 *Supplementary set*

2.2.1 The first supplementary set of graphic characters specified in Figure 2a/T.51 is a superset of the supplementary set given in Recommendation T.61 and that given in Recommendation T.100. The second supplementary set of graphic characters specified in Figure 2b/T.51 is identical to the first supplementary set, with the addition of four graphic characters, namely: "broken bar", "not sign", "no-break space" and "soft hyphen".

2.2.2 Unallocated code positions are subject to future standardization and will be allocated when a need for such is identified.

2.2.3 The first supplementary set is designated as G2 by the sequence ESC 2/10 6/2. It can be alternatively designated at G0, G1 or G3 by the sequences ESC 2/8 6/2, ESC 2/9 6/2 or ESC 2/11 6/2 respectively. See § 3 of this Recommendation for details on code extension techniques.

2.2.4 The second supplementary set is designated as G2 by the sequence ESC 2/14 F. It can be alternatively designated as G1 or G3 by the sequences ESC 2/13 F or ESC 2/15 F respectively. (The final character F to be assigned by ISO Registration Authority.)

2.2.5 *Notes on the primary and supplementary sets of graphic characters for Figures 1/T.51, 2a/T.51 and 2b/T.51*

In the figures the number of the Note being referred to is encircled.

Note 1 – All the characters in column 4 of the supplementary set are non-spacing characters. They are all diacritical marks with the exception of 4/12.

Note 2 – Cross-shaded code positions are reserved for future standardization by the CCITT.

Note 3 – Terminals used for CCITT defined telematic services should send only the codes 2/6 and 2/8 of the supplementary set for the number sign and currency sign, respectively. When receiving codes 2/3 and 2/4 from the primary set of graphic characters, terminals should interpret them as # and ¤ respectively.

Note 4 – Terminals used for CCITT defined telematic services should send only the codes 4/1 of the supplementary set followed by SPACE for a stand-alone grave accent, 4/3 of the supplementary set followed by SPACE for a stand-alone circumflex accent, and 4/4 of the supplementary set followed by SPACE for a stand-alone tilde. Whenever a telematic terminal is capable of receiving and interpreting codes 6/0, 5/14 and 7/14 from the primary set of graphic characters, terminals shall interpret them as ◌̀, ◌̂ and ◌̃, respectively.

Note 5 – This code position is reserved and shall not be used.

Note 6 – In certain interactive Videotex systems the code 5/15 of the primary set is used as a terminator for data input field transmitted from terminal to host. Its graphic representation may be different from "low line".

				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
b4	b3	b2	b1									
0	0	0	0	0				0	@	P	` ④	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	3	C	S	c	s
0	1	0	0	4			¤ ③	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	^ ④	n	¯ ④
1	1	1	1	15			/	?	O	_ ⑥	o	

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Note – Notes to this Figure are contained in § 2.2.5.

FIGURE 1/T.51

The primary set of graphic characters for telematic services

(coded representation when invoked in columns 2-7 of the code table)

				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				°	⑤	―	Ω	ĸ
0	0	0	1	1			¡	±	`	¹	Æ	æ
0	0	1	0	2			¢	²	´	®	Đ	đ
0	0	1	1	3			£	³	ˆ	©	ª	ð
0	1	0	0	4			$	×	˜	™	Ħ	ħ
0	1	0	1	5			¥	µ	¯	♪	②	ı
0	1	1	0	6			#	¶	˘	②	Ĳ	ĳ
0	1	1	1	7			§	·	˙	②	Ŀ	ŀ
1	0	0	0	8			¤	÷	¨	②	Ł	ł
1	0	0	1	9			‘	’	⑤	②	Ø	ø
1	0	1	0	10			“	”	˚	②	Œ	œ
1	0	1	1	11			«	»	¸	②	º	ß
1	1	0	0	12			←	¼	_	⅛	Þ	þ
1	1	0	1	13			↑	½	˝	⅜	Ŧ	ŧ
1	1	1	0	14			→	¾	˛	⅝	Ŋ	ŋ
1	1	1	1	15			↓	¿	ˇ	⅞	ŉ	
									①			

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Note – Notes to this Figure are contained in § 2.2.5.

FIGURE 2a/T.51

The first supplementary set of graphic characters for Telematic services (coded representation when invoked in columns 2-7 of the code table)

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			NBSP	°	⑤	—	Ω	K
0	0	0	1	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	¯	♪	②	ı
0	1	1	0	6			#	¶	˘	¬	Ĳ	ĳ
0	1	1	1	7			§	·	˙	¦	Ŀ	ŀ
1	0	0	0	8			¤	÷	¨	②	Ł	ł
1	0	0	1	9			‘	’	⑤	②	Ø	ø
1	0	1	0	10			“	”	˚	②	Œ	œ
1	0	1	1	11			«	»	¸	②	º	ß
1	1	0	0	12			←	¼	_	⅛	Þ	þ
1	1	0	1	13			↑	½	˝	⅜	Ŧ	ŧ
1	1	1	0	14			→	¾	˛	⅝	Ŋ	ŋ
1	1	1	1	15			↓	¿	ˇ	⅞	ŉ	SHY
									①			

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Note – Notes to this Figure are contained in § 2.2.5.

FIGURE 2b/T.51

The second supplementary set of graphic characters for Telematic services

(coded representation when invoked in colomns 2-7 of the code table)

3 Code extension technique

3.1 *General*

3.1.1 Code extension techniques are required for the designation of various graphic or control character sets and their invocation in the 7-bit set or 8-bit set in use. Such techniques are derived from ISO Standard 2022.

3.1.2 This Recommendation describes only those code extension techniques currently specified for existing telematic services. Additional techniques will be further incorporated as they are identified for use in one or more telematic services.

3.2 *Definitions*

For the purpose of code extension techniques given in this Recommendation, the following definitions apply.

3.2.1 **bit combination**

An ordered set of bits used for the representation of characters.

3.2.2 **byte**

A bit string that is operated upon as a unit and the size of which is independent of redundancy or framing techniques.

3.2.3 **character**

A member of a set of elements used for the organization, control or representation of data.

3.2.4 **coded character set; code**

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

3.2.5 **code extension**

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

3.2.6 **code table**

A table showing the character allocated to each bit combination in a code.

3.2.7 **control character**

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

3.2.8 **control function**

An action that affects the recording, processing, transmission or interpretation of data and that has a coded representation consisting of one or more bit combinations.

3.2.9 **to designate**

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.

3.2.10 **environment**

The characteristic that identifies the number of bits used to represent a character in a data processing or data communication system or in part of such a system.

3.2.11 **escape sequence**

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 bit combinations represents the character ESCAPE (1/11).

3.2.12 **final character**

The character the bit combination of which terminates an escape sequence.

3.2.13 **graphic character**

A character, other than a control function, that has a visual representation normally handwritten, printed or displayed.

3.2.14 **intermediate character**

A character the bit combination of which occurs between that of the ESCAPE character and that of the Final character in an escape sequence consisting of more than two bit combinations.

3.2.15 **to invoke**

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.

3.2.16 **position**

That part of a code table identified by its column and row coordinates.

3.2.17 **to represent**

a) to use a prescribed bit combination with the meaning of a character in a set of characters that has been designated and invoked; or

b) to use an escape sequence with the meaning of an additional control function.

3.3 *Code extension facilities*

These are depicted in Figure 3/T.51 for the 7-bit environment and Figure 4/T.51 for the 8-bit environment. They include the following functions:

a) designation and invocation of control sets C0 and C1 by means of the relevant escape sequences given in § 3.4;

b) designation of a graphic character set G0 by means of the relevant escape sequence given in § 3.4;

c) designation of up to three additional G-sets called G1, G2 and G3 by means of the relevant escape sequences given in § 3.4;

d) invocation of the designated graphic sets, by means of locking and/or non-locking shift functions, given in § 3.5;

e) designation and invocation of a complete code by means of the relevant escape sequence given in § 3.4.

3.4 *Types of character sets*

There are a number of different types of control and graphic character sets that can be designated and invoked for use in the 7-bit or 8-bit environment. These are listed in Table 3/T.51 and defined below. A given control or graphic character set can be designated by an escape sequence terminated by a Final character F from bit combination 4/0 to 7/14, specific to the character set to be designated. Final characters are allocated by ISO and registered in the ISO "International register of coded character sets to be used with escape sequences."

3.4.1 C0 set of 32 control characters (bit combinations 0/0 to 1/15). A C0 set is designated and invoked by the sequence ESC 2/1 F, where F identifies a registered C0 set.

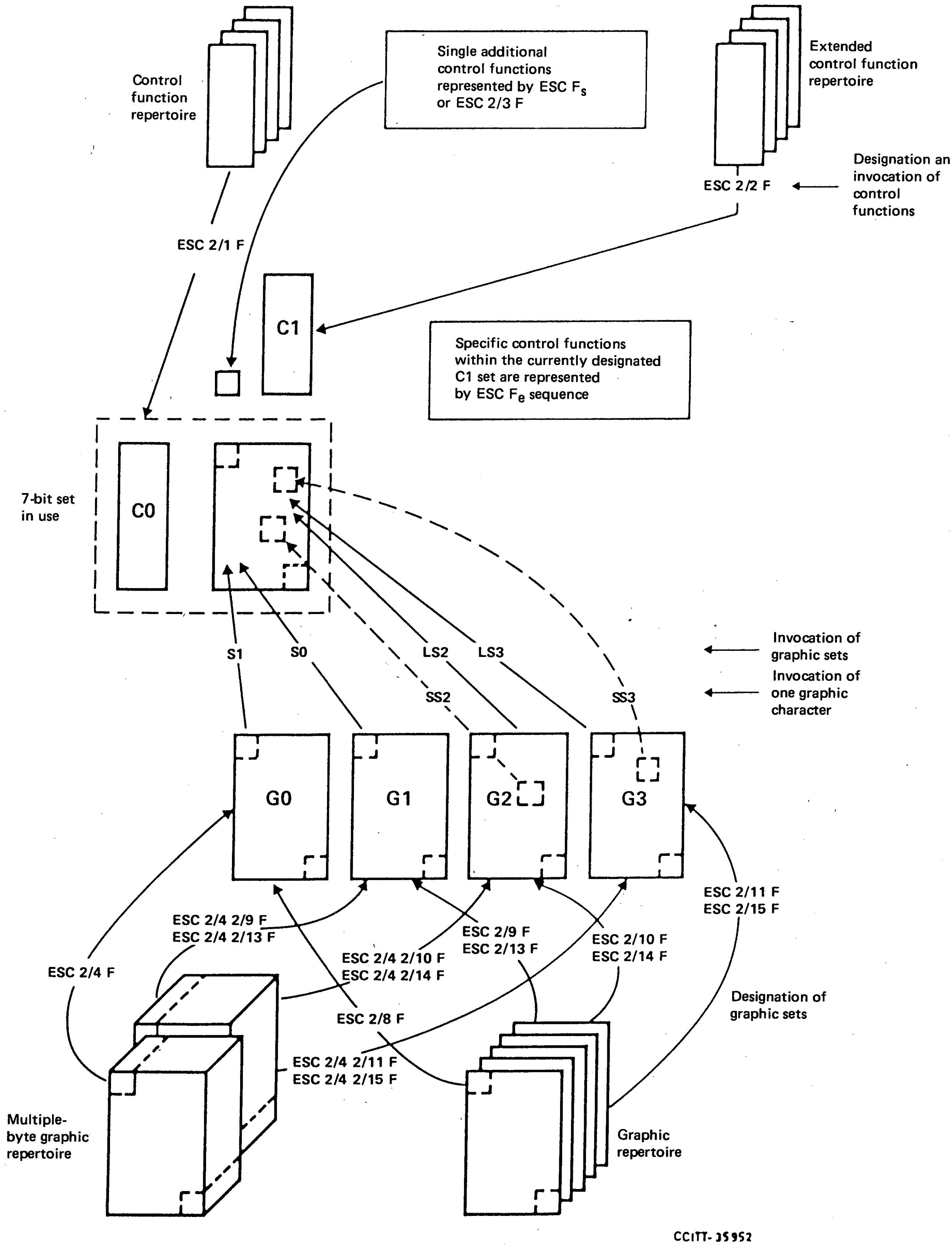


FIGURE 3/T.51

Code extension in 7-bit environment

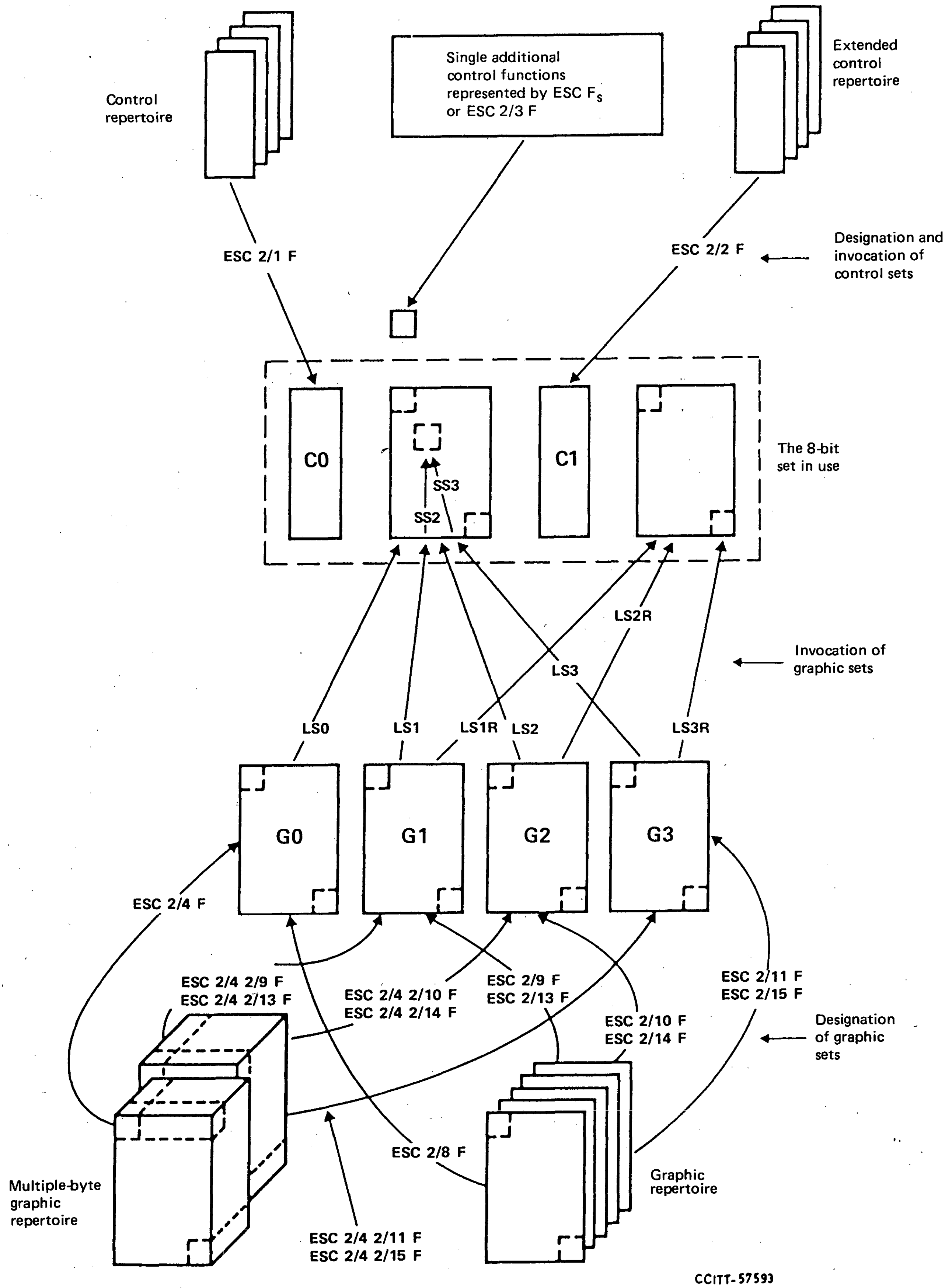


FIGURE 4/T.51

Code extension in 8-bit environment

3.4.2 C1 set of 32 control characters (bit combinations 8/0 to 9/15 in an 8-bit environment, or ESC 4/0 to ESC 5/15 in a 7-bit environment). A C1 set is designated and invoked by the sequence ESC 2/2 F, where F identifies a registered C1 set.

3.4.3 G0 set of 94 graphic characters (bit combinations 2/1 to 7/14).

3.4.4 G1, G2 and G3 sets of 94 graphic characters (bit combinations 2/1 to 7/14 or 10/1 to 15/14). A registered set of 94 graphic characters can be designated by the escape sequence ESC 2/8 F, ESC 2/9 F, ESC 2/10 F or ESC 2/11 F in order to be used as a G0, G1, G2 or G3 set respectively, where F identifies the designated set.

3.4.5 G1, G2 and G3 sets of 96 graphic characters (bit combinations 2/0 to 7/15 or 10/0 to 15/15). A registered set of 96 graphic characters can be designated by the escape sequence ESC 2/13 F, ESC 2/14 F or ESC 2/15 F in order to be used as a G1, G2 or G3 set respectively, where F identifies the designated set.

3.4.6 Multiple-byte G0 set of more than 94 graphic characters each represented by more than one bit combinations from 2/1 to 7/14.

3.4.7 Multiple-byte G1, G2 and G3 sets of more than 94 graphic characters each represented by more than one bit combination from 2/1 to 7/14 or from 10/1 to 15/14. A registered multiple-byte set of more than 94 graphic characters can be designated by the escape sequence ESC 2/4 F, ESC 2/4 2/9 F, ESC 2/4 2/10 F or ESC 2/4 2/11 F in order to be used as a G0, G1, G2 or G3 set respectively, where F identifies the designated set.

3.4.8 Multiple-byte G1, G2 and G3 sets of more than 96 graphic characters each represented by more than one bit combination from 2/0 to 7/15 or from 10/0 to 15/15. A registered multiple-byte set of this type identified by a Final character F can be designated by the escape sequence ESC 2/4 2/13 F, ESC 2/4 2/14 F or ESC 2/4 2/15 F in order to be used as G1, G2 or G3 set respectively.

3.4.9 Complete code containing all bit combinations 0/0 to 7/15 in 7-bit environment, or 0/0 to 15/15 in 8-bit environment. A complete code identified by a Final character F, can be designated and invoked by the escape sequence ESC 2/5 F.

Note – Complete code is now referred to in ISO 2022 as "Coding System different from that of ISO 2022".

3.5 *Invocation functions*

Following the designation of a G0, G1, G2 or G3 set as specified in § 3.4, any one of these sets will require invocation into the 7-bit or 8-bit in-use code table. This is performed by the use of either locking shift functions or non-locking shift functions listed in Table 4/T.51. Coding for these functions is given in Table 5/T.51.

3.5.1 *Use of locking shift functions*

There are seven locking shift functions as given in Tables 4/T.51 and 5/T.51. A locking shift function invokes the relevant G0, G1, G2 or G3 set into columns 2 to 7 or into columns 10 to 15 (8-bit code only) in order to replace the previously invoked G-set. The occurrence of a locking shift function shall not affect those bit combinations that are included in any escape sequence or those that follow single shift function SS2 or SS3. If a particular set has already been invoked, use of the corresponding locking shift function has no effect.

3.5.2 *Use of single shift functions*

The single shift function SS2 shall invoke one character from the last designated G2 set. Similarly SS3 shall invoke one character from the last designated G3 set. In the case of using single-byte graphic sets, these invocations alter the meaning of the immediately following bit combination only and ascribe to it the meaning of the corresponding bit combination of the G2 or G3 set. The bit combination permitted to follow SS2 or SS3 is limited to one from columns 2 to 7. If a single-shift function is used to invoke a character from a multiple-byte set, the shift function will affect two or more bit-combinations to represent that character. The use of a single-shift function does not affect the current shift status established by a locking-shift function.

TABLE 3/T.51

Types of character sets

Description	Character set	Designation sequence	Bit combinations	
			7-bit environment	8-bit environment
Sets of 32 control characters	C0 C1	ESC 2/1 F ESC 2/2 F	0/0 to 1/15 ESC 4/1 to ESC 5/15	0/0 to 1/15 8/0 to 9/15
Sets of 94 graphic characters	G0	ESC 2/8 F	2/1 to 7/14	2/1 to 7/14
	G1 G2 G3	ESC 2/9 F ESC 2/10 F ESC 2/11 F	2/1 to 7/14	2/1 to 7/14 or 10/1 to 15/14
Sets of 96 graphic characters	G1 G2 G3	ESC 2/13 F ESC 2/14 F ESC 2/15 F	2/0 to 7/15	2/0 to 7/15 or 10/1 to 15/15
Sets of more than 94 graphic characters each represented by more than one byte	G0	ESC 2/4 F	2/1 to 7/14	2/1 to 7/14
	G1 G2 G3	ESC 2/4 2/9 F ESC 2/4 2/10 F ESC 2/4 2/11 F	2/1 to 7/14	2/1 to 7/14 or 10/1 to 15/14
Sets of more than 96 graphic characters each represented by more than one byte	G1 G2 G3	ESC 2/4 2/13 F ESC 2/4 2/14 F ESC 2/4 2/15 F	2/0 to 7/15	2/0 to 7/15 or 10/0 to 15/15
Complete code		ESC 2/5 F	0/0 to 7/15	0/0 to 15/15

Note – Control sets C0 and C1, and complete codes are simultaneously designated and invoked by the relevant escape sequences indicated.

TABLE 4/T.51

Allocation of shift functions to the graphic character sets to be invoked

A set	Locking shift functions: Columns 2 to 7 of 7-bit or 8-bit code	Locking shift functions: Columns 10 to 15 of 8-bit code	Non-locking shift functions: Columns 2 to 7 of 7-bit or 8-bit code
G0	SI(7-bit), LS0(8-bit)	–	–
G1	SO(7-bit), LS1(8-bit)	LS1R	–
G2	LS2	LS2R	SS2
G3	LS3	LS3R	SS3

TABLE 5/T.51

Coding for shift functions

Shift function		Coding
Single-shift two	SS2	1/9
Single-shift three	SS3	1/13
Shift in SI(7-bit), locking-shift zero	LS0(8-bit)	0/15
Shift out SO(7-bit), locking-shift one	LS1(8-bit)	0/14
Locking-shift one right	LS1R	ESC 7/14
Loching-shift two	LS2	ESC 6/14
Locking-shift two right	LS2R	ESC 7/13
Locking-shift three	LS3	ESC 6/15
Locking-shift three right	LS3R	ESC 7/12

ANNEX A

(to Recommendation T.51)

Superset of the Repertoire of the Latin Based Character Set

A.1 This Annex contains a superset of the repertoire of Latin based alphanumeric graphic characters used in CCITT telematic services, with the exception of the following four characters which are not yet in use in telematic services.

"Broken Bar"

"Not Sign"

"No-Break SPACE"

"Soft-Hyphen"

Each graphic character is identified by the identification system identical to that used in Recommendation T.61 (see § A.2).

In the tables of § A.4, DS I, DS II and DS III refer to the Data Syntaxes I, II and III respectively of Recommendation T.101.

In the tables of § A.4, a mark "x" signifies the particular graphic character is used. On the other hand a "–" mark signifies that the graphic character is not used.

A.2 *Identification system*

A system was developed that allows for the identification and description of each graphic character or control function. The system is shown in Figure A-1/T.51.

Each identifier consists of two letters and two digits.

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

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.

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 not special meaning in the case of the first letter being a C, N or S.

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

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

The numbering principle is shown in Table A-1/T.51.

TABLE A-1/T.51

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.
- G = Greek alphabetic character.

FIGURE A-1/T.51

Identification system

A.3 *Combination of diacritical marks and basic letters*

Figure A-2/T.51 specifies the combinations of diacritical marks and basic letters that are defined in this Annex A/T.51.

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 A-2/T.51

Use of diacritical marks

A.4 *Tables of superset of repertoire*

A.4.1 *Latin alphabetic characters*

Identifier	Graphic	Name or description	T.61	DS I	DS II	DS III
LA01	a	small a	x	x	x	x
LA02	A	capital A	x	x	x	x
LA11	á	small a with acute accent	x	–	x	x
LA12	Á	capital A with acute accent	x	–	x	x
LA13	à	small a with grave accent	x	–	x	x
LA14	À	capital A with grave accent	x	–	x	x
LA15	â	small a with circumflex accent	x	–	x	x
LA16	Â	capital A with circumflex accent	x	–	x	x
LA17	ä	small a with diaeresis or umlaut mark	x	–	x	x
LA18	Ä	capital A with diaeresis or umlaut mark	x	–	x	x
LA19	ã	small a with tilde	x	–	x	x
LA20	Ã	capital A with tilde	x	–	x	x
LA23	ă	small a with breve	x	–	x	x
LA24	Ă	capital A with breve	x	–	x	x
LA27	å	small a with ring	x	–	x	x
LA28	Å	capital A with ring	x	–	x	x
LA31	ā	small a with macron	x	–	x	x
LA32	Ā	capital A with macron	x	–	x	x
LA43	ą	small a with ogonek	x	–	x	x
LA44	Ą	capital A with ogonek	x	–	x	x
LA51	æ	small diphtong	x	–	x	x
LA52	Æ	capital diphtong	x	–	x	x
LB01	b	small b	x	x	x	x
LB02	B	capital B	x	x	x	x
LC01	c	small c	x	x	x	x
LC02	C	capital C	x	x	x	x
LC11	ć	small c with acute accent	x	–	x	x
LC12	Ć	capital C with acute accent	x	–	x	x
LC15	ĉ	small c with circumflex accent	x	–	x	x
LC16	Ĉ	capital C with circumflex accent	x	–	x	x
LC21	č	small c with caron	x	–	x	x
LC22	Č	capital c with caron	x	–	x	x
LC29	ċ	small c with dot	x	–	x	x
LC30	Ċ	capital C with dot	x	–	x	x
LC41	ç	small c with cedilla	x	–	x	x
LC42	Ç	capital C with cedilla	x	–	x	x
LD01	d	small d	x	x	x	x
LD02	D	capital D	x	x	x	x
LD21	ď or d'	small d with caron	x	–	x	x
LD22	Ď	capital D with caron	x	–	x	x
LD61	đ	small d with stroke	x	–	x	x
LD62	Đ	capital D with stroke, Icelandic eth	x	–	x	x
LD63	ð	small eth, Icelandic	x	–	x	x
LE01	e	small e	x	x	x	x
LE02	E	capital E	x	x	x	x
LE11	é	small e with acute accent	x	–	x	x
LE12	É	capital E with acute accent	x	–	x	x
LE13	è	small e with grave accent	x	–	x	x
LE14	È	capital E with grave accent	x	–	x	x
LE15	ê	small e with circumflex accent	x	–	x	x
LE16	Ê	capital E with circumflex accent	x	–	x	x
LE17	ë	small e with diaeresis or umlaut mark	x	–	x	x
LE18	Ë	capital E with diaereis or umlaut mark	x	–	x	x
LE21	ě	small e with caron	x	–	x	x
LE22	Ě	capital E with caron	x	–	x	x
LE29	ė	small e with dot	x	–	x	x
LE30	Ė	capital E with dot	x	–	x	x
LE31	ē	small e with macron	x	–	x	x
LE32	Ē	capital E with macron	x	–	x	x
LE43	ę	small e with ogonek	x	–	x	x
LE44	Ę	capital E with ogonek	x	–	x	x
LF01	f	small f	x	x	x	x
LF02	F	capital F	x	x	x	x
LG01	g	small g	x	x	x	x
LG02	G	capital G	x	x	x	x

Note – "x" means used, "–" means not used.

Identifier	Graphic	Name or description	T.61	DS I	DS II	DS III
LG11	ǵ	small g with acute accent	x	–	x	x
LG15	ĝ	small g with circumflex accent	x	–	x	x
LG16	Ĝ	capital G with circumflex accent	x	–	x	x
LG23	ğ	small g with breve	x	–	x	x
LG24	Ğ	capital G with breve	x	–	x	x
LG29	ġ	small g with dot	x	–	x	x
LG30	Ġ	capital G with dot	x	–	x	x
LG42	Ģ	capital G with cedilla	x	–	x	x
LH01	h	small h	x	x	x	x
LH02	H	capital H	x	x	x	x
LH15	ĥ	small h with circumflex accent	x	–	x	x
LH16	Ĥ	capital H with circumflex accent	x	–	x	x
LH61	h	small h with stroke	x	–	x	x
LH62	H	capital H with stroke	x	–	x	x
LI01	i	small i	x	x	x	x
LI02	I	capital I	x	x	x	x
LI11	í	small i with acute accent	x	–	x	x
LI12	Í	capital I with acute accent	x	–	x	x
LI13	ì	small i with grave accent	x	–	x	x
LI14	Ì	capital I with grave accent	x	–	x	x
LI15	î	small i with circumflex accent	x	–	x	x
LI16	Î	capital I with circumflex accent	x	–	x	x
LI17	ï	small i with diaeresis or umlaut mark	x	–	x	x
LI18	Ï	capital I with diaeresis or umlaut mark	x	–	x	x
LI19	ĩ	small i with tilde	x	–	x	x
LI20	Ĩ	capital I with tilde	x	–	x	x
LI30	I	capital I with dot	x	–	x	x
LI31	i	small i with macron	x	–	x	x
LI32	I	capital I with macron	x	–	x	x
LI43	i	small i with ogonek	x	–	x	x
LI44	I	capital I with ogonek	x	–	x	x
LI51	ĳ	small ij ligature	x	–	x	x
LI52	Ĳ	capital IJ ligature	x	–	x	x
LI61	i	small i without dot	x	–	x	x
LJ01	j	small j	x	x	x	x
LJ02	J	capital J	x	x	x	x
LJ15	ĵ	small j with circumflex accent	x	–	x	x
LJ16	Ĵ	capital J with circumflex accent	x	–	x	x
LK01	k	small k	x	x	x	x
LK02	K	capital K	x	x	x	x
LK41	ķ	small k with cedilla	x	–	x	x
LK42	Ķ	capital K with cedilla	x	–	x	x
LK61	ĸ	small k, Greenlandic	x	–	x	x
LL01	l	small l	x	x	x	x
LL02	L	capital L	x	x	x	x
LL11	ĺ	small l with acute accent	x	–	x	x
LL12	Ĺ	capital L with acute accent	x	–	x	x
LL21	ľ or l'	small l with caron or apostrophe	x	–	x	x
LL22	Ľ or L'	capital L with caron or apostrophe	x	–	x	x
LL41	ļ	small l with cedilla	x	–	x	x
LL42	Ļ	capital L with cedilla	x	–	x	x
LL61	ł	small l with stroke	x	–	x	x
LL62	Ł	capital L with stroke	x	–	x	x
LL63	l·	small l with middle dot	x	–	x	x
LL64	L·	capital L with middle dot	x	–	x	x
LM01	m	small m	x	x	x	x
LM02	M	capital M	x	x	x	x
LN01	n	small n	x	x	x	x
LN02	N	capital N	x	x	x	x
LN11	ń	small n with acute accent	x	–	x	x
LN12	Ń	capital N with acute accent	x	–	x	x
LN19	ñ	small n with tilde	x	–	x	x
LN20	Ñ	capital N with tilde	x	–	x	x

Identifier	Graphic	Name or description	T.61	DS I	DS II	DS III
LN21	ň	small n with caron	x	–	x	x
LN22	Ň	capital N with caron	x	–	x	x
LN41	ņ	small n with cedilla	x	–	x	x
LN42	Ņ	capital N with cedilla	x	–	x	x
LN61	ŋ	small eng, Lapp	x	–	x	x
LN62	Ŋ	capital eng, Lapp	x	–	x	x
LN63	'n	small n with apostrophe	x	–	x	x
LO01	o	small o	x	x	x	x
LO02	O	capital O	x	x	x	x
LO11	ó	small o with acute accent	x	–	x	x
LO12	Ó	capital O with acute accent	x	–	x	x
LO13	ò	small o with grave accent	x	–	x	x
LO14	Ò	capital O with grave accent	x	–	x	x
LO15	ô	small o with circumflex accent	x	–	x	x
LO16	Ô	capital O with circumflex accent	x	–	x	x
LO17	ö	small o with diaeresis or umlaut mark	x	–	x	x
LO18	Ö	capital O with diaeresis or umlaut mark	x	–	x	x
LO19	õ	small o with tilde	x	–	x	x
LO20	Õ	capital O with tilde	x	–	x	x
LO25	o	small o with double acute accent	x	–	x	x
LO26	O	capital O with double acute accent	x	–	x	x
LO31	ō	small o with macron	x	–	x	x
LO32	Ō	capital O with macron	x	–	x	x
LO51	œ	small œ ligature	x	–	x	x
LO52	Œ	capital Œ ligature	x	–	x	x
LO61	ø	small o with slash	x	–	x	x
LO62	Ø	capital O with slash	x	–	x	x
LP01	p	small p	x	x	x	x
LP02	P	capital P	x	x	x	x
LQ01	q	small q	x	x	x	x
LQ02	Q	capital Q	x	x	x	x
LR01	r	small r	x	x	x	x
LR02	R	capital R	x	x	x	x
LR11	ŕ	small r with acute accent	x	–	x	x
LR12	Ŕ	capital R with acute accent	x	–	x	x
LR21	ř	small r with caron	x	–	x	x
LR22	Ř	capital R with caron	x	–	x	x
LR41	ŗ	small r with cedilla	x	–	x	x
LR42	Ŗ	capital R with cedilla	x	–	x	x
LS01	s	small s	x	x	x	x
LS02	S	capital S	x	x	x	x
LS11	ś	small s with acute accent	x	–	x	x
LS12	Ś	capital S with acute accent	x	–	x	x
LS15	ŝ	small s with circumflex accent	x	–	x	x
LS16	Ŝ	capital S with circumflex accent	x	–	x	x
LS21	š	small s with caron	x	–	x	x
LS22	Š	capital S with caron	x	–	x	x
LS41	ş	small s with cedilla	x	–	x	x
LS42	Ş	capital S with cedilla	x	–	x	x
LS61		small sharp s, German	x	–	x	x
LT01	t	small t	x	x	x	x
LT02	T	capital T	x	x	x	x
LT21	ť or t'	small t with caron or apostrophe	x	–	x	x
LT22	Ť	capital T with caron	x	–	x	x
LT41	ţ	small t with cedilla	x	–	x	x
LT42	Ţ	capital T with cedilla	x	–	x	x
LT61	ŧ	small t with stroke	x	–	x	x
LT62	Ŧ	capital T with stroke	x	–	x	x
LT63	þ	small thorn, Icelandic	x	–	x	x
LT64	Þ	capital thorn, Icelandic	x	–	x	x
LU01	u	small u	x	x	x	x
LU02	U	capital U	x	x	x	x

Identifier	Graphic	Name or description	T.61	DS I	DS II	DS III
LU11	ú	small u with acute accent	x	–	x	x
LU12	Ú	capital U with acute accent	x	–	x	x
LU13	ù	small u with grave accent	x	–	x	x
LU14	Ù	capital U with grave accent	x	–	x	x
LU15	û	small u with circumflex accent	x	–	x	x
LU16	Û	capital U with circumflex accent	x	–	x	x
LU17	ü	small u with diaeresis or umlaut mark	x	–	x	x
LU18	Ü	capital U with diaeresis or umlaut mark	x	–	x	x
LU19	ũ	small u with tilde	x	–	x	x
LU20	Ũ	capital U with tilde	x	–	x	x
LU23	ŭ	small u with breve	x	–	x	x
LU24	Ŭ	capital U with breve	x	–	x	x
LU25	ű	small u with double acute accent	x	–	x	x
LU26	Ű	capital U with double acute accent	x	–	x	x
LU27	ů	small u with ring	x	–	x	x
LU28	Ů	capital U with ring	x	–	x	x
LU31	ū	small u with macron	x	–	x	x
LU32	Ū	capital U with macron	x	–	x	x
LU43	ų	small u with ogonek	x	–	x	x
LU44	Ų	capital U with ogonek	x	–	x	x
LV01	v	small v	x	x	x	x
LV02	V	capital V	x	x	x	x
LW01	w	small w	x	x	x	x
LW02	W	capital W	x	x	x	x
LW15	ŵ	small w with circumflex accent	x	–	x	x
LW16	Ŵ	capital W with circumflex accent	x	–	x	x
LX01	x	small x	x	x	x	x
LX02	X	capital X	x	x	x	x
LY01	y	small y	x	x	x	x
LY02	Y	capital Y	x	x	x	x
LY11	ý	small y with acute accent	x	–	x	x
LY12	Ý	capital Y with acute accent	x	–	x	x
LY15	ŷ	small y with circumflex accent	x	–	x	x
LY16	Ŷ	capital Y with circumflex accent	x	–	x	x
LY17	ÿ	small y with diaeresis or umlaut mark	x	–	x	x
LY18	Ÿ	capital Y with diaeresis or umlaut mark	x	–	x	x
LZ01	z	small z	x	x	x	x
LZ02	Z	capital Z	x	x	x	x
LZ11	ź	small z with acute accent	x	x	x	x
LZ12	Ź	capital Z with acute accent	x	x	x	x
LZ21	ž	small z with caron	x	–	x	x
LZ22	Ž	capital Z with caron	x	–	x	x
LZ29	ż	small z with dot	x	–	x	x
LZ30	Ż	capital Z with dot	x	–	x	x

A.4.2 *Non-alphabetic characters*

A.4.2.1 *Decimal digits*

Identifier	Graphic	Name or description	T.61	DS I	DS II	DS III
ND01	1	digit 1	x	x	x	x
ND02	2	digit 2	x	x	x	x
ND03	3	digit 3	x	x	x	x
ND04	4	digit 4	x	x	x	x
ND05	5	digit 5	x	x	x	x
ND06	6	digit 6	x	x	x	x
ND07	7	digit 7	x	x	x	x
ND08	8	digit 8	x	x	x	x
ND09	9	digit 9	x	x	x	x
ND10	0	digit 0	x	x	x	x

A.4.2.2 *Currency signs*

Identifier	Graphic	Name or description	T.61	DS I	DS II	DS III
SC01	¤	general currency sign	x	–	x	x
SC02	£	pound sign	x	x	x	x
SC03	$	dollar sign	x	x	x	x
SC04	¢	cent sign	x	x	x	x
SC05	¥	yen sign	x	x	x	x

A.4.2.3 *Punctuation marks*

Identifier	Graphic	Name or description	T.61	DS I	DS II	DS III
SP01		space (see also § 3.3.2)	x	x	x	x
SP02	!	exclamation mark	x	x	x	x
SP03	¡	inverted exclamation mark	x	–	x	x
SP04	"	quotation mark	x	x	x	x
SP05	'	apostrophe	x	x	x	x
SP06	(	left parenthesis	x	x	x	x
SP07	)	right parenthesis	x	x	x	x
SP08	,	comma	x	x	x	x
SP09	_	low line	x	x	x	x
SP10	-	hyphen or minus sign	x	x	x	x
SP11	.	full stop, period	x	x	x	x
SP12	/	solidus	x	x	x	x
SP13	:	colon	x	x	x	x
SP14	;	semicolon	x	x	x	x
SP15	?	question mark	x	x	x	x
SP16	¿	inverted question mark	x	–	x	x
SP17	«	angle quotation mark left	x	–	x	x
SP18	»	angle quotation mark right	x	–	x	x
SP19	‘	single quotation mark left	–	–	x	x
SP20	’	single quotation mark right	–	–	x	x
SP21	“	double quotation mark left	–	–	x	x
SP22	”	double quotation mark right	–	–	x	x

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

A.4.2.4 *Arithmetic signs*

Identifier	Graphic	Name or description	T.61	DS I	DS II	DS III
SA01	+	plus sign	x	x	x	x
SA02	±	plus/minus sign	x	x	x	x
SA03	<	less-than sign	x	x	x	x
SA04	=	equals sign	x	x	x	x
SA05	>	greater-than sign	x	x	x	x
SA06	÷	divide sign	x	x	x	x
SA07	×	multiply sign	x	x	x	x

Note – For *minus sign* see SP10.

A.4.2.5 *Subscripts and superscripts*

Identifier	Graphic	Name or description	T.61	DS I	DS II	DS III
NS02	^{2}	superscript 2	x	–	x	x
NS03	^{3}	superscript 3	x	–	x	x

A.4.2.6 *Fractions*

Identifier	Graphic	Name or description	T.61	DS I	DS II	DS III
NF01	½	fraction one-half	x	–	x	x
NF04	¼	fraction one-quarter	x	–	x	x
NF05	¾	fraction three-quarters	x	–	x	x
NF06	$^1/_8$	fraction one-eight	–	–	x	x
NF07	$^3/_8$	fraction three-eights	–	–	x	x
NF08	$^5/_8$	fraction five-eights	–	–	x	x
NF09	$^7/_8$	fraction seven-eights	–	–	x	x

A.4.3 *Miscellaneous symbols*

Identifier	Graphic	Name or description	T.61	DS I	DS II	DS III
SM01	#	number sign	x	x	x	x
SM02	%	percent sign	x	x	x	x
SM03	&	ampersand	x	x	x	x
SM04	*	asterisk	x	x	x	x
SM05	@	commercial at	x	x	x	x
SM06	[	left square bracket	x	x	x	x
SM07	\	reverse solidus	–	x	x	x
SM08	]	right square bracket	x	x	x	x
SM11	{	left curly bracket	–	x	x	x
SM12	–	central horizontal bar jointive	–	x	x	x
SM13	|	vertical line	x	x	x	x
SM14	}	right curly bracket	–	x	x	x
SM17	µ	micro sign	x	–	x	x
SM18	Ω	ohm sign	x	–	x	x
SM19	°	degree sign	x	–	x	x
SM20	º	ordinal indicator, masculine	x	–	x	x
SM21	ª	ordinal indicator, feminine	x	–	x	x
SM24	§	section sign	x	x	x	x
SM25	¶	paragraph sign, pilcrow	x	–	x	x
SM26	·	middle dot	x	–	x	x
SM30	←	leftward arrow	–	x	x	x
SM31	→	rightward arrow	–	x	x	x
SM32	↑	upward arrow	–	x	x	x
SM33	↓	downward arrow	–	x	x	x
SM34	■	delete	–	x	x	–
SM53	®	registered sign	–	–	x	x
SM57	©	copyright sign	–	–	x	x
SM54	TM	trade mark	–	–	x	x
SM93	♪	musical note	–	x	x	x
SM45	|	left vertical bar jointive	–	–	x	–
SM46	|	right vertical bar jointive	–	–	x	–
SM65	¦	broken bar	–	–	–	–
SM66	¬	not sign	–	–	–	–
SP31	NBSP	no-break space	–	–	–	–
SP32	SHY	soft hyphen	–	–	–	–
SM94	⧄	diagonal	–	x	–	x
SM95	⧅	reverse diagonal	–	x	–	x
SM96	◢	filled diagonal	–	–	–	x
SM97	◥	filled reverse diagonal	–	–	–	x
SM98	⊞	cross	–	x	–	x
SM99	◫	full vertical line	–	x	–	x
SM100	——	horizontal bar	–	–	–	x

A.4.4 *Diacritical marks as separate graphic characters*

Identifier	Graphic	Name or description	T.61	DS I	DS II	DS III
SD11	□́	acute accent with space	x	x	x	x
SD13	□̀	grave accent with space	x	x	x	x
SD15	□̂	circumflex accent with space	x	x	x	x
SD17	□̈	diaeresis or umlaut mark with space	x	x	x	x
SD19	□̃	tilde with space	x	x	x	x
SD21	□̌	caron with space	x	–	x	x
SD23	□̆	breve with space	x	–	x	x
SD25	□̋	double acute accent with space	x	–	x	x
SD27	□̊	ring with space	x	–	x	x
SD29	□̇	dot with space	x	–	x	x
SD31	□̄	macron with space	x	–	x	x
SD41	□̧	cedilla with space	x	–	x	x
SD43	□̨	ogonek with space	x	–	x	x

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

A.4.5 *Non-spacing characters*

Identifier	Graphic	Name or description	T.61	DS I	DS II	DS III
SM27	□̲	non spacing underline	x	–	–	x
SM101	⇀	non spacing vector overbar	–	–	–	x
SM102	/	non spacing slant	–	–	–	x

Note – The *Non-spacing underline* character is never used individually but always in combination with some other graphic character to represent the graphic rendition "underlined" for the associated character. The *Non-spacing underline* character can be used in combination with any graphic character of the repertoire, including an accented letter or an umlaut, or *Space.*

ANNEX B

(to Recommendation T.51)

Table of character and control sets

Reg. No.	Name of registered set	(Note 1)	Final character	C0	C1	G0	G1	G2	G3
2	Rec. T.50. International reference version, IRV. This is also the primary set of T.51, as modified by Notes 3 and 4 of T.51	94	4/0			x	x	x	x
70	Rec. T.51. First supplementary graphic set	94	6/2			x	x	x	x
132	Rec. T.101. Data Syntax I Primary control set	C0	4/9	x					
125	Rec. T.101. Data Syntax I Supplementary control set	C1	4/4		x				
42	Rec. T.101. Data Syntax I Kanji set (2 byte set) JISC 6226 (1978)	94 × 94	4/0			x	x	x	x
137	Rec. T.101. Data Syntax I Mosaic 1 set	94	7/9			x	x	x	x
14	Rec. T.101. Data Syntax I Primary character set (JISC 6220 (1969))	94	4/10			x	x	x	x
131	Rec. T.101. Data Syntax I Complete code	–	4/3						
134	Rec. T.101. Data Syntax II Primary control set	C0	4/10	x					
56	Rec. T.101. Data Syntax II Serial supplementary control set	C1	4/0		x				
73	Rec. T.101. Data Syntax II Parallel supplementary control set	C1	4/1		x				
70	Rec. T.101. Data Syntax II Supplementary character set	94	6/2			x	x	x	x
71	Rec. T.101. Data Syntax II 2nd supplementary mosaic set	94	6/3			x	x	x	x
72	Rec. T.101. Data Syntax II 3rd supplementary mosaic set	94	6/4			x	x	x	x

Reg. No.	Name of registered set	(Note 1)	Final character	C0	C1	G0	G1	G2	G3
145	Rec. T.101. Data Syntax II Complete code	–	4/4						
Note 2	Rec. T.101. Data Syntax II Greek primary set	94	Note 2			x	x	x	x
108	Rec. T.101. Data Syntax III Complete code	–	4/1						
135	Rec. T.101. Data Syntax III Primary control set	C0	4/11	x					
136	Rec. T.101. Data Syntax III Supplementary control set	C1	4/6		x				
6	Rec. T.101. Data Syntax III Primary character set	94	4/2			x	x	x	x
128	Rec. T.101. Data Syntax III Supplementary character set	94	7/12			x	x	x	x
Cannot be reg.	Rec. T.101. Data Syntax III PDI set	96	(5/7) never to be assigned				x	x	x
129	Rec. T.101. Data Syntax III Mosaic set	96	7/13			x	x	x	x
102	Rec. T.61. Primary graphic character set (left half of Fig. 2/T.61)	94	7/5			x	x	x	x
103	Rec. T.61. Supplementary character set (right half of Fig. 2/T.61)	94	7/6			x	x	x	x
106	Rec. T.61. Primary control set	C0	4/5	x					
107	Rec. T.61. Supplementary control set	C1	4/8		x				
Note 2	Rec. T.51. Second supplementary graphic set	96	Note 2				x	x	x

Note 1 – The 94 or 96 character set applies only to single byte graphic character sets. The 94 × 94 set applies to two byte graphic character set. Primary control sets are C0. Supplementary control sets are C1. Complete code is also referred to as "Coding System different from that of ISO 2022".

Note 2 – Application for ISO Registration will take place after the Recommendation T.51 is approved.

TERMINAL EQUIPMENT FOR USE IN THE TELETEX SERVICE

(Geneva, 1980; amended at Malaga-Torremolinos, 1984 and Melbourne, 1988)

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.

1.3 The character repertoire and the coded character sets for the Teletex service are defined in Recommendation T.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, see § 6;

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

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

1.5 Requirements for terminals providing mixed-mode capability are specified in Recommendation T.72.

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. Other paper sizes are included as options.

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. In this context, a permanent copy is understood to be, e.g., paper, tape, magnetic media, etc., except volatile memory devices (such as semi-conductor memory without battery back-up).

A compulsory printout due to full memory (interruption of the local mode of operation) is not required.

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. Unambiguous presentation of the basic international Teletex character repertoire is a minimum requirement.

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).

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).

3.1.19 This Recommendation does not specify requirements for receive-only terminals. However, it is not intended to exclude such terminals.

3.2 *Basic functions*

3.2.1 A terminal shall be capable of handling:

a) the end-to-end control procedures as defined in Recommendations T.62 and T.70;
b) the appropriate network-dependent procedure, see § 6;
c) the Teletex basic graphic character repertoire;
d) the Teletex basic control function repertoire;
e) text in the basic vertical and horizontal page formats;
f) 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 ISO 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 T.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 T.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 Recommendations T.62 and T.70.

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

a) Annex B to this Recommendation;

b) Annex E to Recommendation T.61.

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 For Teletex terminals supporting the mixed mode of operation (MM), additional terminal characteristics are specified in Recommendation T.561.

3.3.7 For Teletex terminals supporting the processable mode (PM.1), additional terminal characteristics are specified in Recommendation T.562.

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).

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 T.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 T.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 are described in Recommendation T.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 mm) 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/T.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/T.60 certain assumptions about technical and operational problems have been taken. Further details about these assumptions are given in Annex A.

TABLE 1/T.60

Basic printable areas and basic page formats

		Paper orientation	
		Vertical	Horizontal
Maximum number of lines per page [a]	Line spacing (mm) 4.23 6.35 8.47	X = 110 HLS 55 37 28	X = 76 HLS 38 25 19
Maximum number of characters per line [b]	Character spacing (mm) 2.54	77 (5 + 72)	105 (5 + 100)

[a] The maximum number of lines per page is calculated according to the formula given.

[b] The maximum number of characters per line are given in the form $C(D + E)$, where C is the total number of characters per line defined for the printable area, D the number of characters to the left side of the home position as defined for the page format and E the number of characters to the right side including the home position character.
The home position is defined in Figure B-1/T.60.

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/T.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 (4.23 mm) less than the defined maximum printable area, to allow for presentation of the call identification line.

4.3.2 The call identification line, if presented, will appear preferably at the superscripted level of the first printable line or the subscripted level of the last printable line, to ensure that it cannot partially overlap superscript text in the first communicable text line, or subscript text in the last communicable text line.

Note – Some existing equipment may be unable to comply with the requirement. If overlapped printing occurs on such terminals, it will be the recipient's responsibility to obtain clarification of text from the sender.

4.3.3 For each text area a home position is defined. See Recommendations T.61 and F.200.

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

5 **Communications**

5.1 *Terminal identification*

5.1.1 Each Teletex terminal shall be equipped with a unique terminal identifier stored in the terminal.

5.1.2 The terminal identifier consists of 24 characters (octets) to which it shall be possible to assign any permissible bit combination of the primary set of Recommendation T.61.

The content and restrictions of the terminal identifier are defined in Recommendation F.200.

5.1.3 The content of the terminal identifier must be protected against loss or modification due to technical faults or non-authorized intervention.

5.1.4 The Teletex communication procedures include the exchange of the terminal identifiers prior to sending any document. The sender should use the receivers identifier to check the correct establishment of the call. If an automatic check is performed, this is preferably done on the mnemonic part of the terminal identifier, i.e. the part following the equals sign (=), see Recommendation F.200.

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.

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.

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 rules for the call control phase: Recommendation X.21;

b) bit rate: 2400 bit/s;

c) link and network layer procedures during the data transfer phase: duplex as defined in Recommendation T.70.

6.3 *Packet-switched data network*

a) functional and procedural rules for the call control phase: Recommendation X.25;

b) bit rates: 2400, 4800, 9600 and 48 000 bit/s.

6.4 *Public switched telephone network*

a) functional and procedural rules for the call control phase in the case of automatic calling and answering: Recommendation V.25 line requirements for automatic calling and answering;

b) bit rates: half-duplex 2400 bit/s; duplex 1200 or 2400 bit/s; Recommendation V.22, V.22 *bis* or V.26 *ter* modem line requirements;

Note – V.22 *bis* line requirements are preferable to V.22.

c) link and network layer procedures during data transfer phase: Recommendation T.70 and in the case of half-duplex operation also Recommendation T.71.

7 Indicators

7.1 Indicators should inform about situations in which operator attention is required in order to maintain the grade of service.

7.2 An indication of the following situations shall be provided:

a) message received in store;

b) terminal unable or soon unable to receive, e.g. when receiving memory is nearly full;

c) operator assistance required, e.g. when printing element or paper orientation requires changing.

The terminal operator's attention shall be drawn to the above situations immediately regardless of the actual condition of the terminal, e.g. when terminal is in stand-by mode.

8 Interworking between Teletex terminals and telex terminals

8.1 In text which is to be sent to a telex terminal, the graphic character set should be restricted to that of International Telegraph Alphabet No. 2 (ITA2). This restriction only applies to that part of the text which is for onward transmission to telex. This restriction should be performed in the Teletex terminal.

8.2 The text for onward transmission to telex shall only contain those characters of ITA2 that form a subset of the basic Teletex character repertoire, as specified in Table C-1/T.60. Coding of these characters shall be in accordance with Recommendation T.61.

8.3 For the new line function, it is strongly recommended to use CR and LF in the order CR followed by LF. The order LF followed by CR is deprecated because this may cause improper printing in certain telex terminals.

8.4 The line length is restricted to 69 characters.

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

8.6 The control procedures to be used between a Teletex terminal and a conversion facility (see Recommendation F.200) are defined in Recommendation T.90.

Note – A conversion facility provides for necessary conversion between Teletex and telex of communication procedures, signalling rates, character coding, etc.

9 Interworking between basic Teletex equipments and equipments supporting PM.1 and/or MM option

9.1 *General*

Basic Teletex documents are to be interchanged according to the rules defined in Recommendation T.62 *bis.*

PM.1 and MM Teletex documents are to be interchanged according to the application context defined in Recommendations T.561 and T.562.

Figure 1/T.60 below illustrates the two different sets of rules to be used by Teletex equipments depending on the interchanged document format.

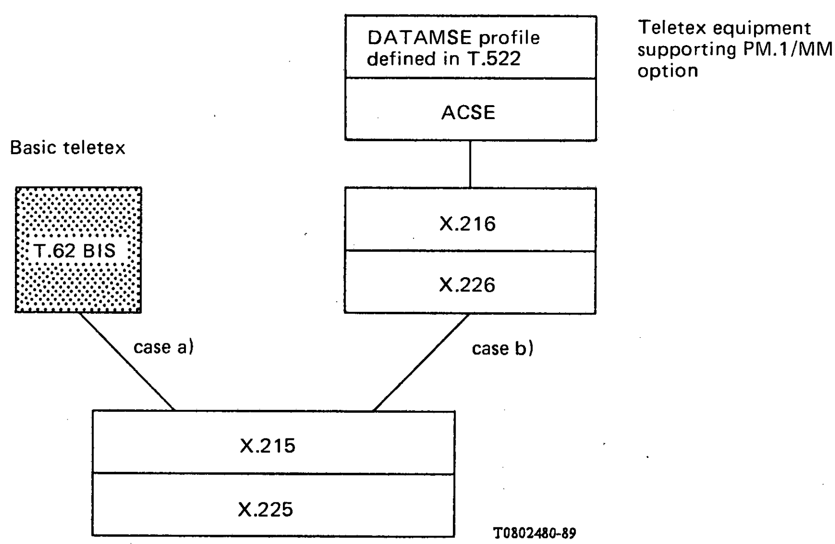


FIGURE 1/T.60

Model for interworking between T.62 ***bis*** **based teletex equipments and teletex equipments supporting PM.1 and/or MM**

9.2 *Interworking rules*

9.2.1 The basic Teletex equipment is the sender.

The only type of document that can be sent by the basic Teletex equipment is the basic Teletex document. The sender should therefore try to send this type of document by using the appropriate rules, i.e. T.62 *bis* rules.

In order to accept the reception of the basic Teletex document, the receiver has to recognize the "nature" of the originator and to select the adequate rules. For this purpose, when receiving the CONNECT SPDU (which corresponds to the CSS command of Recommendation T.62), the recipient must detect the absence of Session User Data (SUD) and select the T.62 *bis* module to accept the interchanged document [case a)].

9.2.2 The PM.1/MM Teletex equipment is the sender.

9.2.2.1 The recipient is a basic Teletex equipment.

If the document type to be transmitted is a basic Teletex document, the sender will initiate the communication by selecting the T.62 *bis* module [case a)] and the basic Teletex equipment can accept the document.

If the document type to be transmitted is a PM.1/MM document, the sender will initiate the communication by selecting the T.522 module [case b)].

The receiver will then send an ACCEPT SPDU without Session User Data. This allows the sender to recognize that the receiver is a basic Teletext equipment and therefore that the documents are to be interchanged in a basic Teletex format by using T.62 *bis* communication rules [case a)], the sender could then inform the user that the interchange of the PM.1/MM document is not possible as the addressee is a basic Teletex equipment.

9.2.2.2 The recipient is a PM.1 and/or MM Teletex equipment.

If the document type to be transmitted is a basic Teletex document, the sender will initiate the communication by selecting the T.62 *bis* module [case a)] and the rules specified in § 2.1 apply.

If the document type to be transmitted is a PM.1 or MM.1 Teletex document the sender will initiate the communication by selecting the T.522 module [case b)].

The recipient will detect the presence of Session User Data and therefore will select the T.522 module to give an adequate response to the sender.

ANNEX A

(to Recommendation T.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/T.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/T.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/T.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/T.60 and Figure A-2/T.60, and are given as examples only.

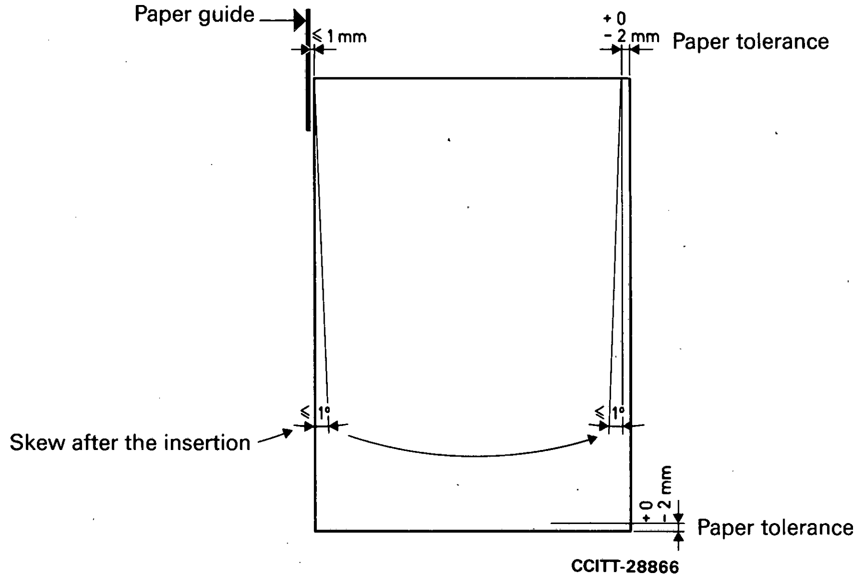
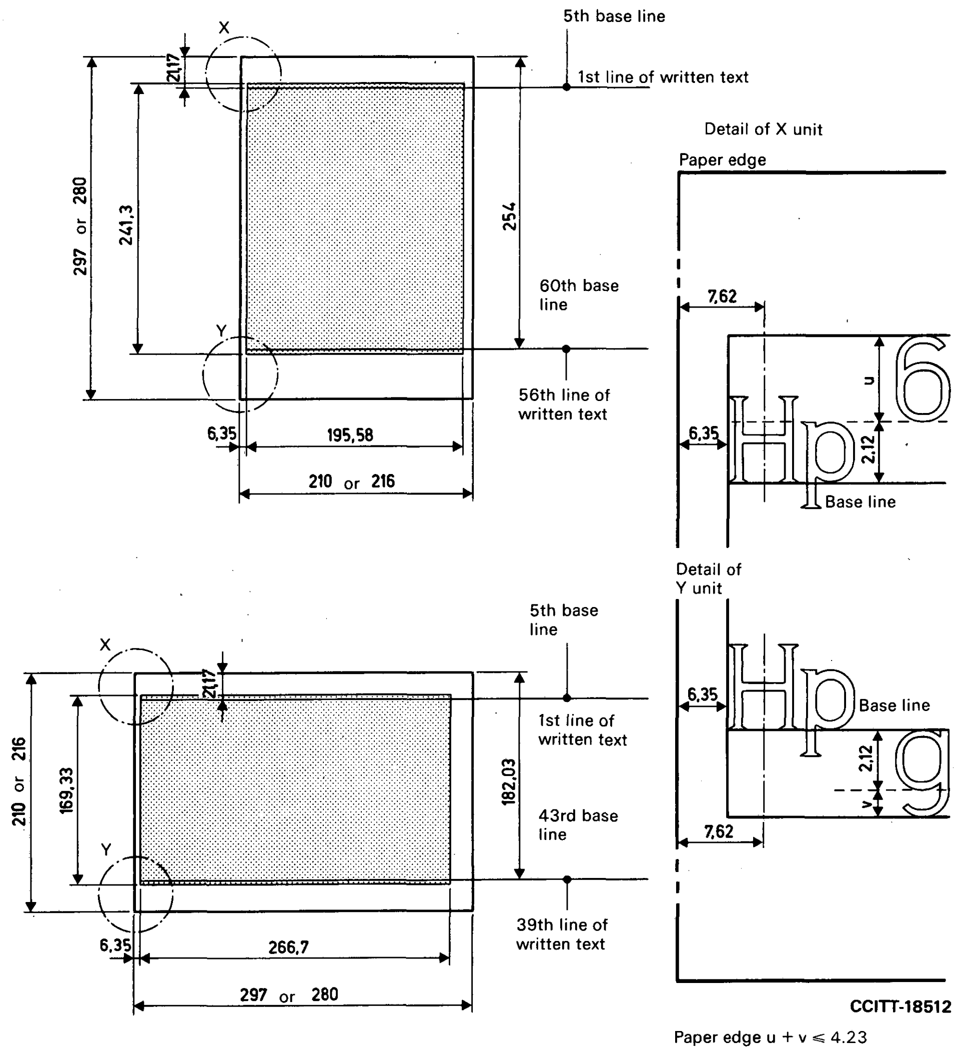


FIGURE A-1/T.60

TABLE A-1/T.60

	Best line position		Character position
	Orientation		For 2.54 mm character spacing
	Vertical	Horizontal	
First printable positions	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/T.60

ANNEX B

(to Recommendation T.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/T.60 contains the values for the usage of different optional character and line spacings.

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

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/T.60.

B.2.2 The optional printable areas for ISO A4 paper sheets defined by the ISO International Standard 3535 and the United Nations layout key – and the associated page formats – are those shown in Table B-3/T.60.

The part of the printable area intended for presentation of the communicated text are assumed to be located on the ISO A4 paper sheet as follows (compare Figure A-2/T.60):

– For vertical paper orientation:

  First line of communicated text: 3rd base line
  Last possible line for communicated text: 68th base line.

– For horizontal paper orientation:

  First line of communicated text: 5th base line
  Last possible line for communicated text: 48th base line.

The 2nd (resp. 4th) base line is assumed for the locally defined presentation of the call identification line.

Presentation of superscript and subscript on the first and last base line respectively is not assumed for these printable areas.

B.3 *Options for presentation within ISO paper sizes used with Japanese Kanji terminals*

B.3.1 Optional printable areas for ISO A4 paper size for use with Japanese Kanji terminals are shown in Table B-4/T.60.

B.3.2 Optional printable areas for ISO B5 paper size for use with Japanese Kanji terminals are shown in Table B-5/T.60.

B.3.3 Optional printable areas for ISO B4 paper size for use with Japanese Kanji terminals are shown in Table B-6/T.60.

B.4 *Options for presentation with North American legal paper size*

B.4.1 The optional printable areas for North American legal paper size (216 × 356 mm) are shown in Table B-7/T.60.

B.5 *Calculation of the maximum number of lines per page*

In calculating the maximum number of lines per page one must be aware of the following calculation problem:

- when using a line spacing of 1 1/2 there is always the combination of 2 half-line spacing text (the text-line itself) plus 1 half-line spacing of free space;
- when using a line spacing of 2 there is always the combination of 2 half-line spacing text (the text-line itself) plus 2 half-line spacings of free space.

There is always one "free space line" less than text lines.

Example (using line spacing 2 [SVS(2)])

xxxx1.lignexxxxxx	2 half-line spacing for text 2 half-line spacings for "free space"
xxxx2.lignexxxxxx	2 half-line spacings for text 2 half-line spacings for "free-space"
xxxx3.lignexxxxxx	2 half-line spacings for text

Although at the first sight when using double-line spacing [SVS(2)] 3 lines need 3 times 4 half-line spacings (equal to 12 half-line spacings), the example shows that 2 half-line spacings less (namely 10 half-line spacings) are sufficient. The reason is simple, as mentioned above, that one always need one "free-space" less than real text lines.

Taking this into account a calculation is only correct, when one of the text lines is taken out at the beginning of the calculation and added at the end, thus allowing the devision by "complete lines" (text-line plus "space-line").

Based on these principles, the calculations are made using the formula

$$n = \frac{X - d}{s} + 1$$

wherein

n maximum number of lines per page, measured in [lines],

X size of available area, excluding CIL and offsets, measured in [HLS],

d size of one text-line, which value is exactly 2 HLS,

s value of line-spacing, measured in [HLS/line].

Note – In the following tables the term [HLS] stands for 1/12 of 25.4 mm.

When using a line spacing of 3.175, the term [HLS*] is used, being based on 1/16 of 25.4 mm.

When using a line spacing of 5 mm, the term [HLS**] is used, being based on 2.5 mm.

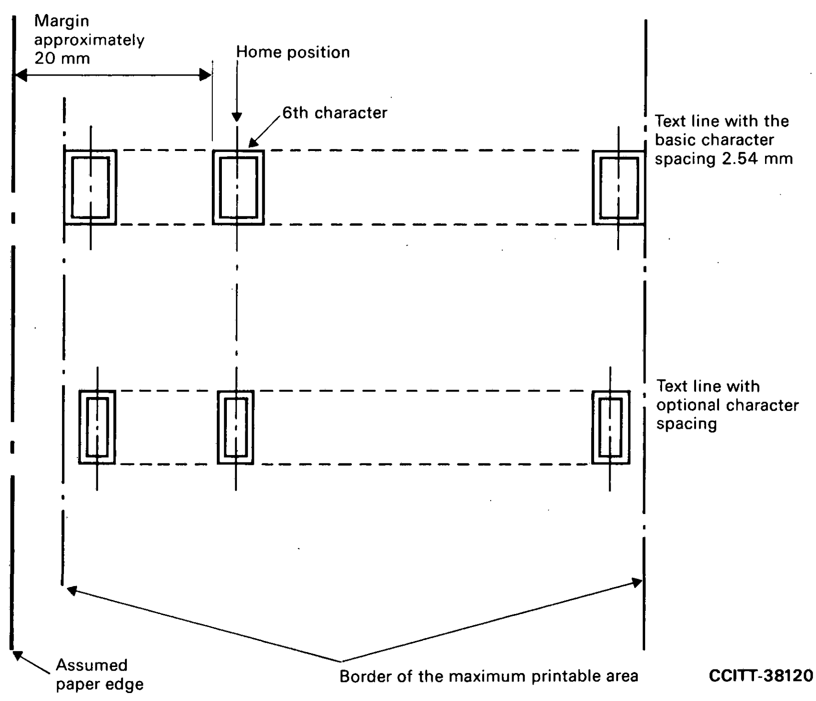
TABLE B-1/T.60

Options for presentation within the basic maximum printable areas
(see § 4)

		Paper orientation	
		Vertical	Horizontal
Maximum number of lines per page	Line spacing (mm) 3.175 5	X = 146 HLS [a)] 73 46	X = 101 HLS [a)] 50 32
Maximum number of characters per line [b)]	Character spacing (mm) 2.12 1.69	92 (6 + 86) 115 (7 + 108)	125 (6 + 119) 156 (7 + 149)

a) X is the total available size for text to be communicated, measured in half-line spacings, excluding the CIL and excluding the offset for sub- and superscripted presentations.

b) The maximum number of characters per line are given in the form $C(D + E)$, where C is the total number of characters per line defined for the printable area, D the number of characters on the left side of the home position as defined for the page format (see Figure B-1/T.60) and E the number of characters to the right side including the home position character.



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, except in the case of Japanese Kanji terminals (see Note 3).

Note 3 — In the case of Japanese Kanji terminals the home position is such that a margin of approximately 25 mm results.

FIGURE B-1/T.60

Definition of the home position

TABLE B-2/T.60

Optional printable areas/page formats and associated values for ISO A4 paper size

		Paper orientation, Vertical	Paper orientation, Horizontal
Maximum number of lines per page	Line spacing (mm)	X = 118 HLS [a]	X = 76 HLS [a]
	4.23	59	38
	6.35	39	25
	8.47	30	19
		X = 157 HLS* [a]	X = 101 HLS* [a]
	3.175	78	50
		X = 99 HLS** [a]	X = 64 HLS** [a]
	5	49	32
Maximum number of characters per line [b]	Character spacing (mm)		
	2.54	77 (5 + 72)	110 (5 + 105)
	2.12	92 (6 + 86)	132 (6 + 126)
	1.69	115 (7 + 108)	165 (7 + 158)

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

[b] See footnote [b] to Table B-1/T.60.

TABLE B-3/T.60

Optional printable areas/page formats and associated values corresponding to ISO 3535/A4

		Paper orientation, Vertical	Paper orientation, Horizontal
Maximum number of lines per page	Line spacing (mm)	X = 132 HLS [a]	X = 88 HLS [a]
	4.23	66	44
	6.35	44	29
	8.47	33	22
		X = 176 HLS* [a]	X = 117 HLS* [a]
	3.175	88	58
		X = 111 HLS** [a]	X = 74 HLS** [a]
	5	55	37
Maximum number of characters per line [b]	Character spacing (mm)		
	2.54	77 (5 + 72)	110 (5 + 105)
	2.12	92 (6 + 86)	132 (6 + 126)
	1.69	115 (7 + 108)	165 (7 + 158)

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

[b] See footnote [b] to Table B-1/T.60.

TABLE B-4/T.60

Optional printable areas/page formats and associated values for ISO A4 paper size (Standardized option for Japanese Kanji terminals)

		Paper orientation	
		Vertical	Horizontal
Maximum number of lines per page	Line spacing (mm) 4.23 6.35 8.47	X = 118 HLS [a)] 59 39 30	X = 76 HLS [a)] 38 25 19
Maximum number of characters per line [b)]	Character spacing (mm) 4.23	45 (4 + 41)	66 (4 + 62)

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

[b)] See footnote [b)] to Table B-1/T.60.

TABLE B-5/T.60

Optional printable areas/page formats and associated values for ISO B5 paper size (Standardized option for Japanese Kanji terminals)

		Paper orientation	
		Vertical	Horizontal
Maximum number of lines per page	Line spacing (mm) 4.23 6.35 8.47	X = 98 HLS [a)] 49 33 24	X = 64 HLS [a)] 32 21 16
Maximum number of characters per line [b)]	Character spacing (mm) 4.23	38 (4 + 34)	56 (4 + 52)

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

[b)] See footnote [b)] to Table B-1/T.60.

TABLE B-6/T.60

Optional printable areas/page formats and associated values for ISO B4 paper size
(Standardized option for Japanese Kanji terminals)

		Paper orientation	
		Vertical	Horizontal
Maximum number of lines per page	Line spacing (mm)	X = 150 HLS [a]	X = 98 HLS [a]
	4.23	75	49
	6.35	50	33
	8.47	38	25
Maximum number of characters per line [b]	Character spacing (mm)		
	4.23	56 (4 + 52)	79 (4 + 75)

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

[b] See footnote [b] to Table B-1/T.60.

TABLE B-7/T.60

Optional printable areas/page formats and associated values for North American Legal paper size (216 mm × 356 mm)

		Paper orientation	
		Vertical	Horizontal
Maximum number of lines per page	Line spacing (mm)	X = 146 HLS [a]	X = 78 HLS [a]
	4.23	73	39
	6.35	49	26
	8.47	37	20
		X = 194 HLS* [a]	X = 104 HLS* [a]
	3.175	97	52
Maximum number of characters per line [b]	Character spacing (mm)		
	2.54	80 (5 + 75)	135 (5 + 130)
	2.12	96 (6 + 90)	161 (6 + 155)
	1.69	120 (7 + 113)	201 (7 + 194)

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

[b] See footnote [b] to Table B-1/T.60.

B.6 *Options for presentation within ISO paper sizes used with Chinese ideogram terminal*

B.6.1 Optional printable areas for ISO A4 paper size used with Chinese ideogram terminal are shown in Table B-8/T.60.

B.6.2 Optional printable areas for ISO B5 paper size used with Chinese ideogram terminal are shown in Table B-9/T.60.

B.6.3 Optional printable areas for ISO B4 paper size used with Chinese ideogram terminal are shown in Table B-10/T.60.

TABLE B-8/T.60

Optional printable areas/page formats and associated values for ISO A4 paper size (Standardized options for Chinese ideogram terminal)

		Paper orientation	
		Vertical	Horizontal
Maximum number of lines per page	Line spacing (mm)	X = 118 HLS [a]	X = 76 HLS [a]
	4.23 [c]	59	38
	6.35	39	25
	8.47	30	19
Maximum number of characters per line [b]	Character spacing (mm)		
	4.23	45 (4 + 41)	66 (4 + 62)
	5.64	33 (3 + 30)	49 (3 + 46)
	6.35	30 (3 + 27)	44 (3 + 41)

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

[b] See footnote [b] to Table B-1/T.60.

[c] Line spacing of 4.23 mm will not be used when character spacing is 5.64 or 6.35 mm.

TABLE B-9/T.60

Optional printable areas/page formats and associated values for ISO B5 paper size
(Standardized options for Chinese ideogram terminal)

		Paper orientation	
		Vertical	Horizontal
Maximum number of lines per page	Line spacing (mm) 4.23 [c] 6.35 8.47	X = 98 HLS [a] 49 33 24	X = 64 HLS [a] 32 21 16
Maximum number of characters per line [b]	Character spacing (mm) 4.23 5.64 6.35	 38 (4 + 34) 28 (3 + 25) 25 (3 + 22)	 56 (4 + 52) 42 (3 + 39) 37 (3 + 34)

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

[b] See footnote [b] to Table B-1/T.60.

[c] See footnote [c] to Table B-8/T.60.

TABLE B-10/T.60

Optional printable areas/page formats and associated values for ISO B4 paper size
(Standardized options for Chinese ideogram terminal)

		Paper orientation	
		Vertical	Horizontal
Maximum number of lines per page	Line spacing (mm) 4.23 [c] 6.35 8.47	X = 150 HLS [a] 75 50 38	X = 98 HLS [a] 49 33 25
Maximum number of characters per line [b]	Character spacing (mm) 4.23 5.64 6.35	 56 (4 + 52) 42 (3 + 39) 37 (3 + 34)	 79 (4 + 75) 59 (3 + 56) 53 (3 + 50)

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

[b] See footnote [b] to Table B-1/T.60.

[c] See footnote [c] to Table B-8/T.60.

ANNEX C

(to Recommendation T.60)

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

TABLE C-1/T.60

ITA No. 2 Combination No.	Telex repertoire	Teletex repertoire	Identifier (Rec. T.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 T.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 sheet of paper. This information may be stored, displayed or printed.

Note – Relevant paper sizes are indicated in this Recommendation.

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.

D.4 **communicated text area**

Area with a size of one line spacing (4.23 mm) less than the defined maximum printable area.

Recommendation T.61

CHARACTER REPERTOIRE AND CODED CHARACTER SETS FOR THE INTERNATIONAL TELETEX SERVICE

(Geneva, 1980; amended at Malaga-Torremolinos, 1984 and Melbourne, 1988)

CONTENTS

Note – Octets notation in Recommendation T.61.

Notation for identifying octets coding has been changed, referring to new ISO practice, decided within ISO/IEC JTC 1/SC2.

According to the new notation, each number now must have two figures according to the following examples:

0/4 4/12 10/12 (previous notation)	to become to become to become	00/04 04/12 10/12 (new notation)

The amendments of T.61 may be done in conformity to this new notation.

Occurence of this new notation is indicated by a "*" sign on the right of the page.

The existing text still remains with the previous notations.

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 (IA5) or International Telegraph Alphabet No. 2 (ITA2). This Recommendation, based on Recommendation T.50, provides an extended alphabet for use in the international text communication service, Teletex. Where graphic characters of IA5 are not required for Teletex, their code table positions have been left unused, thereby assuring compatibility with IA5. The resulting subset of IA5 has been extended by the definition of additional graphic 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:

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

T.62 – Control procedures for Teletex and Groupe 4 Facsimile services;

F.200 – Teletex service.

1.6 The following Recommendations and ISO standards are related to this Recommendation, however, for the Teletex service this Recommendation only is relevant:

T.50 International Alphabet No. 5;

T.51 Coded character sets for the telematic services.

ISO 646 Information processing – ISO 7-bit coded character set for information interchange;

ISO 2022 Information processing – ISO 7-bit and 8-bit coded character sets – Code extension techniques;

ISO 6429 Information processing – ISO 7-bit and 8-bit coded character sets – Additional control functions for character imaging devices;

ISO 6937 Information processing – Coded character sets 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 T.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: extensión 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.

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 binaire

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: extensión de 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.

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/T.61.

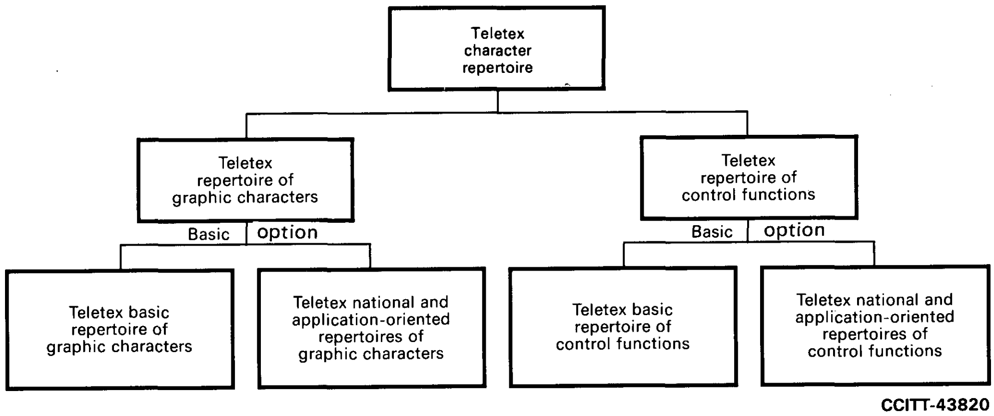


FIGURE 1/T.61
Teletex character repertoire

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. To prevent problems coming from overlaid characters, it is recommended not to transmit *Backspace* regardless of operator keying sequences, except in the left margin. However, because overlaid characters may be received from certain terminals, it is recommended that the terminal can represent the overlay. Similarly, an underline implemented by SGR or by *Non spacing underline* and followed by PLD may be a cause of overlap of graphic symbols. Although the definition of PLD in § 3.3.2 states that it is the sender's responsibility to avoid overlap, it may be difficult to prevent an accidental occurrence. In such cases the receiver may suppress printing of the underline to preserve legibility of the other graphic symbol.

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) non-alphabetic characters, listed in § 3.2.3, which comprise decimal digits, currency signs, punctuation marks (including *Space*), diacritical marks, arithmetic signs, subscripts and superscripts, fractions, miscellaneous symbols that have individual special meanings and non-spacing 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	e	small e with dot
LE30	E	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
LF02	F	capital F
LG01	g	small g
LG02	G	G capital G
LG11	ǵ	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 o l'	small l with caron
LL22	Ľ o 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
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	'n	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 o 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
LT64	Þ	capital thorn, Icelandic
LU01	u	small u
LU02	U	capital U
LU11	ú	small u with acute
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 *Non-alphabetic 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 *Non-spacing characters*

Identifier	Graphic	Name or description
SM27	_	non spacing underline

Note – The *Non-spacing underline* character is never used individually but always in combination with some other graphic character to represent the graphic rendition "underlined" for the associated character. The *Non-spacing underline* character can be used in combination with any graphic character of the repertoire, including an accented letter or an umlaut, or *Space.* It is recommended to implement the "underline" function by means of the control function SGR(4) instead of the "non-spacing underline" graphic character. However, both must be correctly interpreted when received.

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.

3.3.1.4 The default state for all control functions defined in § 3.3 § E.3.2 are assumed at the beginning of each page. The same applies to the implicit designation and invocation of character sets defined in §§ A.1 and A.2.

The start of a new page is indicated by either a *Command document start* (CDS), a *Command document continued* (CDC), or a *Command document page boundary* (CDPB) all accompanied by a *Command document user information* (CDUI). See Recommendation T.62.

Because of their immediate effect on the presentation of the new page, parameter values other than default values of those control functions according to §§ 3.3 and E.3.2, e.g., *Page format selection* or *Select horizontal spacing*, must be transmitted before the *Form feed, Carriage return* or *Carriage return, Form feed* sequence. By this sequence the control functions will become effective.

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). In this character sequence CR must immediately be followed by LF or vice versa. See also § 2.1.2 (text area).
CF14	FF	*Form feed* A format effector that advances the active position to the corresponding character position on the first line of the communicated text area of a new page. *Form feed* never causes a horizontal movement of the active position. *Form feed* shall only be used in combination with *Carriage return* (CR). In this character sequence CR must immediately be followed by FF or vice versa. This sequence affects the presentation of the new page (see also § 3.3.1.4). The text shall be introduced by this sequence in every page (including the first page of a document). Any control functions that need to be defined at the start of the page shall precede this sequence. This sequence must not be used more than once within a page according to Recommendation T.62.
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.

PLD does not affect the vertical position of any underlining of subsequent character(s) if the underlining is invoked (by SGR or *Non-spacing underline*) prior to the PLD.

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.

PLU does not affect the vertical position of any underlining of subsequent character(s) if the underlining is invoked (by SGR or *Non-spacing underline*) prior to the PLU.

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 Vertical spacing, horizontal spacing and graphic rendition may be changed within a 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 page 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 T.60.

Identifier	Abbreviation	Name and definition
CP03	SGR	*Select graphic rendition*

A control function with one or more parameters which specify one or more graphic rendition aspects for graphic characters and *Space* characters in the subsequent text.

Each specified graphic rendition aspect takes effect immediately and remains in effect until it is changed by a subsequent occurrence of SGR with an appropiate parameter value within the page.

When SGR is used to start underlining within the scope of subscript or superscript presentation (see PLD and PLU § 3.3.2) any horizontal lines used to implement such underlining are lowered or raised together with the subscript or superscript characters to which they apply. Any PLU or PLD functions occurring when underlining is already in effect, do not affect the vertical position of such horizontal lines. (See also Note to § 3.1.7.)

The representation of multiple underlining is one character position caused by combinations of SGR and *Non-spacing underline* or by other means (e.g., $\underline{x^{y}}$), is not guaranteed at the receiving end in the basic Teletex service.

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 parameter value of this control function may be changed within a page, provided that no graphic characters occur between the SHS and the next occurrence of both *Carriage return* (CR) and *Line feed* or both CR and *Form feed.* The new parameter value will take effect immediately.

The meaning of the parameter value is:

0: 10 characters per 25.4 mm.

The default value of the parameter is 0.

Note – In the basic Teletex service, terminals should avoid sending SHS because only one parameter value is valid, and this value is implied by default (see § 3.3.1.4), however, all terminals must be able to receive text containing SHS with parameter value "0" and SHS without a parameter value.

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.

Parameter value 3 is used to specify half line down spacing (or half line up spacing if used in conjunction with *Reverse line feed*).

3.3.4 *Code extension control function*

Identifier	Abbreviation	Name and definition
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 defined in §§ E.3.2.3 and E.4.2.3.

3.3.5 *Miscellaneous control functions*

Identifier	Abbreviation	Name and description
CM02	SUB	*Substitute character*

A control function used as defined in Recommendation T.50 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.

It is not allowed for a terminal to send the substitute character SUB (01/10).

Terminals receiving a substitute character may either represent it with a spacing character or ignore it.

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/T.61 is a subset of the set of graphic characters of the International Reference Version of the 7-bit coded character set of Recommendation T.50.

4.1.2.2 The supplementary set, also specified in Figure 2/T.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 Bit combinations equivalent to the empty positions in Figure 2/T.61 code table shall not be transmitted in the basic Teletex service. Shaded positions denote bit combinations which are not part of the sets specified by the table.

Note – In Recommendations T.50 and T.100, and in ISO Standard 6937, bit combinations equivalent to empty positions in Figure 2/T.61 are used to represent graphic characters that are not, however, relevant to the basic Teletex service.

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.

b4	b3	b2	b1		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
				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
0	0	0	0	0			SP	0	@	P		p				°	⑤		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			④	3	C	S	c	s			£	³	^		ª	ð
0	1	0	0	4			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	

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

Note 2 — In the 1980 version of this Recommendation code 12/9 was allocated to represent the umlaut mark. The use of this facility is discouraged. Its removal is foreseen in the future.

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

Note 4 — Teletex terminals should send only the codes 10/6 and 10/8 for graphic characters # and ¤ respectively. When receiving codes 2/3 and 2/4 terminals should interpret them as # and ¤.

Note 5 — This bit combination shall not be used in the basic teletex service (see § 4.1.2.3). See Annex E, § E.3.1.1.3 for additional requirements for terminals participating in the freer teletex service.

FIGURE 2/T.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

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) The coded representation of the *Non-spacing underline* character shall precede that of the character to which it applies. In particular, when used to underline an accented letter or umlaut, the *Non-spacing underline* shall precede the bit combination representing the diacritical mark. Between the *Non-spacing underline* character and the character to which it applies, one or more control functions may occur, e.g. *Partial line down* (PLD), *Partial line up* (PLU) or a code extension control function.

As there are two possibilities of underlining (the *Non-spacing underline* and the control function *Select graphic rendition*) some examples to show the use of them, and their interaction with the control functions PLU and PLD, are included in Annex F.

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/T.61.

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

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/T.61, has been derived from the set of control functions of the 7-bit coded character set of Recommendation T.50.

4.2.2.2 The supplementary set is also specified in Figure 3/T.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 T.50 and in ISO Standard 6429, bit combinations equivalent to empty positions in Figure 3/T.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 Recommendation 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

$$\mathrm{CSI}\ \mathrm{P}_1 \ldots \mathrm{P}_n\ \mathrm{I}_1 \ldots \mathrm{I}_m\ \mathrm{F}$$

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.

Note – For the coded representation of the parameters ($P_1 \dots P_n$) leading zeroes (bit combination 03/00) must not be used (e.g. if $P_1 \dots P_n = 4$, it is not allowed to use 03/00 03/04 to code the parameter value 4).

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.

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 $P_1 \dots P_n$ 2/0 4/10
CP03	SGR	CSI $P_1 \dots P_n$ 6/13
CP04	SHS	CSI $P_1 \dots P_n$ 2/0 4/11
CP05	SVS	CSI $P_1 \dots P_n$ 2/0 4/12

4.2.4.3 *Code extension control functions*

Identifier	Abbreviation	Coded representation
CE06	CSI	9/11

4.2.4.4 *Miscellaneous control functions*

Identifier	Abbreviation	Coded representation
CM02	SUB	1/10

TABLE 1/T.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 a	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/T.61

The teletex supplementary set of graphic characters

Position	Graphic	Name or description	Position	Graphic [a]	Name or description	Position	Graphic	Name or description
10/1	¡	inverted exclamation mark	12/0		(not used)	14/0	Ω	ohm sign
			12/1	`	grave accent	14/1	Æ	capital Æ dipthong
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	¨	diaresis 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 [b]	¸	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 [b]	˝	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 [b]	ˇ	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 dipthong
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) In the 1980 version of this Recommendation, code 12/9 was allocated to represent the umlaut mark. The use of this facility is discouraged. Its removal is foreseen in the future.

				b_8	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
				b_7	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1
				b_6	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
				b_5	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
b_4	b_3	b_2	b_1		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		SS2 ①														
1	0	1	0	10	LF	SUB														
1	0	1	1	11		ESC ①							PLD	CSI						
1	1	0	0	12	FF								PLU							
1	1	0	1	13	CR	SS3 ①														
1	1	1	0	14	LS1 ①															
1	1	1	1	15	LS0 ①															

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Note — The characters ESC, LS1, LS0, SS2 and SS3 must not be used in the basic Teletex service. The definitions of these control characters are contained in § E.3.2.3.

FIGURE 3/T.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

ANNEX A

(to Recommendation T.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 as a default condition according to § 3.3.1.4.

A.2 This 8-bit code contains the primary set of graphic characters as G0 set in positions 2/1 to 7/14, the supplementary set of graphic characters as G2 set in positions 10/1 to 15/14, the primary set of control characters in positions 0/0 to 1/15 and the supplementary set of control characters in positions 8/0 to 9/15. 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 and invocation of control sets C0 and C1 by means of the relevant escape sequences. See Figure A-1/T.61.

b) designation of up to four graphic character sets called G0, G1, G2 and G3;

c) invocation of the designated graphic sets, by means of locking and/or non-locking shift functions.

The shift functions used are:

LS0, LS1, LS1R, LS2, LS2R, LS3, LS3R, SS2, SS3.

According to ISO Standard 2022 the bit combination following SS2 or SS3 represents a character from columns 2 to 7, except positions 2/0 and 7/15, of a code table. All characters in columns 8 to 15 are excluded from assignment to the bit combinations following SS2 or SS3. The use of a single shift function does not affect the current status established by one or more of the locking-shift functions.

There are seven locking-shift functions used exclusively for graphic set extension. Each invokes an additional set of 94 graphic characters into columns 2 to 7 or into columns 10 to 15.

The single shift functions, the locking-shift functions and the related G-sets are shown in Table A-1/T.61.

A.4 The shift functions are defined in § E.3.2.3 and coded as specified in § E.4.2.3.

The use of shift functions is implicitly negotiated by specifying the character sets during the negotiation procedure of terminal capabilities in the control procedures of Recommendation T.62. All terminals supporting graphic character code extension techniques must support shift functions LSO, LS2R and SS2 in order to invoke the Teletex primary and supplementary graphic character sets within a page.

A.5 For the designation and invocation of control sets the following escape sequences are used:

C0 set ESC 2/1 F

C1 set ESC 2/2 F

The symbol F denotes the final bit combination of an escape sequence.

The final characters F have to be provided by CCITT and ISO.

A.6 For the designation of CCITT/ISO registered graphic character sets the escape sequence formats shown in Table A-2/T.61 are used.

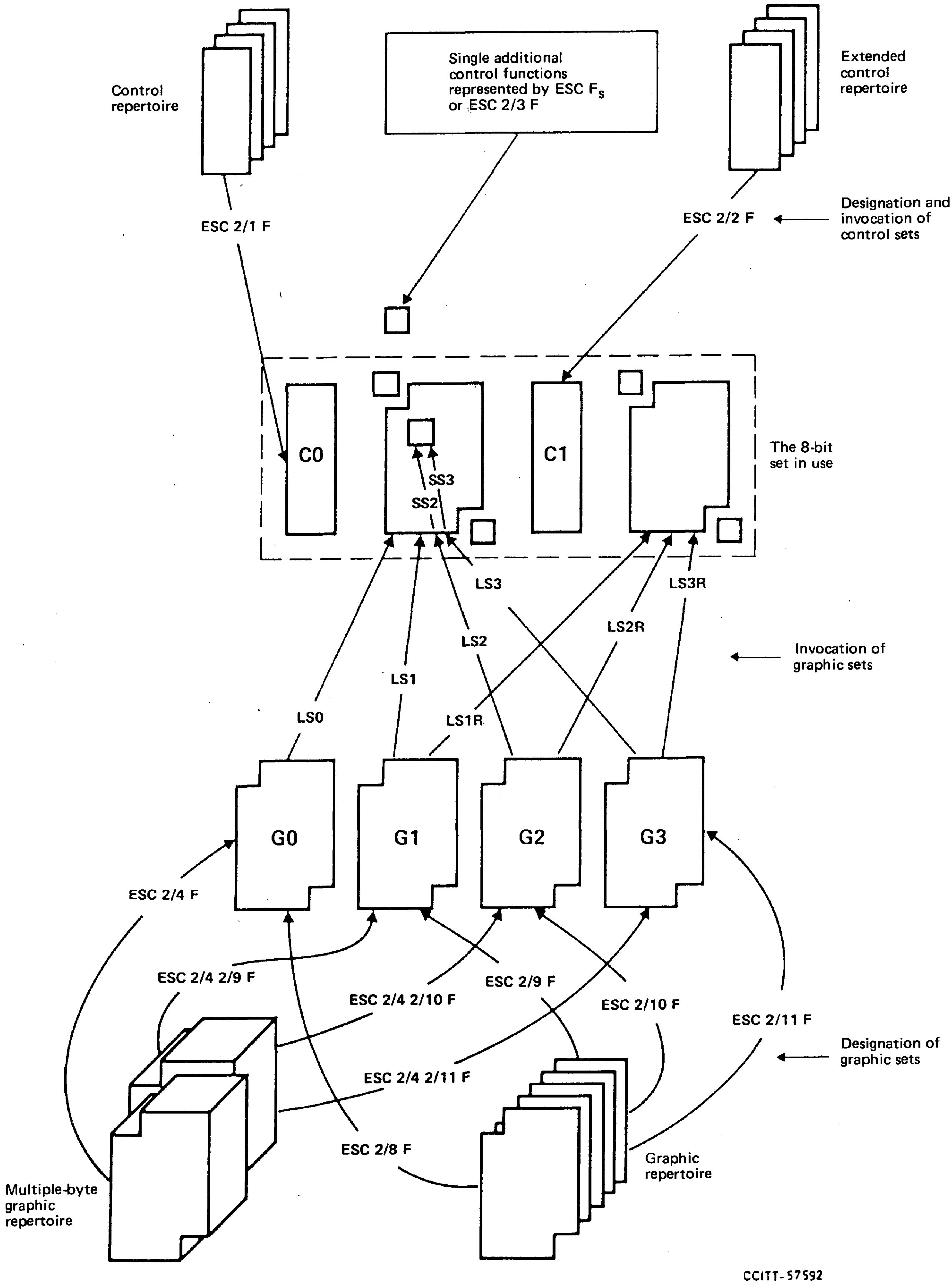

FIGURE A-1/T.61

Code extension in an 8-bit environment (showing all shift facilities)

TABLE A-1/T.61

Allocation of shift functions to the graphic character sets

Graphic character set	Locking shift functions for invocation of G-set to positions		Non-locking shift functions for invocation of G-set to positions
	2/1 to 7/14	10/1 to 15/14	2/1 to 7/14
G0	LS0	–	–
G1	LS1	LS1R	–
G2	LS2	LS2R	SS2
G3	LS3	LS3R	SS3

TABLE A-2/T.61

Escape sequence formats for designation of CCITT/ISO registered graphic character set

Graphic character set	Escape sequence formats for designation of	
	single-byte set	multiple-byte set
G0	ESC 2/8 F	ESC 2/4 F
G1	ESC 2/9 F	ESC 2/4 2/9 F
G2	ESC 2/10 F	ESC 2/4 2/10 F
G3	ESC 2/11 F	ESC 2/4 2/11 F

Note 1 – The symbol F denotes final bit combination of an escape sequence.

Note 2 – The final characters F have to be provided by CCITT and ISO.

A.7 For the designation of *Dynamically redefinable character sets* (DRCS) the escape sequence formats shown in Table A-3/T.61 are used.

A.8 Escape sequences for the designation of graphic character sets, and the associated shift functions for invoking these graphic sets, as well as the escape sequence for the designation and invocation of the control sets, may appear at any position within the text.

A.9 The final character F for the basic Teletex character sets are:

- Primary control set 04/05
- Supplementary control set 04/08
- Primary graphic set 07/05
- Supplementary graphic set 07/06

TABLE A-3/T.61

Escape sequence formats for designation of dynamically redefinable character sets

Graphic character set	Escape sequence formats for designation of	
	single-byte DRCS	multiple-byte DRCS
G0	ESC 2/8 2/0 F	ESC 2/4 2/8 2/0 F
G1	ESC 2/9 2/0 F	ESC 2/4 2/9 2/0 F
G2	ESC 2/10 2/0 F	ESC 2/4 2/10 2/0 F
G3	ESC 2/11 2/0 F	ESC 2/4 2/11 2/0 F

Note 1 – The final character F denotes the final bit combination of an escape sequence.

Note 2 – The character F should be in the range 4/0 to 7/14 and should be assigned by the user. It is recommended that these final characters be allocated sequentially starting with 4/0.

ANNEX B

(to Recommendation T.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 – In the 1980 version of this Recommendation code 12/9 was allocated to represent the umlaut mark. The use of this facility is discouraged. Its removal is foreseen in the future.

B.2 Figure B-1/T.61 specifies the combinations of diacritical marks and basic letters that are defined in this Recommendation in its left part and also indicates the special alphabetic characters used, in the right part.

Basic letters	Acute accent	Grave accent	Circumflex accent	Diaeresis or umlaut mark	Tilde	Caron or hacek	Breve	Double acute accent	Ring	Dot above	Macron	Cedilla	Ogonek	Ligature	Other
aA	áÁ	àÀ	âÂ	äÄ	ãÃ		ăĂ		åÅ		āĀ		ąĄ	æ Æ	
bB															
cC	ćĆ		ĉĈ			Čč				Ċċ		çÇ			
dD						ďĎ									đ Đ ð
eE	éÉ	èÈ	êÊ	ëË		ěĚ				ėĖ	ēĒ		ęĘ		
fF															
gG	ģ		ĝĜ				ğĞ			ġĠ		Ģ			
hH			ĥĤ												ħ Ħ
iI	íÍ	ìÌ	îÎ	ïÏ	ĩĨ					İ	īĪ		įĮ	ĳ Ĳ	ı
jJ			ĵĴ												
kK												ķĶ			ĸ
lL	ĺĹ					ľĽ						ļĻ			ł Ł ŀ Ŀ
mM															
nN	ńŃ				ñÑ	ňŇ						ņŅ			ŋ Ŋ
oO	óÓ	òÒ	ôÔ	öÖ	õÕ			őŐ			ōŌ			œŒ	ø Ø
pP															
qQ															
rR	ŕŔ					řŘ						ŗŖ			
sS	śŚ		ŝŜ			šŠ						şŞ			ß
tT						ťŤ						ţ Ţ			ŧ Ŧ þ Þ
uU	úÚ	ùÙ	ûÛ	üÜ	ũŨ		ŭŬ	űŰ	ůŮ		ūŪ		ųŲ		
vV															
wW			ŵŴ												
xX															
yY	ýÝ		ŷŶ	ÿŸ											
zZ	źŹ					žŽ				żŻ					

FIGURE B-1/T.61

Use of alphabetic characters with diacritical marks, ligatures or other

ANNEX C

(to Recommendation T.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/T.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/T.61.

TABLE C-1/T.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.
Diaeresis with acute accent	33	–

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;
G = greek alphabetic character.

FIGURE C-1/T.61
Identification system

ANNEX D

(to Recommendation T.61)

Format of control sequences

This annex is for information only and does not form part of the requirements laid down by this Recommendation; instead, it provides explanations of the format of control sequences. It consists of non-contiguous extracts from the ISO Standard 6429. For ease of cross-reference to that standard 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 ISO 6429.

The double codings of parameters, intermediates and finals of a control sequence, and the operand of a single-shift character (as mentioned in Section 10 of the ISO extract) are not allowed in the Teletex service. In addition 7-bit coding is not relevant in the Teletex service.

Extract from ISO Standard 6429:

"5.1.2 *Control functions represented by control sequences*

A control sequence consists of CONTROL SEQUENCE INTRODUCER (CSI) followed by one or more characters 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 shall be:

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

where:

a) CSI is represented by ESC 5/11 in a 7-bit code and by bit combination 9/11 in an 8-bit code (see § 5.2).

b) $P_1 \ldots P_n$ correspond to parameter values and are represented by bit combinations of column 3; these bit combinations are omitted if the control function has no parameter, and may be omitted if the default parameter value is to apply.

c) $I_1 \ldots I_m$ are Intermediate characters represented by bit combinations of column 2 which, together with the bit combination representing the Final character F, identify the control function; these bit combinations are omitted if the control function is identified only by the bit combination representing the Final character F.

Note – The number of Intermediate characters is not limited by this International Standard (ISO 6429); in practice, at the most, one Intermediate character will be sufficient since over one thousand control functions may be identified using not more than one Intermediate character.

d) F is the Final character; it is represented by a bit combination of column 4, 5, 6 or 7 (except 7/15); it terminates the control sequence and, together with the Intermediate characters, if present, identifies the control function (however, see § 10).

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 International Standard (ISO 6429).

The Final characters (either used alone or together with Intermediate characters) are classified in two categories:

i) the control functions identified by a Final character represented by a bit combination of columns 4, 5 and 6 are either standardized or reserved for future standardization;

ii) the control functions identified by a Final character represented by a bit combination 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 § 5.4).

The bit combinations of columns 4, 5 and 6 representing the Final characters and the bit combinations representing the Intermediate characters are specified in Table 2 and Table 3."

"5.4 *Parameter representations*

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

The string of bit combinations representing $P_1 \dots P_n$ 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 defined by this International Standard (ISO 6429).

5.4.1 *Parameter string format*

A parameter string shall have the following format:

a) a parameter string consists of one or more parameter sub-strings;

b) each parameter sub-string consists of one or more bit combinations from 3/0 to 3/9, representing the digits zero to nine;

c) parameter sub-strings are separated by one bit combination 3/11;

d) bit combination 3/10 is reserved for future standardization as an additional parameter separator;

e) bit combinations 3/12 to 3/15 shall not be used;

f) in each parameter sub-string, leading bit combinations 3/0 are not significant and may be omitted;

g) if the parameter string starts with the bit combination 3/11, an empty parameter sub-string is assumed preceding the separator; if the parameter string terminates with the bit combination 3/11, an empty parameter sub-string is assumed following the separator; if the parameter string contains successive bit combinations 3/11, empty parameter sub-strings are assumed between the separators;

h) if the control function has more than one parameter, and some parameter sub-strings are empty, the separators (bit combination 3/11) must still be present. However, if the last parameter sub-string(s) is empty, the separator preceding it may be omitted (see Annex B – Coding examples);

j) an empty parameter sub-string or a parameter sub-string which consists of bit combinations 3/0 only represents a default value which depends on the control function.

5.4.2 *Types of parameters*

In a control sequence representing a control function with parameters, each parameter sub-string corresponds to one parameter, and represents the value of that parameter. The number of parameters is either fixed of variable, depending on the control function. If the number of parameters is variable, neither the maximum number of values nor the order in which the corresponding actions are performed are defined by this International Standard (ISO 6429).

5.4.2.1 *Numeric parameters*

In a control sequence representing a control function with numeric parameters, each parameter sub-string which has a value other than a zero represents a quantity in decimal notation.

5.4.2.2 *Selective parameters*

In a control sequence representing a control function with selective parameters, each parameter sub-string whilst expressed by digits, is not quantitative i.e. does not represent a quantity in decimal notation. Each value corresponds to one of the actions the control function can perform.

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

"10 *Transformation between 7-bit and 8-bit coded representations*

The control functions defined in this International Standard (ISO 6429) can be coded in a 7-bit code as well as in an 8-bit code: both forms of coded representation are equivalent and in accordance with ISO 2022.

However, when data containing these control functions are transformed from a 7-bit to an 8-bit representation or vice versa, the transformation algorithm specified in ISO 2022 may produce results which are formally in disagreement with this International Standard (ISO 6429).

In order to make allowance for such unintended but unavoidable deviations, the format rules are extended in the manner described below.

In an 8-bit code, the bit combination of columns 10 to 15 (except 10/0 and 15/15) are permitted to represent:

a) parameters, intermediates and finals of a control sequence;

b) the contents of a control string;

c) the operand of a single-shift character.

In these situations, the bit combinations in the range 10/1 to 15/14 have the same meanings as the corresponding bit combination in the range 2/1 to 7/14."

ANNEX E

(to Recommendation T.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 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*

E.3.1.1 *Registered character sets*

E.3.1.1.1 Japanese Kanji terminal optional graphic character repertoire.

Japanese graphic character set for information interchange (JIS C 6226-1983 [1)]) used as a G0 set.

E.3.1.1.2 Chinese ideogram terminal optional graphic character repertoire.

Chinese graphic character set for information interchange (GB 2312-80 set No. 58 in ISO Register) used as a G1 set.

E.3.1.1.3 *Greek primary set of graphic characters*

E.3.1.1.3.1 The code table of the Greek set, shown in Figure E-1/T.61, consists of the most frequently used Greek alphanumeric characters and punctuation marks. The bit combination 02/00 is used for SPACE and 07/15 is used for DELETE.

[1)] Japanese Industrial Standard.

				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	@	Π	②	π
0	0	0	1	1			!	1	Α	Ρ	α	ρ
0	0	1	0	2			”	2	Β	①	β	ς
0	0	1	1	3			#	3	Γ	Σ	γ	σ
0	1	0	0	4			¤	4	Δ	Τ	δ	τ
0	1	0	1	5			%	5	Ε	Υ	ε	υ
0	1	1	0	6			&	6	Ζ	Φ	ζ	φ
0	1	1	1	7			’	7	Η	Χ	η	χ
1	0	0	0	8			(	8	Θ	Ψ	θ	ψ
1	0	0	1	9			)	9	Ι	Ω	ι	ω
1	0	1	0	10			*	:	Κ	②	κ	②
1	0	1	1	11			+	;	Λ	[	λ	{
1	1	0	0	12			,	<	Μ	\	μ	|
1	1	0	1	13			−	=	Ν	]	ν	}
1	1	1	0	14			.	>	Ξ	^	ξ	‾
1	1	1	1	15			/	?	Ο	_	ο	

CCITT-44102

Note 1 — Telematic terminals should not transmit this code. However, to ensure compatibility with some conversion equipments, when a telematic terminal receives code 5/2, it shall interpret it as a capital greek letter Sigma.

Note 2 — These code positions are reserved for further standardisation.

FIGURE E-1/T.61

The greek primary set of graphic characters

E.3.1.1.3.2 *Greek alphabetic characters*

ID	Graphic	Name or description	Set	Position
GA01	α	small letter Alpha	G0	6/1
GA02	Α	capital letter Alpha	G0	4/1
GA11	ά	small letter Alpha with accent	G2	4/2 G0 6/1
GA12	Ά	capital letter Alpha with accent	G2	4/2 G0 4/1
GB01	β	small letter Beta	G0	6/2
GB02	Β	capital letter Beta	G0	4/2
GG01	γ	small letter Gamma	G0	6/3
GG02	Γ	capital letter Gamma	G0	4/3
GD01	δ	small letter Delta	G0	6/4
GD02	Δ	capital letter Delta	G0	4/4
GE01	ε	small letter Epsilon	G0	6/5
GE02	Ε	capital letter Epsilon	G0	4/5
GE11	έ	small letter Epsilon with accent	G2	4/2 G0 6/5
GE12	Έ	capital letter Epsilon with accent	G2	4/2 G0 4/5
GZ01	ζ	small letter Zeta	G0	6/6
GZ02	Ζ	capital letter Zeta	G0	4/6
GE61	η	small letter Eta	G0	6/7
GE62	Η	capital letter Eta	G0	4/7
GE63	ή	small letter Eta with accent	G2	4/2 G0 6/7
GE64	Ή	capital letter Eta with accent	G2	4/2 G0 4/7
GT61	θ	small letter Theta	G0	6/8
GT62	Θ	capital letter Theta	G0	4/8
GI01	ι	small letter Iota	G0	6/9
GI02	Ι	capital letter Iota	G0	4/9
GI11	ί	small letter Iota with accent	G2	4/2 G0 6/9
GI12	Ί	capital letter Iota with accent	G2	4/2 G0 4/9
GI17	ϊ	small letter Iota with diaeresis	G2	4/8 G0 6/9
GI18	Ϊ	capital letter Iota with diaeresis	G2	4/8 G0 4/9
GI33	ΐ	small letter Iota with accent and diaeresis	G2	4/0 G0 6/9
GK01	κ	small letter Kappa	G0	6/10
GK02	Κ	capital letter Kappa	G0	4/10
GL01	λ	small letter Lambda	G0	6/11
GL02	Λ	capital letter Lambda	G0	4/11
GM01	μ	small letter Mu	G0	6/12
GM02	Μ	capital letter Mu	G0	4/12
GN01	ν	small letter Nu	G0	6/13
GN02	Ν	capital letter Nu	G0	4/13
GX01	ξ	small letter Xi	G0	6/14
GX02	Ξ	capital letter Xi	G0	4/14
GO01	ο	small letter Omicron	G0	6/15
GO02	Ο	capital letter Omicron	G0	4/15
GO11	ό	small letter Omicron with accent	G2	4/2 G0 6/15
GO12	Ό	capital letter Omicron with accent	G2	4/2 G0 4/15
GP01	π	small letter Pi	G0	7/0
GP02	Π	capital letter Pi	G0	5/0
GR01	ρ	small letter Rho	G0	7/1
GR02	Ρ	capital letter Rho	G0	5/1
GS01	σ	small letter Sigma	G0	7/3
GS02	Σ	capital letter Sigma	G0	5/3
GS03	ς	small letter final Sigma	G0	7/2

ID	Graphic	Name or description	Set	Position	
GT01	τ	small letter Tau	G0	7/4	
GT02	T	capital letter Tau	G0	5/4	
GY01	υ	small letter Upsilon	G0	7/5	
GY02	Y	capital letter Upsilon	G0	5/5	
GY11	ύ	small letter Upsilon with accent	G2	4/2	G0 7/5
GY12	Ύ	capital letter Upsilon with accent	G2	4/2	G0 5/5
GY17	ϋ	small letter Upsilon with diaeresis	G2	4/8	G0 7/5
GY18	Ϋ	capital letter Upsilon with diaeresis	G2	4/8	G0 5/5
GY33	ΰ	small letter Upsilon with accent and diaeresis	G2	4/0	G0 7/5
GF01	φ	small letter Phi	G0	7/6	
GF02	Φ	capital letter Phi	G0	5/6	
GH01	χ	small letter Khi	G0	7/7	
GH02	X	capital letter Khi	G0	5/7	
GP61	ψ	small letter Psi	G0	7/8	
GP62	Ψ	capital letter Psi	G0	5/8	
GO61	ω	small letter Omega	G0	7/9	
GO62	Ω	capital letter Omega	G0	5/9	
GO63	ώ	small letter Omega with accent	G2	4/2	G0 7/9
GO64	Ώ	capital letter Omega with accent	G2	4/2	G0 5/9

Coded representations of letters with diacritical marks are constituted of letter codes from the Greek primary set in combination with diacritical marks codes from positions 12/00 to 12/15 of the supplementary set (Figure 2/T.61 code table).

Bit combination equivalent to empty position 12/00 of the supplementary set in Figure 2/T.61 code table is used to represent the diacritical mark "Diaeresis with acute accent". (Identification SD33, graphic symbol ΅.) that shall be transmitted in the Greek Teletex service.

E.3.1.1.3.3 Figure E-2/T.61 specifies the possible combinations of diacritical marks from the supplementary set and letters of the Greek primary set that are defined in this Recommendation.

E.3.1.1.4 The use of additional sets is for further study.

Diacritical mark \ Basic letter	a A	β B	γ Γ	δ Δ	ε E	ζ Z	η H	θ Θ	ι I	κ K	λ Λ	μ M	ν N	ξ Ξ	ο O	π Π	ρ P	σ Σ ς	τ T	υ Y	φ Φ	χ X	ψ Ψ	ω Ω
Acute accent	ά Ά				έ Έ		ή Ή		ί Ί						ό Ό					ύ Ύ				ώ Ώ
Diaeresis									ϊ Ϊ											ϋ Ϋ				
Diaeresis with acute accent									ΐ											ΰ				

FIGURE E-2/T.61

Use of diacritical marks

E.3.1.2 *Dynamically redefinable character sets (DRCS)*

DRCS will be used by Japanese Kanji terminal and Chinese ideogram terminal to extend their character repertoire. Japanese Kanji character patterns and Chinese ideogram character patterns will be loaded into a terminal by procedures described in Recommendation T.62, and shall be designated and invoked as described in Annex A of this Recommendation.

A definition for **DRCS** is as follows:

A DRCS is a set of graphic characters whose exact shape is specified and transmitted at the time of use. Such characters may be alphabetic, special symbols or picture element symbols. Once loaded, a DRCS is regarded as a member of a library that can be designated by appropriate ESC sequences as a G0, G1, G2 or G3 set.

ESC I 2/0 F designates such a set, where I will take a value from 2/8 ... 2/11 to indicate whether the set is to be used as a G0, G1, G2 or G3 set respectively.

Sixty-three sets may be identified by means of such four character sequences. This should be enough for most requirements but a third or more intermediate character can be inserted between the 2/0 character and the final character if more sets are needed. See ISO Standard 2022.

Sequences with 2/0 as the second intermediate character and with 2/0 to 2/7 as the first Intermediate character are reserved for future standardization.

Multiple-byte graphic sets may also be dynamically redefinable. ECS 2/4 I 2/0 F designate such a set when it is to be a G1, G2 or G3 set, where I takes the same value and has the same meaning as in the preceding paragraphs. However, when such a set is to be a G0 set, it shall be designated by ESC 2/4 2/0 F.

Note 1 – This class of escape sequence is exceptional because the allocation of final (and possible intermediate) character is not done by the ISO Registration Authority but by the user. It is recommended that final characters be allocated sequentially, starting with 4/0.

Note 2 – There is a need for this particular escape sequence as distinct from the normal three character sequence used to represent registered sets. This escape sequence implies an exact description of the shape or font of the characters.

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 standard 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 the preceding line, defined by the current value of the vertical spacing (see SVS). *Note* – In order to use RLF, it is first necessary to negotiate the use of an optional supplementary control character set containing RLF (in addition to those characters shown in Figure 3/T.61 using the control procedures of Recommendation T.62. Designation and invocation of this control character set may appear at any position in the text. For further details see Annex A.

The escape sequence for this control set is ESC 2/2 F.

This control set was not assigned an escape sequence *Final* bit combination during the 1981-84 Study period since no identifiable use for RLF could be found. The need for RLF is for further study.

E.3.2.2 *Presentation control functions*

Identifier	Abbreviation	Name and definition
CP01	PFS	*Page format selection* (Definition: see § 3.3.3) The meaning of the parameter value is: 0: vertical basic page format[2]; 1: horizontal basic page format[2]; 2: vertical A4 page format; 3: horizontal A4 page format; 4: reserved for future option; 5: reserved for future option; 6: vertical ISO 3535/A4 page format; 7: horizontal ISO 3535/A4 page format; 8: vertical North American legal size page format; 9: horizontal North American legal size page format; 10: vertical ISO A4 page format (for use by Chinese ideogram and Japanese Kanji terminals); 11: horizontal ISO A4 page format (for use by Chinese ideogram and Japanese Kanji terminals); 12: vertical ISO B5 page format (for use by Chinese ideogram and Japanese Kanji terminals); 13: horizontal ISO B5 page format (for use by Chinese ideogram and Japanese Kanji terminals); 14: vertical ISO B4 page format (for use by Chinese ideogram and Japanese Kanji terminals); 15: horizontal ISO B4 page format (for use by Chinese ideogram and Japanese Kanji terminals);
CP03	SGR	*Select graphic rendition* (Definition: see § 3.3.3) The meaning of the parameter value is: 0: default rendition[2]; cancels the effect of any preceding occurrence of SGR; if no parameter is present, the default parameter value applies; 1: bold or increased intensity; 3: italicized; 4: underlined[2];

[2] As defined for the basic Teletex service.

9: crossed-out (characters still legible but marked as being deleted);
22: normal intensity (not bold);
23: not italicized;
24: not underlined;
26: proportional spacing character pitch may be used. See Note 1 below. When proportional spacing character pitch is invoked, the parameter value of the SHS function shall specify the nominal character pitch;
29: not crossed-out.

Note 1 – Parameter value 26 specifies that the text that follows may be presented with proportional spacing at the recipient's option. For interworking with devices not capable of proportional spacing, no line or part of a line of text should contain more characters than are permitted by the current pitch value specified by the most recent occurrence of SHS.

Note 2 – Parameters shall be separated by bit combination 3/11. See Annex D, § 5.4.1.

Note 3 – A terminal's capability to support proportional spacing shall be indicated by including an SGR sequence, with parameter value 26 only, in the Recommendation T.62 procedure for exchanging non-basic terminal capabilities.

Note 4 – Several parameter values can be used in combination, in order to obtain, for example, underlined italics.

Note 5 – The default parameter value cannot be used in combination with any other parameter value.

CP04 SHS *Select horizontal spacing*
(Definition: see § 3.3.3)

The meaning of the parameter value is:

0: 10 characters per 25.4 mm;[3]
1: 12 characters per 25.4 mm;
2: 15 characters per 25.4 mm;
3: 6 characters per 25.4 mm;
4: 3 characters per 25.4 mm;
5: 9 characters per 50.8 mm;
6: 4 characters per 25.4 mm.

Note 1 – Parameter value 3 may only be used with page formats specified by PFS parameter values 10 to 15.

Note 2 – Parameter values 5 and 6 may only be used with page formats specified by PFS parameter values 10 to 15 for Chinese ideogram terminal.

[3] As defined for the basic Teletex service.

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

The meaning of the parameter value is:

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

CP06 SPD *Select presentation direction*

A presentation control function with one selective parameter which specifies the character path and line progression, until these directions are respecified by another occurrence of SPD.

The meaning of the parameter value is as follows:

0: character path from left to right, line progression from top to bottom;
1: character path from top to bottom, line progression from right to left when page is orientated for viewing. See Table E-1/T.61.

The default value of the parameter is 0.

Note 1 – An occurrence of SPD is only effective at the beginning of a page, i.e. SPD has no effect in the middle of a page.

Note 2 – Some Japanese and Chinese characters use different patterns for vertical writing from those used for horizontal writing. Table E-2/T.61 and Table E-3/T.61 show the difference between horizontal and vertical writing character patterns.

Note 3 – The perceived effects of SPD on the other control function are shown in Table E-4/T.61.

Note 4 – Figure E-3/T.61 shows an example of a page format using PFS parameter values 10, 12 and 14, with SPD parameter values 0 and 1.

Note 5 – SPD may only be used with page formats specified by PFS parameter values 10 to 15.

CP07 GSM *Graphic size modification*

GSM is a presentation control function with two numeric parameters. Its use causes the height and/or width of the character font to be modified until a subsequent occurrence of GSM in the data stream, or a page boundary is reached.

The meaning of the parameter values are:

n: specifies the character dimension in the direction of the line progression as a percentage of the default font size.

[4] As defined for the basic Teletex service.

m: specifies the character dimension in the direction of the character path as a percentage of the default font size.

The order of the parameters is GSM (*n*, *m*) and the default value of *n* and *m* is 100. Permitted values of parameters n and m, and the effect that these values have on the character spacing (as specified by SHS) and size, are as follows.

For horizontal writing (SPD 0):

GSM 100, 50 causes character spacing and width to be halved.
GSM 100, 100 has no effect.
GSM 100, 200 causes character spacing and width to be doubled.

For vertical writing (SPD 1):

GSM 100, 100 has no effect.
GSM 100, 200 causes character spacing and height to be doubled.

Note 1 – GSM affects only those characters which follow it in the data stream, not those previously received.

Note 2 – GSM may only be used with page formats specified by PFS parameter values 10 to 15.

CP08 SCO *Select character orientation*

SCO is a presentation control function which is used to establish the amount of rotation of the following graphic character string. The established value remains in effect until the next occurrence of SCO.

The parameter values are:

0: 0°
2: 90°
6: 270°

The default value of the parameter is 0.

The initial position of the graphic characters corresponds to the rotation angle of 0°.

Rotation is positive, i.e. anti-clockwise and applies to the normal presentation of the graphic characters along the character path. The direction of the character path depends on the parameter of SELECT PRESENTATION DIRECTIONS (SPD).

Note – For Chinese ideogram terminals, the center of character rotation is the center of the character cell.

TABLE E-1/T.61

Intended viewing orientation of a page

Page format select parameter value	Intended viewing orientation of page with SPD parameter values	
	0	1
10, 12, 14	portrait	landscape
11, 13, 15	landscape	portrait

TABLE E-2/T.61

Difference between character patterns used for horizontal and vertical writing
(Japanese Kanji terminal)

Meaning	Horizontal writing characters	Vertical writing characters	Differences
Long vowel sign	ー	︱	Figure
Hyphen	‐	︲	
Equal sign	＝	‖	
Numerical range sign	〜	≀	
Dash	—	︱	
Dotted line	‥ …	︰ ︙	
Vertical line	｜	—	
Parallel sign	‖	＝	
Parenthesis and bracket marks	（ ） 〔 〕 ［ ］ ｛ ｝ 〈 〉 《 》 「 」 『 』 【 】	︵ ︶ ︹ ︺ ﹇ ﹈ ︷ ︸ ︿ ﹀ ︽ ︾ ﹁ ﹂ ﹃ ﹄ ︻ ︼	
Japanese comma	、	、	Position
Japanese period	。	。	
Small HIRA-KANA characters	ぁ ぃ ぅ ぇ ぉ ゃ ゅ ょ っ ゎ	ぁ ぃ ぅ ぇ ぉ ゃ ゅ ょ っ ゎ	
Small KATA-KANA characters	ァ ィ ゥ ェ ォ ャ ュ ョ ッ ヮ ヵ ヶ	ァ ィ ゥ ェ ォ ャ ュ ョ ッ ヮ ヵ ヶ	
Half-width characters (European language, KATA-KANA and numeric characters) Double-width characters (Japanese language, European language and numeric characters)	半角 (half-width) 倍角 A B	倍角AB 半角 (half-width) a)	Enlarging direction
Highlight (under line)	強調	強調	Position

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a) No change in pattern.

TABLE E-3/T.61

Differences between character patterns for horizontal and vertical writing used in Chinese ideogram terminal

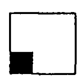
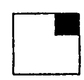
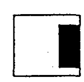
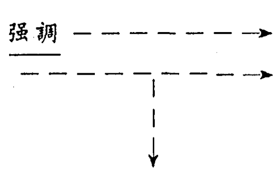
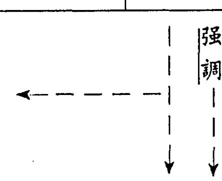
Meaning	Horizontal writing		Vertical writing	
Dash	—		︱	
Ellipsis	…		︙	
Single quotation mark	‘ ’		﹁ ﹂	
Double quotation mark	“ ”		﹃ ﹄	
Underline	_		｜	
Parenthesis and bracket marks	( ) [ ] 〔 〕 { } 〈 〉 《 》 〖 〗 【 】		︵ ︶ ﹇ ﹈ ︹ ︺ ︷ ︸ ︿ ﹀ ︽ ︾ ︗ ︘ ︻ ︼	
Comma	，		，	
Chinese period	。		。	
Chinese comma	、		、	
Semicolon	；		；	
Colon	：		：	
Question mark	？		？	
Exclamation mark	！		！	
Highlight (underline)				

TABLE E-4/T.61

Perceived effect of SPD on other control functions when page is viewed with intended orientation

Control functions		SPD # 0 (horizontal lines)	SPD # 1 (vertical lines)
Format effectors	BS, CR	Backward (leftward)	Backward (upward)
	RLF	Upward	Rightward
	LF	Downward	Leftward
	PLU	Upward	Rightward
	PLD	Downward (ex.) 化学式H_2O	Leftward (ex.) 化学式H_2O
Presentation control functions	GSM	Character "height"	Character "width"
		Character "width"	Character "height"
	SVS	Vertical direction	Horizontal direction
	SHS	Horizontal direction	Vertical direction
	SGR	Under line	Right side line (for Japanese terminal)
			Left side line (for Chinese terminal)

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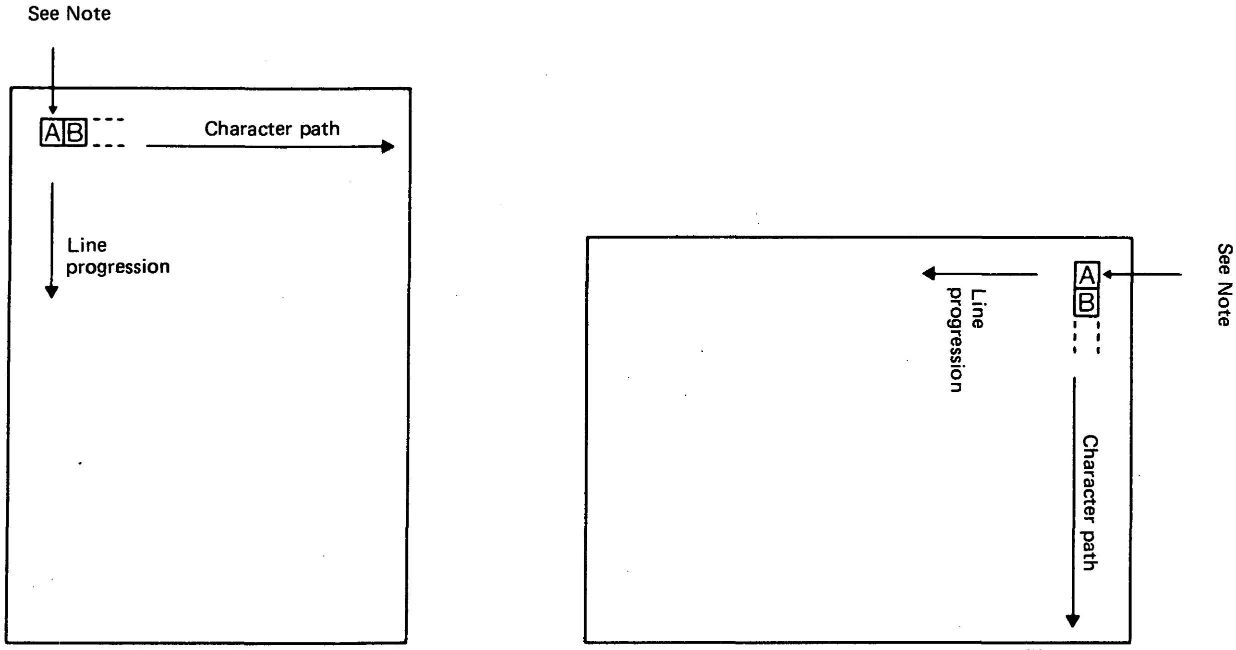


a) PFS parameter values: 10, 12, 14
SPD parameter value: 0

b) PFS parameter values: 10, 12, 14
SPD parameter value: 1

Note – Active position when page is introduced by FF, CR as defined in Recommendation T.60.

FIGURE E-3/T.61

Explanation of page format with SPD parameters 0 and 1

E.3.2.3 *Code extension control functions*

Identifier	Abbreviation	Name and definition
CE03	ESC	*Escape* A code extension control function which is used to provide coded representations for additional control functions.
CE04	SS2	*Single shift 2* A code extension control function which is used in conjunction with ESCAPE to extend the graphic character set of an 8-bit code. SS2 is a non-locking shift function which invokes one character of the currently designated G2 set.
CE05	SS3	*Single shift 3* A code extension control function which is used in conjunction with ESCAPE to extend the graphic character set of an 8-bit code. SS3 is a non-locking shift function which invokes one character of the currently designated G3 set.
CE07	LS0	*Locking shift 0* A code extension control function which is used in conjunction with other locking shift functions and with ESCAPE to extend the graphic character set of an 8-bit code. LS0 is a locking shift function which invokes the currently designated G0 set into positions 2/1 to 7/14.

CE08	LS1	*Locking shift 1* A code extension control function which is used in conjunction with other locking shift functions and with ESCAPE to extend the graphic character set of an 8-bit code. LS1 is a locking shift function which invokes the currently designated G1 set into positions 2/1 to 7/14.
CE09	LS1R	*Locking shift 1 right* A code extension control function which is used in conjunction with other locking shift functions and with ESCAPE to extend the graphic character set of an 8-bit code. LS1R is a locking shift function which invokes the currently designated G1 set into position 10/1 to 15/14.
CE10	LS2	*Locking shift 2* A code extension control function which is used in conjunction with other locking shift functions and with ESCAPE to extend the graphic character set of an 8-bit code. LS2 is a locking shift function which invokes the currently designated G2 set into positions 2/1 to 7/14.
CE11	LS2R	*Locking shift 2 right* A code extension control function which is used in conjunction with other locking shift functions and with ESCAPE to extend the graphic character set of an 8-bit code. LS2R is a locking shift function which invokes the currently designated G2 set into positions 10/1 to 15/14.
CE12	LS3	*Locking shift 3* A code extension control function which is used in conjunction with other locking shift functions and with ESCAPE to extend the graphic character set of an 8-bit code. LS3 is a locking shift function which invokes the currently designated G3 set into positions 2/1 to 7/14.
CE13	LS3R	*Locking shift 3 right* A code extension control function which is used in conjunction with other locking shift functions and with ESCAPE to extend the graphic character set of an 8-bit code. LS3R is a locking shift function which invokes the currently designated G3 set into positions 10/1 to 15/14.

E.3.2.4 *Optional miscellaneous control function*

Identifier	Abbreviation	Name and description
CM04	IGS	*Identify graphic subrepertoire* A control function with one selective 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 selection parameter may be of any value from 0-9999. 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).

E.4 *Coded representations*

E.4.1 *Optional graphic character sets*

E.4.1.1 *Registered character sets*

E.4.1.1.1 Japanese graphic character set for information interchange (set No. 87 in ISO Register) used as a G0 set.

Designation sequence: ESC 2/4 4/2.

E.4.1.1.2 Chinese graphic character set for information interchange (set No. 58 in ISO Register) used as a G1 set.

Designation sequence: ESC 02/04 02/09 04/01.

E.4.1.1.3 *Greek primary set of graphic characters*

Designation sequences:

ECS 02/08 x/x Greek primary set to G0
ECS 02/09 x/x Greek primary set to G1
ECS 02/10 x/x Greek primary set to G2
ECS 02/11 x/x Greek primary set to G3

Note – The final character x/x is awaiting international registration.

E.4.1.2 *Dynamically redefinable character sets (DRCS)*

Designation sequence: see Annex A.

E.4.2 *Optional control functions*

E.4.2.1 *Format effectors*

Identifier	Abbreviation	Coded representation
CF20	RLF	8/13

E.4.2.2 *Presentation control functions*

Identifier	Abbreviation	Coded representation
CP06	SPD	CSI $P_1 \ldots P_n$ 02/00 05/03
CP07	GSM	CSI $P_1 \ldots P_n$ 02/00 04/02
CP08	SCO	CSI $P_1 \ldots P_n$ 02/00 06/05

Additional control functions are for further study.

E.4.2.3 *Optional code extension control functions*

Identifier	Abbreviation	Coded representation
CE03	ESC	1/11
CE04	SS2	1/9
CE05	SS3	1/13
CE07	LS0	0/15
CE08	LS1	0/14
CE10	LS2	1/11 6/14
CE12	LS3	1/11 6/15
CE09	LS1R	1/11 7/14
CE11	LS2R	1/11 7/13
CE13	LS3R	1/11 7/12

E.4.2.4 *Optional miscellaneous control function*

Identifier	Abbreviation	Coded representation
CM04	IGS	CSI $P_1 \ldots P_n$ 02/00 04/13

ANNEX F

(to Recommendation T.61)

Example of underlining

The following examples demonstrate the presentation of permissible combinations of underline and other characters of the basic Teletex repertoire. They also demonstrate the interaction between underline (coded as either a *Non-spacing underline* character or as the control function *Select graphic rendition*) and the control functions PLU and PLD.

Example 1:

a b SGR(4) c d PLU e f PLD PLD g h PLU i j SGR k l

yields: ab$\underline{\text{cd}}^{\text{ef}}{}_{\underline{\text{gh}}}\underline{\text{ij}}$kl (See Notes 1 and 2 below.)

Example 2:

a b SGR(4) c d SGR(0) PLU SGR(4) e f SGR(0) PLD k l

yields: ab$\underline{\text{cd}}^{\underline{\text{ef}}}$kl

Example 3:

a b SGR(4) c d PLU SGR(4) e f SGR(0) PLD k l

yields: ab$\underline{\text{cd}}^{\underline{\text{ef}}}$kl

Example 4:

a b _ c _ d _ PLU e PLD _ PLD g PLU _ i _ j k l

yields: ab$\underline{\text{cd}}^{\underline{\text{e}}}{}_{\underline{\text{g}}}\underline{\text{ij}}$kl (See Note 1 below.)

Example 5:

a b _ c _ d PLU _ e _ f PLD k l

yields: ab$\underline{\text{cd}}^{\underline{\text{ef}}}$kl

Note 1 – See § 3.1.7 for guidance on the presentation of underline in situations where a possibility of overlap exists.

Note 2 – This example also demonstrates the use of an SGR without a parameter value.

Recommendation T.62

CONTROL PROCEDURES FOR TELETEX AND GROUP 4 FACSIMILE SERVICES

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

CONTENTS

1 General

1.1 *Scope*

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

1.1.2 Recommendation F.161 defines the rules to be followed in the Group 4 facsimile service. On the technical side, Recommendations T.563, T.503 and T.521 specify the requirements for Group 4 facsimile apparatus and Recommendation T.6 defines the Group 4 facsimile coding scheme and facsimile control functions.

1.1.3 T.400 series of Recommendations define the document interchange protocol which may be used when services other than basic Teletex are utilized; e.g. Group 4 facsimile, mixed-mode operation, etc.

1.1.4 Network-dependent communication procedures for call establishment and termination are defined in Recommendations T.60 and T.563 for the Teletex and Group 4 facsimile services, respectively.

1.1.5 This Recommendation defines the end-to-end procedures to be used within the Teletex and Group 4 facsimile services.

1.1.6 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 Recommendations T.70 and, as applicable, T.71.

1.1.7 The procedure described in this Recommendation should also be used between a Teletex terminal and a Teletex/telex conversion facility (see Recommendations F.201, T.60 and T.390) and when a Teletex or G4 facsimile terminal takes an access to IPMS (see Recommendations T.422, T.60, T.330 and T.563).

1.1.8 Interworking between Teletex and services other than telex and IPMS, and between Group 4 facsimile and services other than IPMS is for further study.

1.1.9 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.

1.1.10 The provisions in this Recommendation are to be regarded as a first stage in the establishment of Teletex and Group 4 facsimile services in accordance with Recommendations F.200, T.60, T.61 and T.70 as defined in 1980 and Recommendations F.161, T.5, T.6 and T.73 as defined in 1984, respectively. Enhancements and additions to these Recommendations must ensure compatibility with established services.

1.2 *Fundamental principles*

1.2.1 The relationship between the control procedures in this Recommendation 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 document to the recipient's physical media, i.e. store, hard copy device. 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 control procedures 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 control procedures are listed in Tables 1/T.62 and 2/T.62.

TABLE 1/T.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

TABLE 2/T.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.

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.

2.2 *Background information*

Note – § 2 is given as an aid for the understanding of the procedures. The exact definitions of the control procedures are given in subsequent sections 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, exchange information identifying whether they are participating in the Telematic services and thus they will invoke the relevant service facilities and the associated protocol.

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 Teletex session 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) When a Group 4 facsimile session is established, it can only be assumed that the called terminal has adequate recording paper to print at least one page of information (for basic Class 1 apparatus). Negotiation of storage requirements is mandatory for Group 4 Classes 2 and 3 facsimile apparatus. Having negotiated this requirement, exceptionally, a receive memory overflow may 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.

c) 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.

d) The control procedure also provides the possibility to investigate the storage availability at the receiving terminal prior to the transmission of a document.

3 Elements of procedure

3.1 *General*

3.1.1 The paragraphs below contain elements of procedure and rules of use which, when combined, define the control procedures.

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

3.1.3 Annex D describe the session suspension function, which is not applicable to the basic services.

3.2 *Session commands, responses and parameters*

(For a summary of session commands and responses, see Table 1/T.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 whether the sender of this command intends to use the Telematic service.

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

c) *Date and time* – this mandatory parameter gives date and time information as specified in Recommendation F.200.

d) *Additional session reference number* – this number shall be used in addition to the basic session reference (terminal identifier of the called terminal, terminal identifier of the calling terminal, date and time) when the basic session reference is not sufficient to uniquely identify the session and such unique identification is required. If the additional session reference number is not used, the parameter shall not be included.

e) *Non-basic terminal capabilities* – these parameters indicate which of the non-basic terminal capabilities listed in Table 3/T.62 for the Teletex service 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 these table. 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 session capabilities are available as receiving capabilities of the sender of this command.

Note – Examples of the use of this parameter are session suspension (see Annex D) and negotiation of the window size for checkpoint (see §§ 3.3.2.7 and 4.3).

g) *Inactivity timer* – this non-mandatory parameter is used to negotiate the value of the inactivity timer (see §§ 4.1.2 and 5.7.2.11).

h) *Session service functions* – this non-mandatory parameter is used to specify the session service capabilities available. This parameter is used for the interactive session protocol (ISP) and typed data transfer (TDX).

Note – Examples of the use of this parameter are for further study in'association with Annex F.

i) *Session user data* – this non-mandatory parameter is used to convey data of the presentation and/or application protocol(s). All information necessary to negotiate the document interchange protocol parameters defined in the T.400 Series of Recommendations is contained in this parameter field.

j) *Non-standardized capabilities* – this non-mandatory parameter is used to ascertain compatibility regarding the use of non-standardized terminal capabilities.

The first octet following the parameter identifier and the length indicator identifies a particular country. The meaning and code assignments of subsequent octets are defined by the indicated country.

k) *Private use parameters* – these parameters are not mandatory. Their definition and use are not standardized.

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 whether the sender of this response intends to use the Telematic service.

Note 1 – For the basic Teletex services, the service identifiers in RSSP and CSS must be identical.

Note 2 – In case of interconnections between the terminals of different services, the service identifiers in RSSP and CSS may not 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.

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. In this case, it shall also be used, together with the basic session reference when referring to this session in a CDC command. 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) *Session control functions* – this parameter is used to indicate "request control" and "request session suspension" as defined in this Recommendation.

h) *Inactivity timer* – as for § 3.2.1.2 g) above.

i) *Session service functions* – as for § 3.2.1.2 h) above.

j) *Session user data* – as for § 3.2.1.2 i) above.

k) *Non-standardized capabilities*– as for § 3.2.1.2 j) above.

l) *Private use parameters* – as for § 3.2.1.2 k) above.

TABLE 3/T.62

Non-basic terminal capabilities included in CSS

Parameter	Function
Control character sets	Reverse line feed
Page formats	ISO A4 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 T.60. Future extensions and private-use capabilities are to be accommodated with CDCL.

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 – It should be noted that existing equipment may send an RSSN without any parameter fields. This shall not be regarded as an error.

3.2.3.2 Response parameters are:

a) *Service identifier* – this mandatory parameter identifies whether the sender of this response intends to use the telematic service.

Note 1 – For the basic services, the service identifiers in RSSN and CSS must be identical.

Note 2 – In case of interconnections between the terminals of different services, the service identifiers in RSSN and CSS may not be identical.

b) *Terminal identifier* – this mandatory parameter provides the terminal identification of the sender of the RSSN in accordance with the terminal identification specified in Recommendation F.200.

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 RSSN.

e) *Non-basic terminal capabilities* (i.e. those available as receiving capabilities of the sender of the RSSN) – 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) *Reason for sending the negative response* – this parameter is used to indicate the reason for sending the RSSN. The parameter value may be presented to an operator when received. One of the following reasons may be used as a value of the parameter:
   - no reason given;
   - temporarily unable to enter the session. Shall be used e.g. in the case of memory full;
   - text message of maximum 69 characters. It may be possible for the operator to enter this message from the keyboard.

h) *Session service functions:* as for § 3.2.1.2 h) above.

i) *Session user data:* as for § 3.2.1.2 i) above.

j) *Private use parameters:* as for § 3.2.1.2 k) above.

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. CSA shall only be used when there is no other suitable way of ending the session.

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 response and parameters for the document procedures. A non-mandatory parameter, session control function, may be used with this response.

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

3.2.9.3 The parameter, session control functions, is sent with RSUI in conjunction with document response. Use of this parameter with RSUI but without an associated document response is permitted only in the case where the session may intentionally be inactive for a period of time. In this case, when no document responses are being generated, use of the session control functions parameter is permitted without an associated document response. For the Teletex service, this requires a preceding negotiation of the inactivity timer to a value different from the default value.

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 control 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 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 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 session and 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 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). The following rules are applied to the session abort procedure:

a) the session abort procedure is in general completed when the sender of a CSA command receives an RSAP response;

b) the terminal sending the CSA waits for a response RSAP. In state 14, all other commands or responses received will be discarded. If RSAP is not received before a time-out (e.g. T = 4 seconds), the terminal that send the CSA clears the transport connection.

Note – In all cases the transport connection must be cleared when the CSA timer has expired.

3.3.2.7 The following rules should apply to the use of window size:

a) the indication of the window size parameter is not mandatory for the Teletex service, but is mandatory for the Group 4 facsimile service. It may have a value in the range of 1 to 255. The absence of this parameter in CSS or its corresponding response must be interpreted as the default value of three for the Teletex service;

b) all the Teletex terminals should support a window size of 3. Group 4 facsimile terminals of Classes 2 and 3 should be able to support a window size of 3 when interworking with Teletex. Enhanced Teletex terminals (e.g. with mixed-mode capability) and all Group 4 facsimile terminals may require other window sizes;

c) the rule for the use of window size is that the source terminal is free to use any window size that does not exceed the window size indicated by the sink terminal (in CSS or its corresponding response);

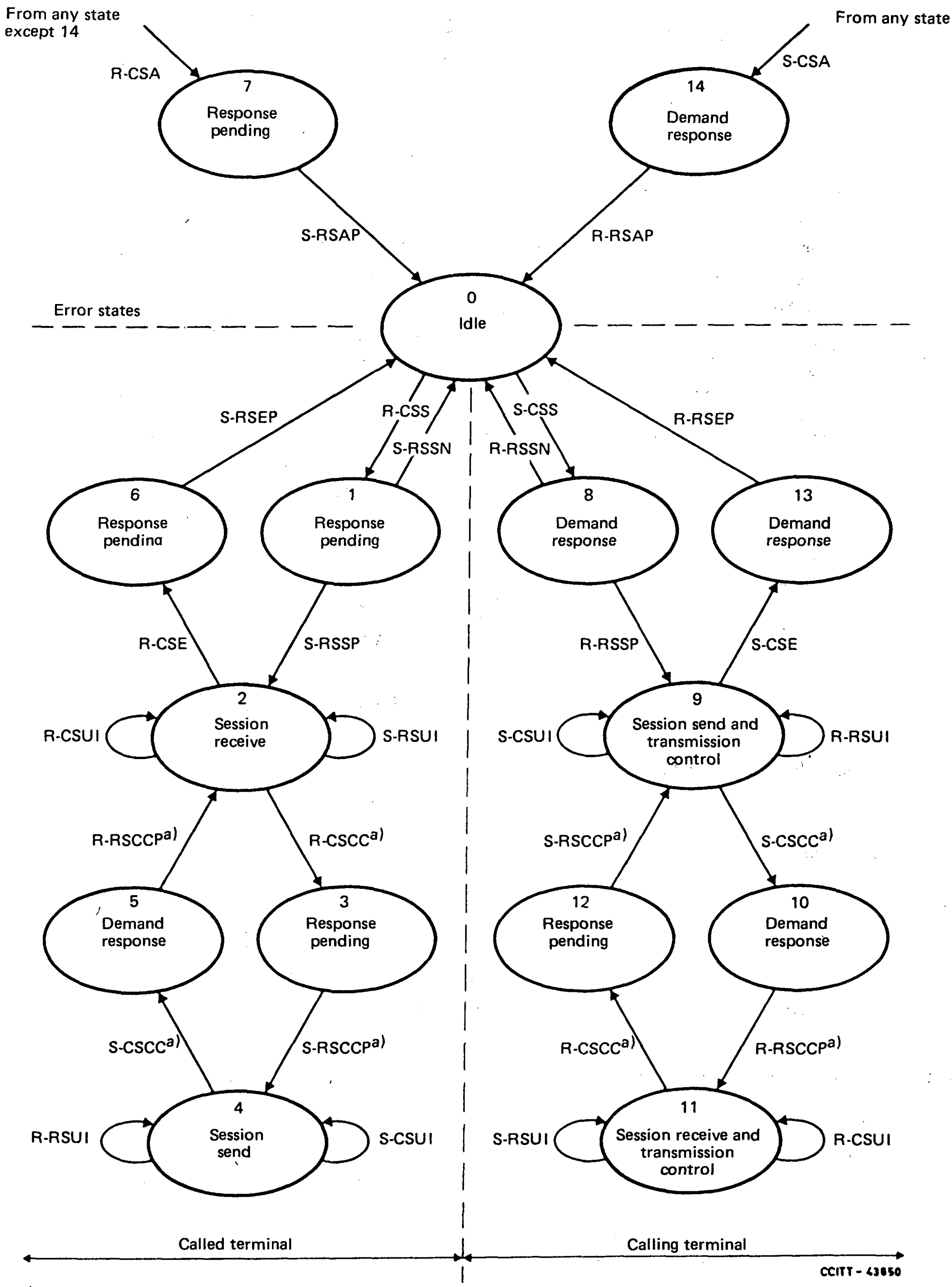
d) if the sender of CSS or its corresponding response is a basic Teletex terminal which does not indicate any parameter for the window size, the receiver should be aware that the sender may ignore any window size indicated and use the window size of 3.

3.3.2.8 Figure 1/T.62 is a state transition diagram for TWA and OWC session modes. The change control commands and responses [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 D.

3.3.2.9 In a session where the use of the RSUI with request control is permitted (as specified in § 3.2.9.3), the following will apply:

a) an RSUI requesting control may be received after giving control and before receiving any valid session protocol element. This shall not be regarded as a procedural error and shall be discarded;

b) an RSUI requesting control may be received after sending a CSE and before receiving an RSEP. This shall not be regarded as a procedural error and shall be discarded.



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

FIGURE 1/T.62

State transition diagram for TWA and OWC session modes

3.4 *Document commands, responses and parameters*

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

3.4.1 *Command document start (CDS)*

3.4.1.1 The CDS indicates the start of a document to the receiver of this command. It also indicates the start of the first page.

3.4.1.2 Command parameters are:

a) *Service interworking identifier* – not a mandatory field (see § 3.5.2).

   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 Recommendations F.200, T.90 and T.91;

   ii) Teletex/Videotex interworking – for further study;

   iii) Teletex/facsimile interworking – for further study.

b) *Document type identifier* – not a mandatory field. If a normal document is used, this parameter shall not be indicated. If other types of document are used, the inclusion of this field is obligatory (for a description of types of document, see Annex E).

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) *Session user data* – this non-mandatory parameter is used to convey data of the presentation and/or application protocol(s). All information necessary to negotiate the document interchange protocol parameters defined in the T.400 Series of Recommendations is contained in this parameter field.

f) *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 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 that has previously been partially transmitted.

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 § 4.2.7) 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.

Note 3 – The checkpoint reference number appearing in CDC is the last checkpoint reference number for which a positive acknowledgement has been received.

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

c) *Document type identifier* – not a mandatory field. If a normal Teletex document is used, this parameter shall not be indicated. If other types of document are used, the inclusion of this field is obligatory (for a description of types of document, see Annex E).

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. Indication of required terminal capability is mandatory if standardized optional terminal capabilities are required for the document. A terminal receiving a CDC that does not contain all of the terminal capabilities should not reject the continuation of the document.

f) *Session user data* – this non-mandatory parameter is used to convey data of the presentation and/or application protocol(s). All information necessary to negotiate the document interchange protocol parameters defined in the T.400 series of Recommendations is contained in this parameter field.

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.

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.

3.4.4.5 The CDCL command may be used to negotiate the value of the inactivity timer. The value of the inactivity timer that the sender of this command wishes to use is indicated in a parameter field of this command.

3.4.4.6 The CDCL command may be used to convey the session user data of the presentation and/or application protocol(s). All information necessary to negotiate the document interchange protocol parameters defined in the T.400 series of Recommendations is contained in this parameter field.

3.4.4.7 The CDCL command may be used to ascertain compatibility regarding the use of non-standardized capabilities.

3.4.5 *Response document capability list positive (RDCLP)*

3.4.5.1 The RDCLP response is sent by the receiver of a CDCL command as a positive acknowledgement of the command.

3.4.5.2 If the CDCL command includes the information to check the non-basic Teletex terminal capabilities, the corresponding RDCLP response has to contain one of the following:

a) confirmation that all the requested capabilities are available at the receiver by use of "acceptance of CDCL parameters";

b) a list of capabilities available at the receiver by use of the "non-basic Teletex terminal capabilities" parameter. This will indicate one of the following:

   - the complete list of all the capabilities requested in the CDCL;
   - a list of the requested capabilities that are available at the receiver. Absence of parameters associated with non-basic capabilities indicated that the requested capabilities are not available at the receiver;
   - a complete list of non-basic receiving capabilities, irrespective of the requested ones.

3.4.5.3 If the CDCL is used for memory negotiation, one of the following shall be included in the RDCLP:

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 the requested memory capacity cannot now be reserved;

d) indication that the available memory cannot be estimated (through either explicit indication or the absence of a memory negotiation parameter in a response to a response to a CDCL with a memory request).

Note 1 – Storage that has been reserved by the CDCL command can be released after session termination or when a new CDCL with storage requirement indication is received.

Note 2 – The use of the memory negotiation parameter in RDCLP (i.e. indicating that the memory cannot be estimated) when not present in CDCL is not prohibited. Therefore, reception of such RDCLP in response to CDCL is not to be regarded as an error.

3.4.5.4 The RDCLP response may be used to negotiate the value of the inactivity timer. The value of the inactivity timer that the sender of this response wishes to use is indicated in a parameter field of this response.

3.4.5.5 The RDCLP response may be used to convey the session user data of the presentation and/or application protocol(s). All information necessary to negotiate the document interchange protocol parameters defined in the T.400 Series of Recommendations is contained in this parameter field.

3.4.5.6 The RDCLP response may be used to ascertain compatibility regarding the use of the non-standardized and private use capabilities.

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. 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. In the basic services, 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; and

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 Only if the sink terminal has sent an RDEP and received either a valid CDS, CDC, CDCL, CSE or CSCC, is it certain that the source terminal will not use error recovery procedures regarding the preceding document. In all other cases it can happen that after sending RDEP a repetition of pages takes place and the duplications may be deleted by the sink terminal.

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 1 – CDD is an invitation to discard the whole of the document and not merely the part of the document transmitted since the last CDC.

Note 2 – 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.

Note 3 – The implementation of this function for Group 4 facsimile is for further study.

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) unable to continue a session (e.g. due to memory full, out of recording paper);

b) sequence error;

c) local terminal error;

d) unrecoverable procedural error;

e) no specific reason stated (used for reasons other than those listed).

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 (see § 4.3.2).

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.

3.4.8.5 No negative response to CDD is allowed except for error conditions where RDGR applies.

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.

3.4.10 *Command document resynchronize (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) unable to continue a session (e.g. due to memory full, out of recording paper);

b) sequence error;

c) local terminal error;

d) unrecoverable procedural error;

e) no specific reason stated (used for reasons other than those listed).

3.4.10.3 No negative response to CDR is allowed except for error conditions where RDGR applies.

3.4.11 *Response document resynchronize 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 within 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 sender of RDRP will be able to perform linking of the following parts of the interrupted document.

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.

3.4.12.2 The basic services do not require any parameter for CDUI. The procedure provides means for adding parameters. Any such need is for further study. For the basic services a CDUI has to contain a user information field. The need for having CDUIs without information field is for further study.

3.4.12.3 Several CDUIs may be used to transfer the contents of one page.

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.

3.4.13.2 The CDPB command parameter is the checkpoint reference number, which, in the basic services, is the page reference number.

3.4.13.3 The checkpoint reference number appearing in the first CDPB after a CDC is the one appearing in this CDC plus one.

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.

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 whether or not the ability of the receiving terminal to continue to accept traffic is jeopardized (e.g. whether or not the memory threshold has been 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 for example, due to a detected error or other failure.

Note – This response may also be returned at any point within the document boundary after the receipt of CDS.

3.4.15.2 The value of the mandatory parameter giving the reason for a negative response should be one of the following:

a) unable to continue a session (e.g. due to memory full, out of recording paper);

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 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. No negative response may be sent to any document commands once the checkpoint associated with those commands has been positively acknowledged.

3.5.4 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 has been positively acknowledged, any error recovery for the subsequent detection of an error is beyond the scope of these control procedures.

3.5.5 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) In the case that a document transmission is initiated by a CDS and no checkpoint is positively acknowledged during that document transmission:

   – the receiving terminal shall treat the failure as if a CDD had been received and an RDDP had been sent;

   – the sending terminal shall treat the failure as if a CDD had been sent and an RDDP had been received.

b) In other cases:

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

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

3.5.6 If, during the transmission of a document, an abnormal condition except those described in § 3.5.5 takes place, the following rules apply:

a) in the case that a document transmission is initiated by CDS command and no checkpoint is positively acknowledged, either a CDD or a CDR command should be used. If a CDR is used, it should be interpreted as a CDD;

b) in other cases, a CDD or CDR should be used.

3.5.7 When a source terminal receives an RDPBP with the receiving ability jeopardized (RAJ) parameter set to 1 during a document transmission, it may continue to transmit one or more pages until the window is closed. In this context the following rules apply:

a) if the source subsequently receives an RDPBP with the RAJ parameter set to 0, it will be able to continue transmission;

b) if the source subsequently receives an RDPBN indicating "memory overflow", the document transmission should be terminated abnormally; e.g. exchange of either CDD/RDDP or CDR/RDRP.

Note – In other contexts (e.g. window size of 1), the session may be terminated abnormally due to expiration of an inactivity timer. However, this requires further study.

3.5.8 When a sink terminal sends an RDPBP with the receiving ability jeopardized parameter set to 1, and subsequent memory overflow results in sending RDPBN, the reason code "unable to continue the session" has to be indicated.

3.6 *Rules for document state diagrams*

3.6.1 *General*

3.6.1.1 The rules common to all state diagrams are given in Annex D.

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/T.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 in accordance with § 3.5.6.

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 demand response timer started when state 13 is entered is only reset when a valid response is received.

3.6.3 *Rules for the receiving protocol* (see Figure 3/T.62)

3.6.3.1 Reception of any command or response except CDS, CDC, CDCL, CDR or CDD 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.

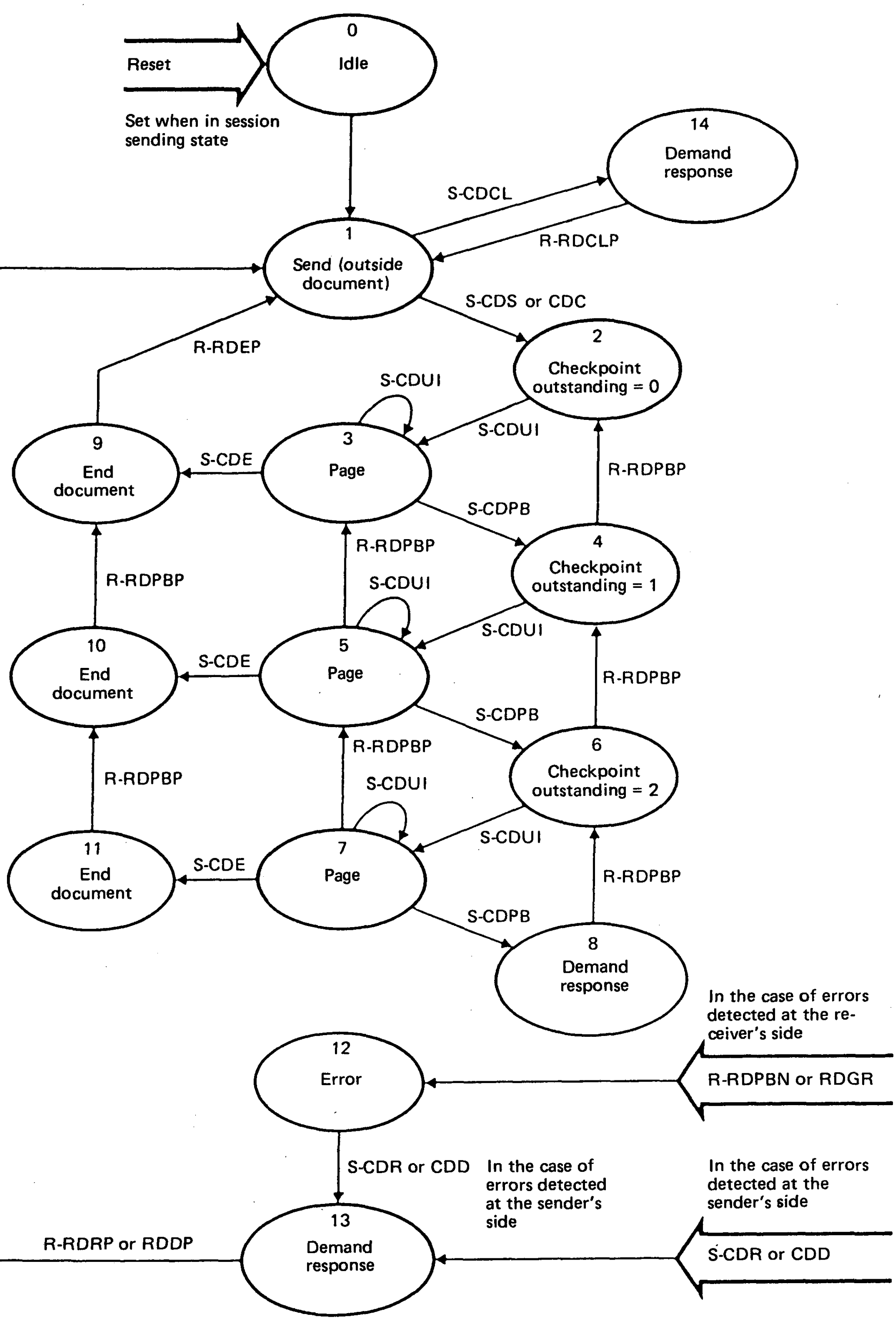


FIGURE 2/T.62

Document state transition diagram for a window size of 3 (sending protocol)

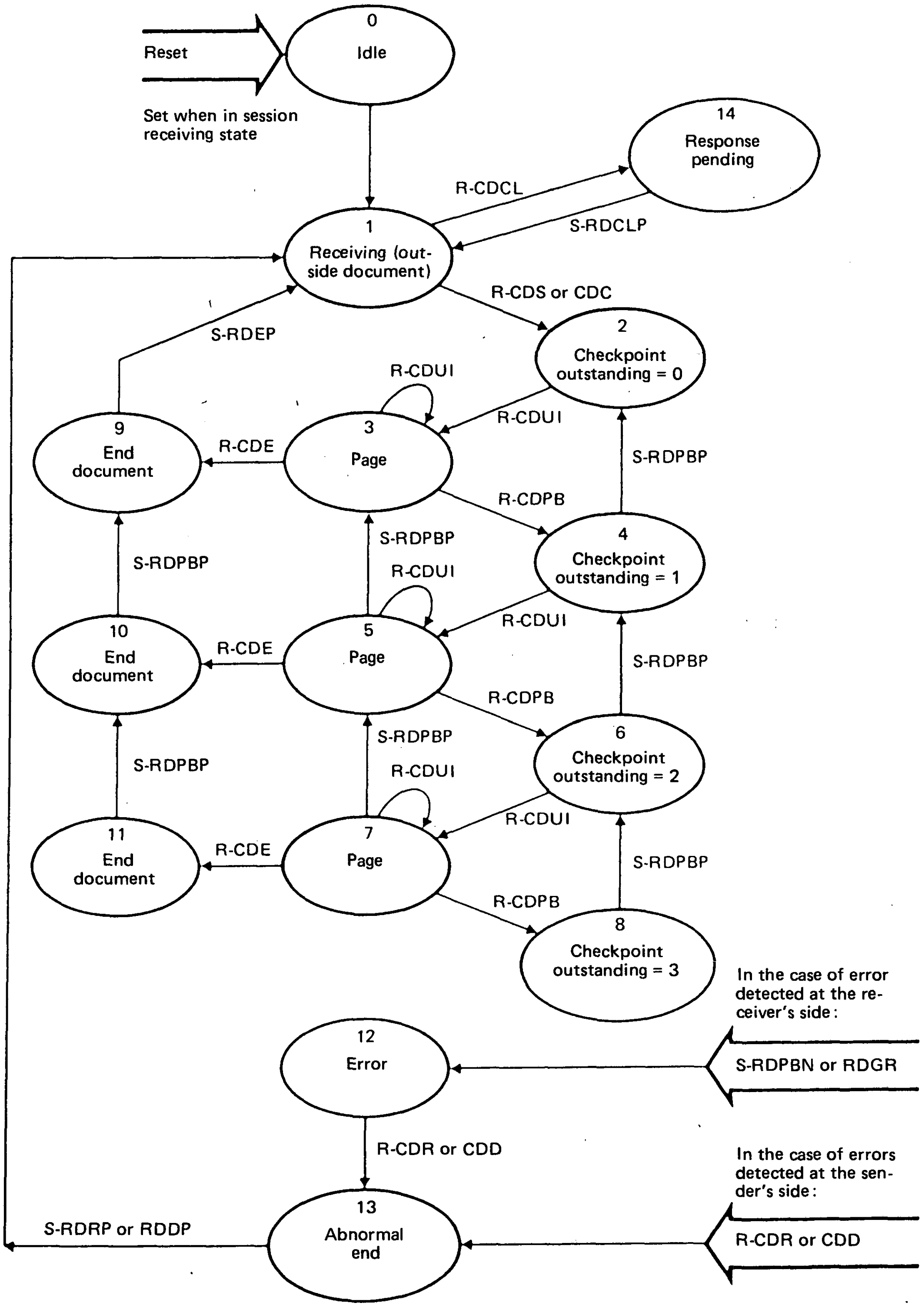


FIGURE 3/T.62

Document state transition diagram for a window size of 3 (receiving protocol)

4 Error recovery

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 the inactivity timer value as determined by negotiation (indicating, for example, a failure or other inability to continue productive use of the session);

d) detection of a period of time in excess of the demand response timer value in which the remote terminal has failed to issue a response.

Note – Negotiation of the demand response timer value is for further study.

4.1.2 The following rules apply to the negotiation of the value of the inactivity timer;

a) an inactivity timer value different from 60 seconds will apply only if this parameter is indicated by both terminals, i.e. negotiation, at session establishment (via CSS/RSSP) or document boundaries (via CDCL/RDCLP);

b) if both terminals indicate an inactivity timer value the following rules apply for the duration of the session or until a subsequent negotiation has taken place:

i) The smaller of the two values applies when both values are greater than or equal to 60 seconds.

ii) The larger of the two values applies when both values are less than 60 seconds.

iii) A timer value of 60 seconds applies if one value is above and one is below 60 seconds.

4.1.3 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. 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 and may be zero.

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 services 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.

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. Each checkpoint in the CDPB must be explicitly acknowledged and the acknowledgements must be in the right sequence.

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. The number does not necessarily have to comprise 3 digits and leading zeros do not necessarily have to be transmitted. In all cases, the leading zeroes must be ignored.

4.2.9 Document reference numbers (DRNs) shall be assigned as decimal digits, preferably, but not necessarily, starting from 001. DRNs shall then sequentially be incremented by one for each successive document. DRNs 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. The number does not necessarily have to comprise 3 digits and leading zeros do not necessarily have to be transmitted. In all cases, the leading zeroes must be ignored.

Note – In order to uniquely identify the documents exchanged, it is recommended that the same DRNs should not appear within a session. However, it is noted that some existing terminals may cause duplication of DRNs when documents are exchanged in both directions.

4.2.10 The sum of the numbers of digits contained in the checkpoint reference number and the document reference number shall not exceed six, to permit printing in the available space in the call identification line as defined in Recommendation F.200. 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 parameters of the CSS command and the corresponding response (see § 5.7.2.6).

4.3.2 In the Group 4 facsimile service, indication of window size parameters in both CSS command and the corresponding response is required (see §§ 3.3.2.7 and 5.7.2.6).

4.3.3 There are two ways that the sender is permitted to recover from an interrupted transmission:

a) a cancellation is achieved by the subsequent use of CDC and CDD commands and the transmission will be resumed by the CDS command;

b) the sender may resume by use of CDC command, 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.

4.3.4 The window mechanism has been introduced in order to allow continuous transmission of pages. The window mechanism may also be used by the receiving terminal to resolve local time problems without affecting the continuous transmission.

Note – For efficiency reasons, the receiving terminal will transmit the response to acknowledge outstanding checkpoint(s) as soon as possible.

4.3.5 The design of a terminal should be such that continuous reception is possible in normal operation of the terminal (e.g. with an average Teletex page content of 1600 octets). The use of the window mechanism should take into account the quality of service requirements in Recommendations F.200 and F.161.

4.3.6 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; domaine

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, responses and parameters is independent of the coding of document commands, responses 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 Bits of an octet are numbered 8 to 1 where bit 1 is the low order bit and is transmitted first. Octets of a session or document field are consecutively numbered starting from 1 and transmitted in this order.

5.2.5 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.

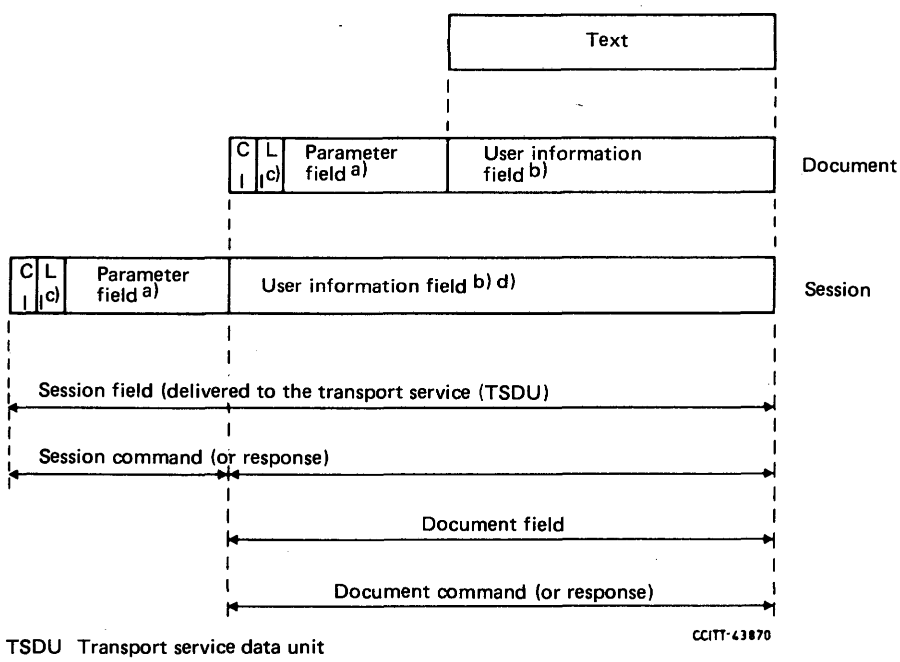
5.2.6 If a parameter field indicated by a PGI appears within a parameter field initiated by a PGI, the PV field of the nested PGI field may not extend beyond the end of the PV of the enclosing PGI field.

5.2.7 To decode CI, RI, PGI and PI, all the bits of the identifier must be considered.

5.2.8 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.

5.2.9 The absence of non-mandatory PI or PGI indicates that no such functions are available. Therefore PIs or PGIs with LI set to zero should be avoided.

5.2.10 Figures 4/T.62, 5/T.62 and 6/T.62 illustrate the coding principles.



a) Present only if LI ≠ 0.

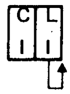
b) Present only after user information commands (or responses).

c) See § 5.2.5.

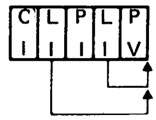
d) See § 1.2.1.

FIGURE 4/T.62

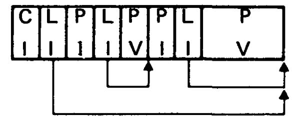
Illustration of the relationship between session and document commands/responses



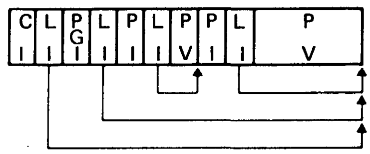
a) LI = 0 (i.e. no parameter field)



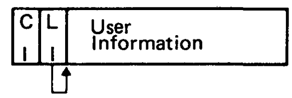
b) LI = 3 and 1 respectively means one parameter of one octet value



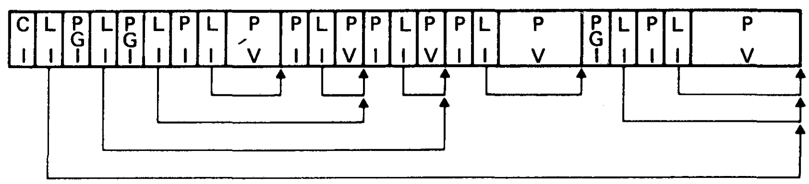
c) Two parameters of 1 and 3 octets respectively. LIs are 8, 1 and 3 respectively



d) One PGI with two enclosed PIs



e) The most simple carrier of user information



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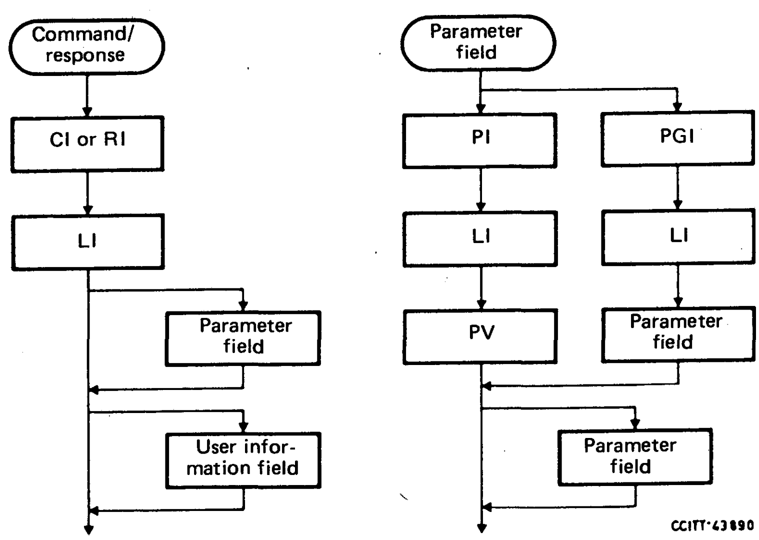
f) Example of complex use of PGIs

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/T.62

Examples of command/response structure



Note – This figure may need further study.

FIGURE 6/T.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 § 5.2.5 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 session commands and responses is shown in Table 4/T.62.

5.4.2 Apart from private use, the codes of the commands and responses in Table 4/T.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	11 Session 10 Session 01 Interaction 00 Session user	
Bits 6, 7, 8	Set to zero (except for private use) and reserved for extension.	

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 non-allocated values are to be reserved for future extension. The method of future extension is for further study.

5.5 *Coding of 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/T.62 and 6/T.62 respectively.

5.5.2 Apart from private use, the codes of the commands and responses in Tables 5/T.62 and 6/T.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
	100	Reserved
	011	Page
	010	Reserved
	001	Reserved for recovery unit
	000	Text
Bits 7, 8	Set to zero, and reserved for future extension.	

5.5.3 With regard to future extension, see the note in § 5.4.2 and § 5.4.3 above.

TABLE 4/T.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
Reserved for private use	1	1	1	1	x	x	x	x

TABLE 5/T.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
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

TABLE 6/T.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
Reserved for private use	1	1	1	1	x	x	x	x

5.6 *Coding of parameter group identifiers and parameter identifiers*

5.6.1 The coding of PGIs and PIs for session commands and responses is shown in Table 7/T.62. The coding of the PGIs and PIs for document commands and responses is shown in Table 8/T.62.

5.6.2 Tables 9/T.62 and 10/T.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/T.62 or 8/T.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/T.62 and 10/T.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 document related PGIs and PIs may possibly be of use to other services.)
010	Document related (for Teletex)
011 100 101	Reserved
110	User data
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.

5.6.5 PGIs and PIs within the same nesting level should be put in the order of increasing binary value. The coding order of PGIs and PIs included in each command or response is defined in Tables 9/T.62 and 10/T.6.

5.6.6 The following rules shall apply to the private use and presently not defined parameters:

a) these parameters, if present in CSS or CDCL (or their corresponding responses), shall not lead to procedural errors;

b) the use of these parameters in other commands or responses must be negotiated upon in advance by CSS or CDCL and their corresponding responses (see § 3.3.2.3);

c) presence of these parameters "unexpectedly" in elements other than CSS, RSSP, CDCL or RDCLP may result in procedural errors;

d) the absence of a parameter of this kind in a response to CSS or CDCL must be interpreted as an indication that the terminal is not capable of handling any of these functions.

5.7 *Parameter values*

5.7.1 *General*

5.7.1.1 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 T.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.

5.7.1.2 Assignment of coding to the various parameter values is shown in the following paragraphs.

5.7.2 *Session related parameters*

Note – The following paragaphs include either session related or both session and document related parameters.

5.7.2.1 *Terminal identifier of the called terminal*

A sequence of graphic characters as defined in Recommendation F.200.

5.7.2.2 *Terminal identifier of the calling terminal*

A sequence of graphic characters as defined in Recommendation F.200.

5.7.2.3 *Date and time*

A sequence of graphic characters as defined in Recommendation F.200.

5.7.2.4 *Additional session reference number*

A fixed length sequence of two decimal digits as coded in Recommendation T.61.

TABLE 7/T.62

Coding of session PGIs and PIs

Parameter group identifier (PGI)		Parameter identifier (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
Non-basic 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
No PGI associated with these PIs		Service identifier	0 0 0 0 1 0 0 0
		Session control functions	0 0 0 1 0 0 0 0
		Session termination parameter	0 0 0 1 0 0 0 1
		Inactivity timer	0 0 0 1 0 0 1 0
		Session service functions	0 0 0 1 0 1 0 0
		Reason	0 0 1 1 0 0 1 0
Non-basic Teletex terminal capabilities	0 1 0 0 0 0 0 1	Control character set	0 1 0 0 1 0 0 1
		Teletex page format	0 1 0 0 1 0 1 0
		Miscellaneous Teletex terminal capabilities	0 1 0 0 1 0 1 1
Session user data	1 1 0 0 0 0 0 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
		Non-standardized capabilities	1 1 1 0 1 0 0 0

TABLE 8/T.62

Coding of document PGIs and PIs

Parameter group identifier (PGI)		Parameter identifier (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		
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
		Checkpoint reference number	0 0 1 0 1 0 1 0
No PGI associated with these PIs		Inactivity timer	0 0 0 1 0 0 1 0
		Service interworking identifier	0 0 1 0 1 0 0 0
		Document reference number	0 0 1 0 1 0 0 1
		Checkpoint reference number	0 0 1 0 1 0 1 0
		Acceptance of CDCL parameters	0 0 1 0 1 1 0 0
		Storage capacity negotiation	0 0 1 0 1 1 0 1
		Receiving ability jeopardized	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	0 0 1 1 0 0 1 0
Reserved for extension	0 1 0 0 0 0 0 0		

TABLE 8/T.62 *(continued)*

Parameter group identifier (PGI)		Parameter identifier (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
Non-basic Teletex terminal capabilities	0 1 0 0 0 0 0 1	Graphic character set	0 1 0 0 1 0 0 0
		Control character set	0 1 0 0 1 0 0 1
		Teletex page format	0 1 0 0 1 0 1 0
		Miscellaneous Teletex terminal capabilities	0 1 0 0 1 0 1 1
		Character box height	0 1 0 0 1 1 0 1
		Character box width	0 1 0 0 1 1 1 0
Session user data	1 1 0 0 0 0 0 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
		Non-standardized capabilities	1 1 1 0 1 0 0 0

TABLE 9/T.62

PGIs and PIs for session elements of procedure

Session command or response identifier	Parameter group identifier (PGI)		Parameter identifier (PI)	
	Description	Mandatory or not mandatory	Description	Mandatory or not mandatory
CSS	Session reference	m	Terminal identifier of the calling terminal	m
			Date and time	m
			Additional session reference number	nm
	Non-basic session capabilities	nm	Miscellaneous session capabilities	nm
			Window size (Note)	nm
			Service identifier	m
			Inactivity timer	nm
			Session service functions	nm
	Non-basic Teletex terminal capabilities	nm	Control character sets	nm
			Teletex page formats	nm
			Miscellaneous Teletex terminal capabilities	nm
	Session user data	nm		
	Private use	nm		
			Non-standardized capabilities	nm
CSE			Session termination parameter	nm
CSA			Session termination parameter	m
CSCC				
CSUI			Session control functions	nm

TABLE 9/T.62 *(continued)*

Session command or response identifier	Parameter group identifier (PGI)		Parameter identifier (PI)	
	Description	Mandatory or not mandatory	Description	Mandatory or not mandatory
RSSP	Session reference	m	Terminal identifier of the called terminal	m
			Date and time	m
			Additional session reference number	nm
	Non-basic session capabilities	nm	Miscellaneous session capabilities	nm
			Window size	nm
			Service identifier	m
			Session control functions	nm
			Inactivity timer	nm
			Session service functions	nm
	Non-basic Teletex terminal capabilities	nm	Control character sets	nm
			Teletex page formats	nm
			Miscellaneous teletex terminal capabilities	nm
	Session user data	nm		
	Private use	nm		
			Non-standardized capabilities	nm

TABLE 9/T.62 *(end)*

Session command or response identifier	Parameter group identifier (PGI)		Parameter identifier (PI)	
	Description	Mandatory or not mandatory	Description	Mandatory or not mandatory
RSSN	Session reference	m	Terminal identifier of the called terminal	m
			Date and time	m
			Additional session reference number	nm
	Non-basic session capabilities	nm	Miscellaneous session capabilities	nm
			Window size	nm
			Service identifier	m
			Session service functions	nm
			Reason	nm
	Non-basic Teletex terminal capabilities	nm	Control character sets	nm
			Teletex page formats	nm
			Miscellaneous Teletex terminal capabilities	nm
	Session user data	nm		
	Private use	nm		
RSEP				
RSAP				
RSCCP				
RSUI			Session control functions	nm

Note – This parameter "window size" in CSS, RSSP and RSSN is mandatory for the Group 4 facsimile service (see § 4.3.2), but not mandatory for the Teletex service.

TABLE 10/T.62.

PGIs and PIs for document elements of procedure

Document command or response identifier	Parameter group identifier (PGI)		Parameter identifier (PI)	
	Description	Mandatory or not mandatory	Description	Mandatory or not mandatory
CDS			Service interworking identifier	nm
			Document reference number	m
			Document type identifier	nm
	Non-basic Teletex terminal capabilities	nm	Graphic character sets	nm
			Control character sets	nm
			Teletex page formats	nm
			Miscellaneous Teletex terminal capabilities	nm
			Character box height	nm
			Character box width	nm
	Session user data	nm		
	Private use	nm		

TABLE 10/T.62 *(continued)*

Document command or response identifier	Parameter group identifier (PGI) Description	Mandatory or not mandatory	Parameter identifier (PI) Description	Mandatory or not mandatory
CDC	Document linking	m	Terminal identifier of the called terminal	m
		Note	Terminal identifier of the calling terminal	m
			Date and time	m
			Additional session reference number	nm
			Document reference number	m
			Checkpoint reference number	m
			Service interworking identifier	nm
			Document reference number (current session)	m
			Document type identifier	nm
	Non-basic Teletex terminal capabilities	nm	Graphic character sets	nm
			Control character sets	nm
			Teletex page formats	nm
			Miscellaneous Teletex terminal capabilities	nm
			Character box height	nm
			Character box width	nm
	Session user data	nm		
	Private use	nm		

TABLE 10/T.62 *(continued)*

Document command or response identifier	Parameter group identifier (PGI)		Parameter identifier (PI)	
	Description	Mandatory or not mandatory	Description	Mandatory or not mandatory
CDE			Checkpoint reference number	m
CDR			Reason	nm
CDD			Reason	nm
CDPB			Checkpoint reference number	m
CDUI				
CDCL			Inactivity timer	nm
			Storage capacity negotiation	nm
	Non-basic Teletex terminal capabilities	nm	Graphic character sets	nm
			Control character sets	nm
			Teletex page formats	nm
			Miscellaneous Teletex terminal capabilities	nm
			Character box height	nm
			Character box width	nm
	Session user data	nm		
	Private use	nm		
			Non-standardized capabilities	nm
RDEP			Checkpoint reference number	m

TABLE 10/T.62 *(end)*

Document command or response identifier	Parameter group identifier (PGI)		Parameter identifier (PI)	
	Description	Mandatory or not mandatory	Description	Mandatory or not mandatory
RDRP				
RDDP				
RDPBP			Checkpoint reference number	m
			Receiving ability jeopardized	m
RDPBN			Reason	m
RDCLP			Inactivity timer	nm
			Acceptance of CDCL parameters	nm
			Storage capacity negotiation	nm
	Non-basic Teletex terminal capabilities	nm	Graphic character sets	nm
			Control character sets	nm
			Teletex page formats	nm
			Miscellaneoux Teletex terminal capabilities	nm
			Character box height	nm
			Character box width	nm
	Session user data	nm		
	Private use	nm		
			Non-standardized capabilities	nm
RDGR			Reflect parameter values	m

Note – These PIs are required only if linking is attempted in a new session.

5.7.2.5 *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.

Bit 3 of the first octet set to 1 indicates the terminal capability for interactive operation.

All other bit values are reserved for future standardization.

5.7.2.6 *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).

5.7.2.7 *Service identifier*

The coding for the service identifier is as follows:

Bits 87654321	Service
00000001	Telematic

All other encodings are for further study.

5.7.2.8 *Session control functions*

When used with a response, i.e. either RSSP or RSUI, the following bit assignments are defined in the first octet:

a) bit 1 set to 1 indicates request control (as defined in this Recommendation);

b) all other bits are reserved for future standardization.

5.7.2.9 *Session termination parameter*

Bit 1 of the first octet set to 1 indicates that the transport 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.

5.7.2.10 *Reason (session or document)*

A field indicating the reason for sending the associated command or response. The value can either be given as a binary coded field or as plain text message. The absence of this parameter indicates that no reason is given.

Bits 87654321	*Reason*
00000000	No specific reason stated (used for session or document reasons other than those listed);
00000001	Temporarily unable to enter into, or to continue, a session (e.g. due to memory full or out of recording paper);
00000010	Explicit text message only for use with RSSN (see Note 1);
00000011	Sequence error (Note 2);
00000101	Local terminal error (Note 2);
00000110	Unrecoverable procedural error (Note 2).

Note 1 – For the basic Teletex service, the text follows immediately after the first byte of the value. Maximum of 69 characters (control characters included). Only characters convertible one-to-one to the telex alphabet (ITA2) shall be allowed. Teletex code shall be used.

Note 2 – These parameter values are valid only in document commands and responses.

5.7.2.11 *Inactivity timer*

a) Bits 8 and 7 indicate the unit of inactivity timer value and bits 6 to 1 indicate the binary value in the range of 1 to 63.

Bits 87	*Unit of timer*
00	Second(s);
01	Minute(s);
10	Hour(s);
11	Reserved for extension.

b) All bits of the first octet set to zero indicates the inactivity timer value is of infinity, i.e. the timer is disabled.

5.7.2.12 *Session service functions*

The parameter value is indicated by a sequence of two octets.

a) In octet 1:

Bits 8-4 (Note 1)	Reserved (set to 0).
Bit 3	Set to 1 to indicate the typed data capability (for further study).
Bit 2 (Note 2)	Set to 1 to indicate the ability to send RDPBN.
Bit 1 (Note 2)	Set to 1 to indicate the ability to send/receive CDCL/RDCLP.

b) In octet 2:

Bits 8, 6, 5 and 3 (Note 1)	Reserved (set to 0).
Bit 7 (Note 2)	Set to 1 to indicate the capability of document transfer.
Bit 4 (Note 2)	Set to 1 to indicate the capability of page synchronization [CDPB/ RDPBP(N)].
Bits 2-1 (Note 3)	Set to 0 1 to indicate "half duplex"
	Set to 1 0 to indicate "duplex"

Note 1 – All bits reserved should be ignored when comparing capabilities indicated in CSS and RSSP.

Note 2 – The indicated bits should be set (to 1 for document transfer and to 0 for no document transfer) as a unit.

Note 3 – Half-duplex and duplex are for further study.

The absence of this parameter should be interpreted as the following default values:

	Bits 87654321
Octet 1:	00000011
Octet 2:	01001001

5.7.2.13 *Non-standardized capabilities*

The first octet represents the registered CCITT country code as specified in Recommendation T.35 to be used to identify non-standard capabilities. Additional octets, may be specified by each country's Administration.

5.7.2.14 *Session user data*

Some parameters associated with this PGI are defined in the T.400 series of Recommendations. The maximum length of this user data field following the PGI and its LI is restricted to 512 octets.

5.7.2.15 *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 command and responses, the use of these parameters is not defined.

5.7.3 *Document related parameters*

Note – The following paragraphs include parameters commonly used by basic Teletex and Group 4 facsimile services.

5.7.3.1 *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.

5.7.3.2 *Document reference number*

A sequence of decimal digits as defined in this Recommendation and coded in Recommendation T.61.

5.7.3.3 *Checkpoint reference number*

A sequence of decimal digits as defined in this Recommendation and coded in Recommendation T.61.

5.7.3.4 *Acceptance of CDCL parameters*

Bit 1 of the first octet set to 1 indicates acceptance of all non-basic terminal capabilities which are defined in this Recommendation and requested by a CDCL command.

All other bit values are reserved for future standardization.

Note – Bit 1 of the first octet set to 1 does not indicate accepance of non-basic terminal capabilities conveyed in the session under data of CDCL.

5.7.3.5 *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 the 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 required/reserved in kilo-octets.

c) Bit 5 of the first octet set to 1 indicates that the binary field in the following octet contains a number, which, when multiplied by 16, indicates storage capacity required/reserved in kilo-octets.

d) Bit 6 of the first octet set to 1 indicates that the binary field in the following octet contains a number, which, when multiplied by 256, indicates storage capacity required/reserved in kilo-octets.

e) Bit 3 of the first octet set to 1 indicates that a terminal cannot estimate its memory capacity.

f) Bit 4 of the first octet set to 1 indicates that a terminal cannot now reserve the requested amount of memory.

g) In the first octet, only one of bits 2, 5 and 6 may be set to 1. For negotiation of storage capacity less than or equal to 255 kilo-octets, bit 2 shall be used.

   Note – Use of bit 5 or 6 for negotiation of a storage capacity greater than 65 kilo-octets but less than or equal to 255 kilo-octets is not to be interpreted as a procedural error by the receiver.

h) Bits 7 and 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.

In cases a), e) and f), the second octet may be ignored by the recipient of RDCLP.

5.7.3.6 *Receiving ability jeopardized*

The first octet shall be encoded as follows:

Bits 87654321	*Meaning*
00000000	Further traffic can be accepted.
00000001	Ability to receive further traffic is jeopardized.

All other binary values are reserved for future standardization.

5.7.3.7 *Document type identifier*

Absence of this parameter shall indicate a normal document. This parameter, if used, is a binary encoded field of fixed length of one octet identifying the document type as follows:

Bits 87654321	*Type of document*
00000001	Operator document.
00000010	Control document.
00000011	Monitor document.

All other encodings are reserved for future standardization.

5.7.3.8 *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.

5.7.4 *Document related parameter for teletex*

Note – The following parameters may also be used by services other than teletex.

5.7.4.1 *Control character sets* (refer to Recommendations T.60 and T.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 to designate that set, as defined in Recommendation T.61. Where more than one such character set are to be indicated, the ESC character fulfills the purpose of a separator between the character set indicators.

5.7.4.2 *Graphic character sets* (refer to Recommendations T.60 and T.61)

5.7.4.2.1 A variable length field indicating the receiving capabilities for non-basic standardized graphic character sets. Each such graphic character sets or DRCS (Dynamically redefinable character set) for Japanese Kanji and Chinese ideogram characters shall be indicated by the sequence of characters used to designate that set, as defined in Recommendation T.61. Where more than one such character set are to be indicated, the ESC character fulfills the purpose of a separator between the character set indicators.

5.7.4.2.2 The following descriptions apply to the use of a DRCS set for Japanese Kanji and Chinese ideogram characters:

a) if the DRCS set is indicated as a parameter value associated with a CDS or CDC command, this should be followed by combinations of a character code (CC) to be registered to the DRCS set and its character dot pattern (DP);

b) the field length of a character code is defined by the DRCS set and that of a character dot pattern is indicated as parameter values of a character box height and a character box width.

Note – The PV field of this parameter in either CDS or CDC will be as follows:

$$\text{DRCS } CC_1 \ DP_1 \ CC_2 \ DP_2 \ldots CC_i \ DP_i$$

5.7.4.3 *Teletex page formats* (refer to Recommendations T.60 and T.61)

The value of the first octet of the parameter value will indicate the capability of a page format, as defined in Table 11/T.62. If the terminal is capable of more than one format, these will be indicated in the first and subsequent octets, one octet per value (see Note 1 of Table 11/T.62). No separator between the values will be given. The length indicator of the parameter will indicate if more than one value is given. All parameter values shall be inserted in increasing order of their binary values.

TABLE 11/T.62

Bits 8 7 6 5 4 3 2 1		Format
0 0 0 0 0 0 0 1	(option)	ISO A4, horizontal and vertical
0 0 0 0 0 0 1 0	(option)	North American, horizontal and vertical
1 0 0 0 0 1 0 0	(option)	ISO A4 extended (ISO standard 3535), vertical
0 1 0 0 0 1 0 0	(option)	ISO A4 extended (ISO standard 3535), horizontal
1 0 0 0 1 0 0 0	(option)	North American legal, vertical
0 1 0 0 1 0 0 0	(option)	North American legal, horizontal
0 0 0 0 0 0 1 1	(option)	ISO A4, horizontal and vertical (for use by Japanese Kanji and Chinese ideogram terminals)
0 0 0 1 0 0 0 0	(option)	ISO B5, horizontal and vertical (for use by Japanese Kanji and Chinese ideogram terminals)
0 0 1 0 0 0 0 0	(option)	ISO B4, horizontal and vertical (for use by Japanese Kanji and Chinese ideogram terminals)

Note 1 – The whole octet has to be considered when decoded, since the meaning is coded as a value, not as a single bit position within the octet. All other values are reserved, i.e. it is not allowed to "combine" the indication of several formats into the same octet by setting more than one bit to "one".

Note 2 – The following rule is used for the coding of bits 7 and 8:

Bits 8 7	*Meaning*
0 0	Vertical and horizontal
0 1	Horizontal only
1 0	Vertical only.

5.7.4.4 *Miscellaneous terminal capabilities* (refer to Recommendation T.61)

A variable length field indicating the receiving capabilities for non-basic standardized values of character spacing, line spacing and graphic renditions. Each parameter value of such a function shall be indicated by the control sequence (CSI P_i I_i F) as defined in Recommendation T.61. This applies to the functions Select Horizontal Spacing (SHS) for a character pitch, Select Vertical Spacing (SVS) for a line pitch and Select Graphic Rendition (SGR) for a graphic rendition. This also applies to the functions Graphic Size Modification (GSM) and Select Presentation Direction (SPD) for Japanese Kanji and Chinese ideogram capabilities, and to Select Character Orientation (SCO) for Chinese ideogram capabilities. When more than one such character sequence is to be indicated, a single space shall be inserted between them. Only one parameter value is allowed within a CSI sequence.

5.7.4.5 *Character box height*

A variable length field indicating the receiving capabilities for the number of dots of the character box height. The number of dots shall be indicated by the numeric character as defined in T.61.

Further study is required for indicating more than one value.

5.7.4.6 *Character box width*

A variable length field indicating the receiving capabilities for the number of dots of the character box width. The number of dots shall be indicated by the numeric character as defined in T.61.

Further study is required for indicating more than one value.

ANNEX A

(to Recommendation T.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 T.60.

A.1.2 **call**

F: communication

S: comunicación

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 llamante (que llama)

The terminal that initiates the procedures to establish a call.

A.1.4 **called terminal**

F: équipement terminal demandé

S: terminal llamado

The 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; orden

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)

User information is transferred from a source to a sink.

A.1.9 **group 4 facsimile apparatus**

F: télécopieur du groupe 4

S: aparato facsímil del grupo 4

A device that is capable of transmitting and receiving facsimile documents in accordance with the basic requirements of Recommendation T.5.

A.2 *Terms specific to session procedures*

A.2.1 **session**

F: session

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.2.2.1 **one way communication (OWC)**

F : échange unidirectionnel (UND)

S : communicación unidireccional (UND)

User 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.

A.2.2.2 **two way alternate (TWA)**

F : échange bidirectionnel à l'alternat (BDA)

S : modo bidireccional alternado (BDA)

User 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.

A.2.2.3 **two way simultaneous (TWS)**

F : échange bidirectionnel simultanné (BDS)

S : modo bidireccional simultáneo (BDS)

User 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 la session

S: referencia básica de la sesión

The basic session reference is used to identify a session. It consists of:

a) terminal identifier of the called terminal;

b) terminal identifier of the calling terminal;

c) date and time.

A.2.4 **expanded session reference**

F: référence élargie de la session

S: referencia extendida de la sesión

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 **page**

F: page

S: página

The basic element of office correspondence in the Telematic services. One A4 (or A4L, North American Standard or North American Legal) page or the information that may be presented on it.

A.3.3 **checkpoint**

F: point de repère

S: punto de comprobación; punto de validación

A checkpoint 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 checkpoints that a sender can transmit without receiving an acknowledgement from the receiver.

ANNEX B

(to Recommendation T.62)

Telematic modes of operation

B.1 *Introduction*

B.1.1 The purpose of this annex is to provide for explanation on the Telematic modes of operation that are realized by the use of this Recommendation.

B.2 *Telematic modes of operation*

There are three modes of operation defined for the Telematic services.

B.2.1 **document transfer mode**

This mode allows only for transfer of documents without interactive capability. Procedures applying to this mode are defined in the main body of this Recommendation.

B.2.2 **interactive mode**

This mode allows only for interactive dialogue. No document transfer can take place. Procedures applying to this mode are for further study.

B.2.3 **document transfer and interactive mode**

This mode allows for interleaving of document transfer with interactive dialogue. Procedures applying to this mode are for further study.

B.3 *Relationship between Telematic modes of operation and the OSI session services*

B.3.1 *Required session service subsets*

B.3.1.1 The three modes of operation defined in § B.2 above use different subsets of the OSI session services as illustrated in Figure B-1/T.62.

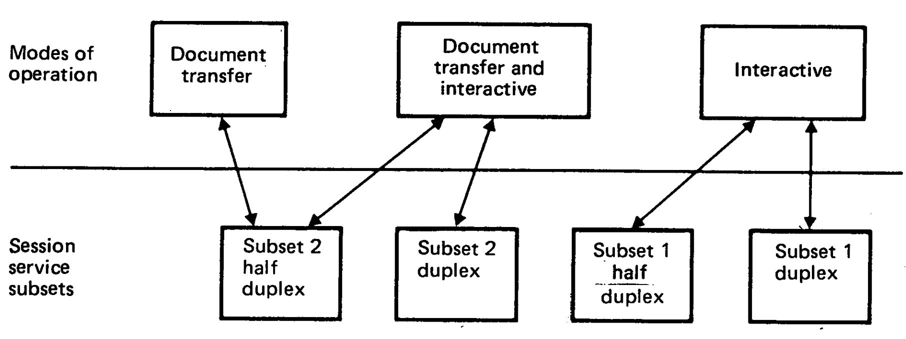


FIGURE B-1/T.62

Modes of operation and supporting session service subsets

B.3.1.2 *Subset 1*

This subset is composed of:

a) kernel functional unit;

b) half-duplex functional unit;

c) duplex functional unit;

d) typed data functional unit.

For one connection, only either duplex or half-duplex functional units can be selected.

B.3.1.3 *Subset 2*

This subset is composed of:

a) kernel functional unit;

b) half-duplex functional unit;

c) duplex functional unit;

d) typed data functional unit;

e) capability data exchange functional unit;

f) minor synchronize functional unit;

g) exception functional unit;

h) activity management functional unit.

Typed data functional unit is an option for the "interactive" and "document transfer and interactive" modes.

Only half-duplex functional unit can be used for the document transfer mode. Either half-duplex or duplex functional unit can be used for "interactive" and "document transfer and interactive" modes.

B.3.2 *Restrictions on the use of the session services*

B.3.2.1 Every mode of operation specifies how it uses the session services. This encompasses restrictions put on the generality offered by the session services. A number of them are reflected in the state transition diagrams given in Annex G. For this, these state transition diagrams take into account only those sequences of events, which are valid in the respective mode of operation, at the session layer boundary.

B.3.3 *Selection of a specific mode*

B.3.3.1 The selection of a particular mode is achieved through the negotiation of the session services available over the established session.

B.3.3.2 Table B-1/T.62 summarizes different cases that may occur and the results of the negotiation.

Note – The availability of the typed data service has no impact on the selection of a mode. If the availability of this has been agreed to, it can be used in any mode.

B.3.3.2.1 The result of the negotiation of the session services can be:

a) the functionalities of the subset 2 have been agreed to. The duplex mode is in use;

b) the functionalities of the subset 2 have been agreed to. The half duplex mode is in use;

c) only the functionalities of the subset 1 have been retained by both systems.

B.3.3.2.2 The combination of the supported capabilities can be:

d) document transfer is the only capability commonly supported by both systems;

e) both systems have indicated that they have the interactive capability.

TABLE B-1/T.62

Selection of a mode of operation

	a)	b)	c)
d)	–	Mode I	–
e)	Mode III	Mode III	Mode II

Note 1 – Modes I, II and III stand for "document transfer", "interactive" and "document transfer and interactive" modes, respectively.

Note 2 – Cases a) to c) are explained in § B.3.3.2.1, cases d) and e) in § B.3.3.2.2.

ANNEX C

(to Recommendation T.62)

Definition of valid/invalid session protocol data units

C.1 *Introduction*

This annex is intended to provide the comprehensive definition and rules on valid/invalid session protocol data units (SPDUs).

C.2 *Invalid protocol data units (PDUs) (definition and rules)*

If the command/response PDUs do not meet the following conditions, such PDUs are invalid:

a) the sum of the length indicators (LIs) of parameter group identifiers (PGIs) and freestanding parameter identifiers (PIs) is equal to the overall LI;

b) the sum of the LIs of PIs embedded within recognized PGIs is equal to the PGIs LI;

c) for all mandatory parameters, the PGIs or PIs are present and the LIs are not equal to zero.

Note 1 – In case of CSA, RSAP and RSSN PDUs, the same checking rules may be applied. However, it is recognized that no externally visible procedure is provided to react to the detection of such invalid PDUs.

Note 2 – Invalid RDPBN or RDGR can either be rejected or processed normally to start error recovery.

Note 3 – When receiving an invalid CSS it is recommended that the connection be refused by serving an RSSN with the appropriate parameters and not to release the transport connection.

Note 4 – An equipment is not required to make any checking at all on parameters it does not support. In such cases it may also omit the checking of the overall LI. In particular it should be noted that not recognized parameters, e.g. new parameters, may appear either between supported parameters or after the complete set of supported parameters.

C.3 *Valid PDUs (rules for mandatory acceptance of PDUs)*

An SPDU shall not be rejected if it does not meet the rejection conditions described n § C.2. They must not be rejected for any of the following conditions:

a) the presence of a non-mandatory PI or PGI of having an LI = 0;

b) the presence of any 3-octet LI, the coding of which follows the rules described in § 5.3.3 of the main body of Recommendation T.62;

c) the presence of any correctly formed parameter value (PV) for which future values can be assigned;

d) the presence of one or more undefined PIs or PGIs in CSS or CDCL and their corresponding responses;

e) the presence of a T.61 coded hyphen ("-") instead of a colon (":") as the separator between the hours and minutes of the date and time PV in CSS;

f) a greater or smaller length of the CRN (checkpoint reference number) in RDPBP than the CRN in the correponding CDPB (with more or less preceding zeros);

g) more PVs in RSSP or RSSN than in CSS.

Note – The scope of these rules are restricted to the determination of protocol element validity (formal validity) and do not impact on rejection of protocol elements due to the functions they invoke.

ANNEX D

(to Recommendation T.62)

General description and rules of operation for state diagrams

D.1 Each state diagram is in only one state at any time.

D.2 Each state is represented as an ellipse, which contains a number for reference and a descriptive name.

D.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.

D.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.

D.5 An event is either the sending (S-) or reception (R-) of a command or a response or an indicated local operation.

D.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.

D.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. A demand response 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.

D.8 The effect of each event that causes a state transition must be completed prior to consideration of a subsequent event.

D.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 telematic facilities, incurring unnecessary charges where the service is not being used effectively, and causing degradation of the service.

D.10 The purpose of the state diagrams is to assist in defining proper use of the elements of procedure, and not to define any particular implementation.

ANNEX E

(to Recommendation T.62)

Types of document

E.1 *General*

E.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.

E.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).

E.1.3 No additional procedure elements or changes in state transition diagrams are required.

E.2 *Normal document*

E.2.1 This is the normal type of document to be used to transfer text in the Telematic services. Upon reception the document may be immediately printed (in the case of G4 facsimile Class 1) or be immediately stored (all other terminals).

E.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.

E.3 *Operator document* (optional)

E.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, preferably (due to the application), it shall 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.

E.4 *Control document*

E.4.1 The control document can be used in communication with intermediate store-and-forward equipment; e.g. interworking with the telex service, in standardized options and national applications.

E.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 outside the scope of this Recommendation.

E.4.3 Teletex terminals shall be able to support the control documents defined, in Recommendation T.90, for interworking with the telex service.

E.5 *Monitor document* (optional)

E.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.

E.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 F

(to Recommendation T.62)

Interactive session protocol and typed data transfer for the Telematic services

Note – Further study is required for such capabilities.

ANNEX G

(to Recommendation T.62)

Detailed state transition diagrams for session/document procedures

G.1 *General*

This annex provides detailed state transition diagrams for session/document procedures for the basic services. These diagrams are modelled using the terminology of the open systems interconnection (OSI) model and are aligned with the latest understanding of the CCITT and ISO activities on the OSI session layer. These diagrams are also aligned with the state transition diagrams in this Recommendation but assume a window-independent mechanism.

G.2 *Description on notations*

G.2.1 These diagrams use a presentation method which provides the following levels of description.

a) *Protocol level*

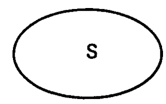
This level addresses only the peer to peer protocol activities between two session entities. It identifies the protocol states, events [receipt of session protocol data units (SPDUs)] and actions (sending of SPDUs).

b) *Detailed level*

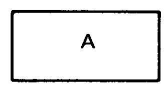
This level addresses the inter-layer and local activities (e.g. management of timers, counters, etc.). It identifies the events, actions and states within each of the protocol level states. The inter-layer activities are described using the session service primitives defined in § G.3.

G.2.2 *Presentation symbols*

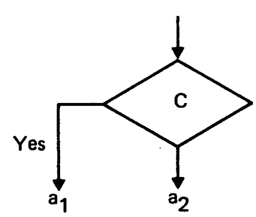
G.2.2.1 *State S*



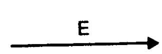
G.2.2.2 *Action A*



G.2.2.3 If condition C is true, then action a_1, otherwise, action a_2.



G.2.2.4 *Event E*



G.2.2.5 *Send SPDU action*

G.2.2.6 *Receive SPDU event*

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G.2.2.7 *Timers*

a) *Timer T1* – Inactivity timer, value as determined by inactivity timer value negotiation.

b) *Timer T2* – Demand response timer, value 60s [see the Note in § 4.1.1.d)].

c) *Timer T3* – CSA timer of, for example, 4 seconds.

G.2.3 *Notes*

G.2.3.1 With regard to the interactions between session and transport layers, the following is assumed:

a) Each SPDU is transferred by "T-DATA REQ". The transport service data unit (TSDU) will contain the SPDU;

b) Each SPDU is received by "T-DATA IND". The TSDU will contain the SPDU.

G.2.3.2 The management of the various timers requires further study.

G.2.3.3 Response (or confirm) service primitive shall indicate a positive response (or confirm) unless otherwise stated.

G.2.4 *Abbreviations*

G.2.4.1 The abbreviations contained in Table G-1/T.62 apply to the description of service primitives.

TABLE G-1/T.62

Abbreviation of service primitives

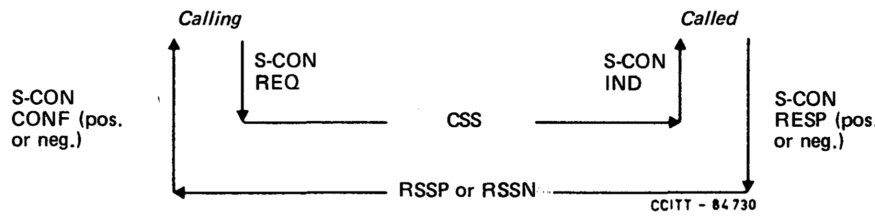
Abbreviation	Meaning	Abbreviation	Meaning
CON	connection	REL	release
CONF	confirmation	REQ	request
IND	indication	RESP	response
POS	positive	NEG	negative
S	session	U	user
P	provider	BEG	begin
CONT	continue	ACT	activity
SYNC	sychronization	MIN	minor
EXPT	exception	CAPAB	capability
ERR	error	FAIL	failure
CTRL	control	PLS	please
INT	interrupt	ABT	abort
DCAD	discard	DISC	disconnection

G.3 *Service primitives*

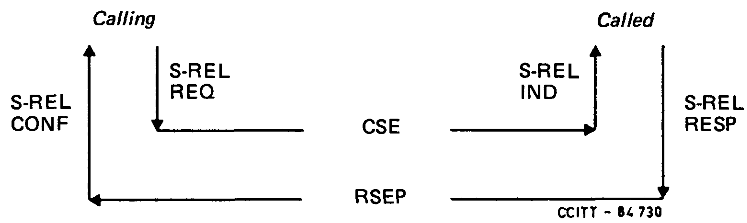
The following illustrates the service primitives and associated SPDUs for the basic session/document control procedures.

G.3.1 *Service primitives for the services provided to the session/document user*

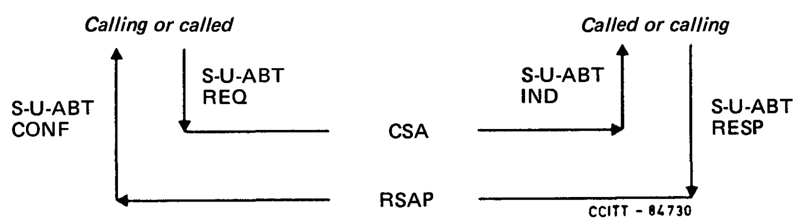
G.3.1.1 *Session connection*



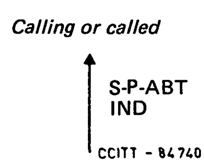
G.3.1.2 *Session release*



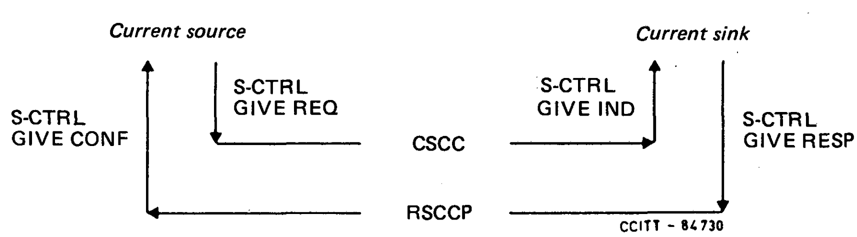
G.3.1.3 *Session user abort*



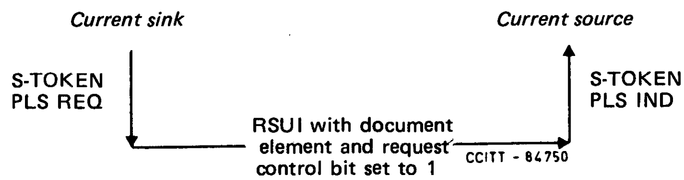
G.3.1.4 *Session provider abort*



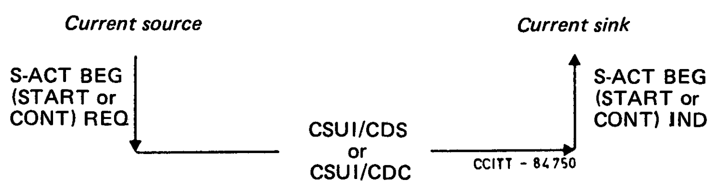
G.3.1.5 *Session control give*



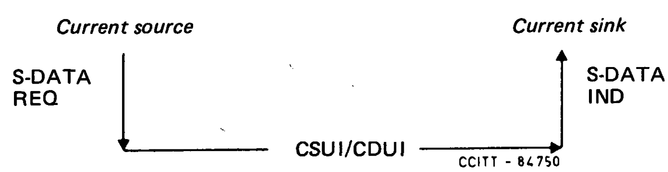
G.3.1.6 *Session token please*



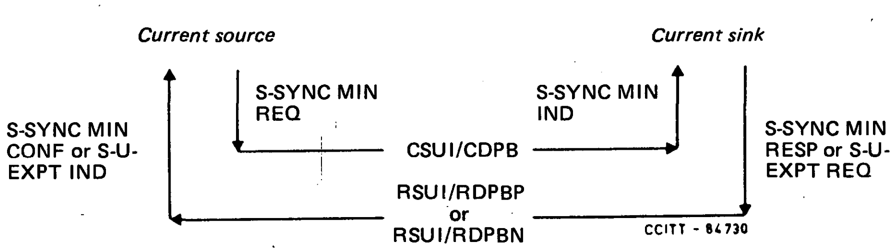
G.3.1.7 *Session activity begin (start or continue)*



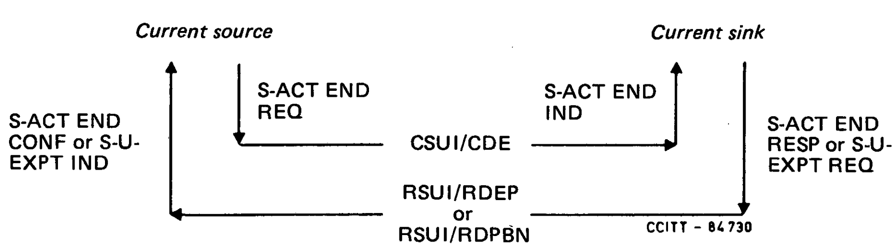
G.3.1.8 *Session data transfer*



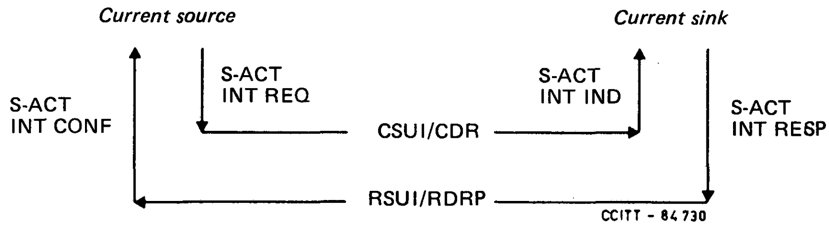
G.3.1.9 *Session synchronization minor*



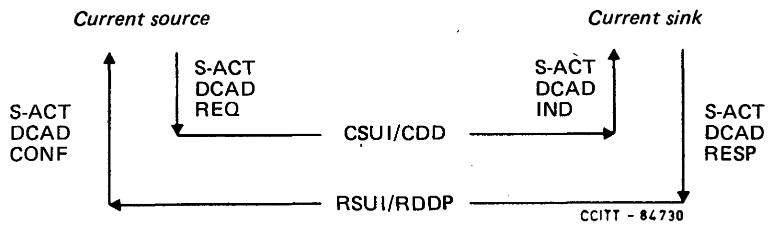
G.3.1.10 *Session activity end*



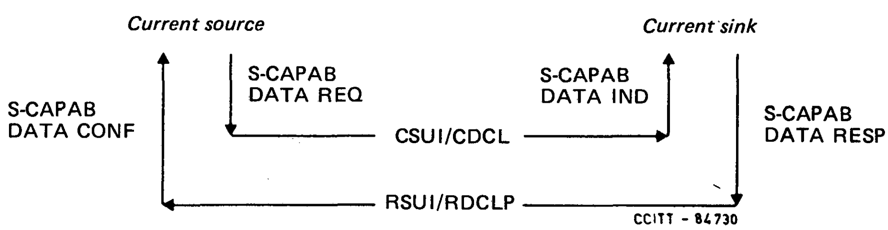
G.3.1.11 *Session activity interrupt*



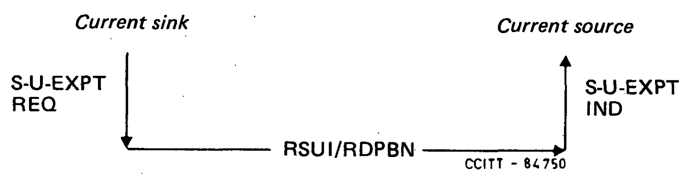
G.3.1.12 *Session activity discard*



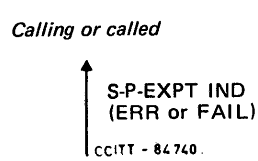
G.3.1.13 *Session capability data*



G.3.1.14 *Session user exception reporting*



G.3.1.15 *Session provider exception reporting*



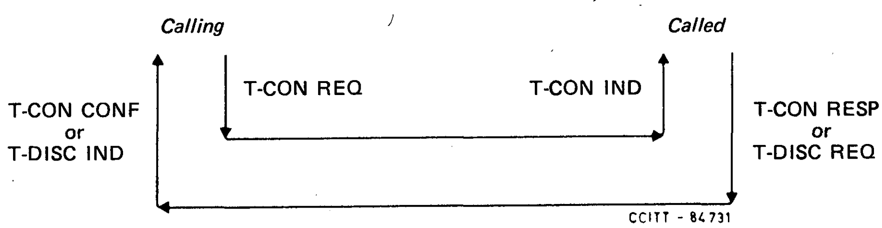
Note – This primitive carries one of the following parameters:

a) ERR – to invite the application to take appropriate action (CDR, CDD, CSA or RDPBN);

b) FAIL – to invite the application to abort (CSA).

G.3.2 *Service primitives for the services expected from the transport layer*

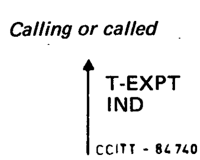
G.3.2.1 *Transport connection*



G.3.2.2 *Transport disconnection (implicit)*

G.3.2.3 *Transport data transfer*

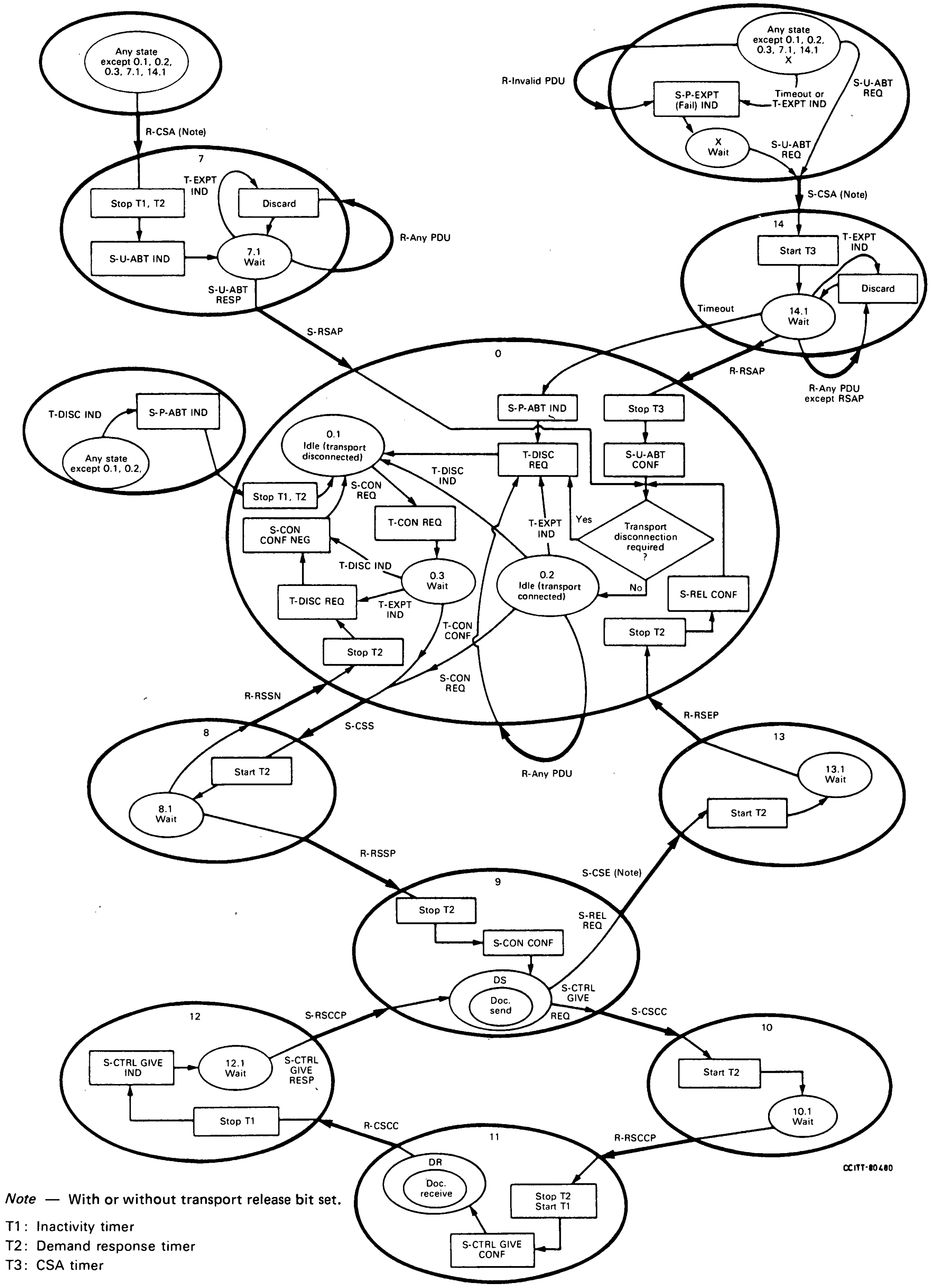
G.3.2.4 *Transport exception reporting (optional and not part of OSI transport class 0)*



G.4 *Detailed state transition diagrams for the basic services*

G.4.1 Figures G-1/T.62 and G-2/T.62 illustrate the detailed state transition diagrams for the calling and the called sides, respectively.

G.4.2 Figures G-3/T.62 and G-4/T.62 illustrate the detailed state transition diagrams for the sending and the receiving protocols, respectively.



Note — With or without transport release bit set.

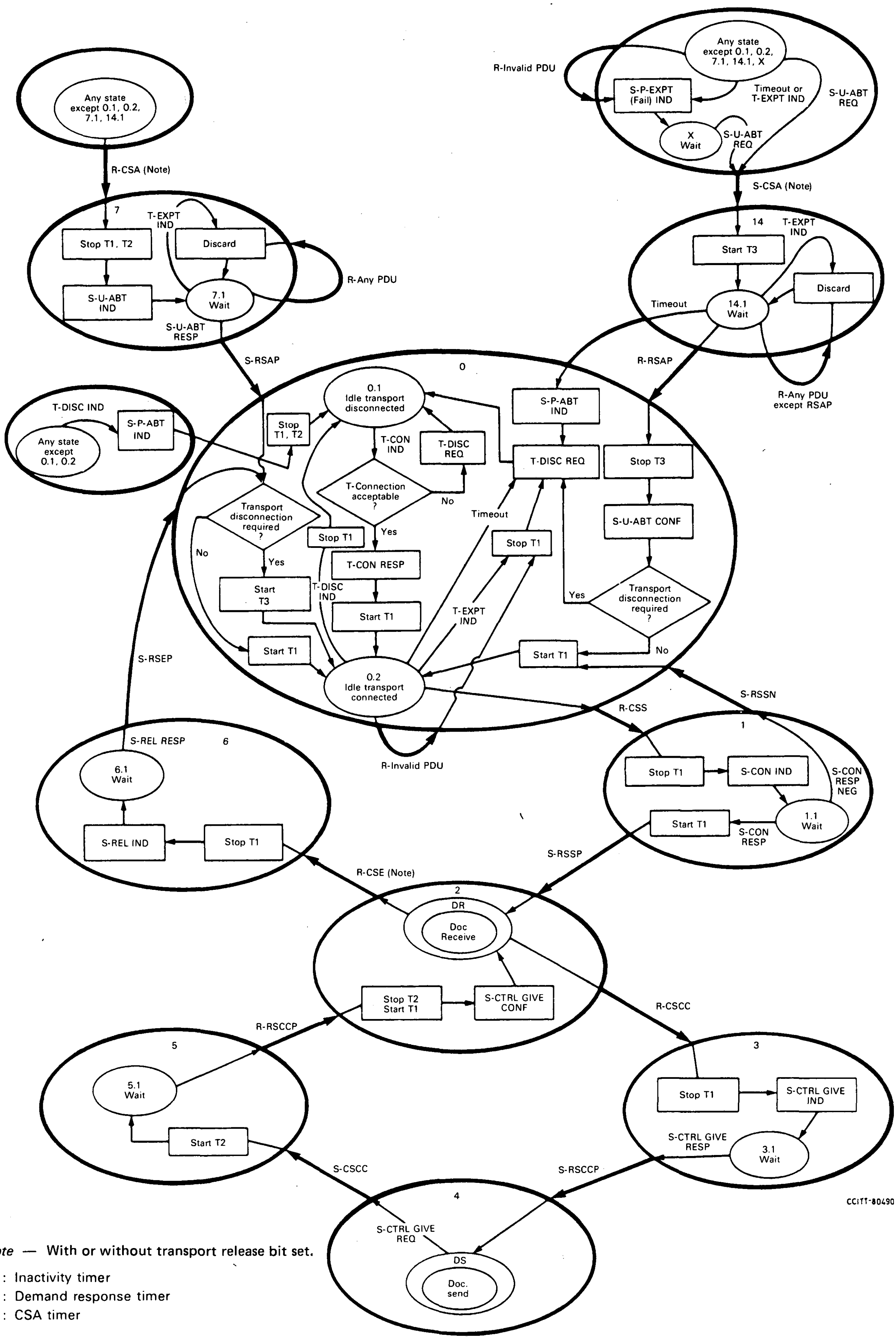
T1: Inactivity timer

T2: Demand response timer

T3: CSA timer

FIGURE G-1/T.62

Teletex session state transition diagram (calling side)



Note — With or without transport release bit set.

T1 : Inactivity timer

T2 : Demand response timer

T3 : CSA timer

FIGURE G-2/T.62

Teletex session state transition diagram (called side)

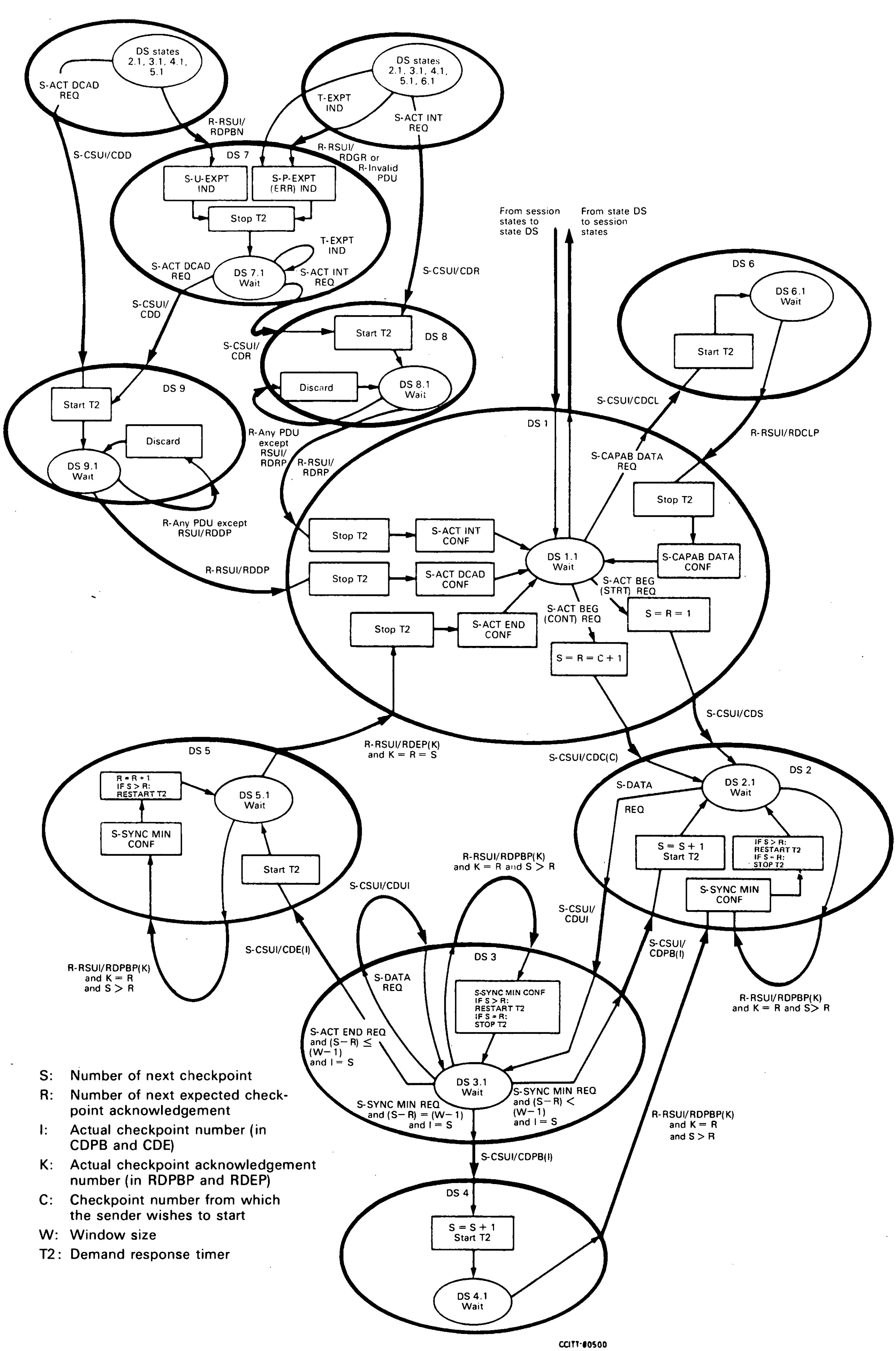
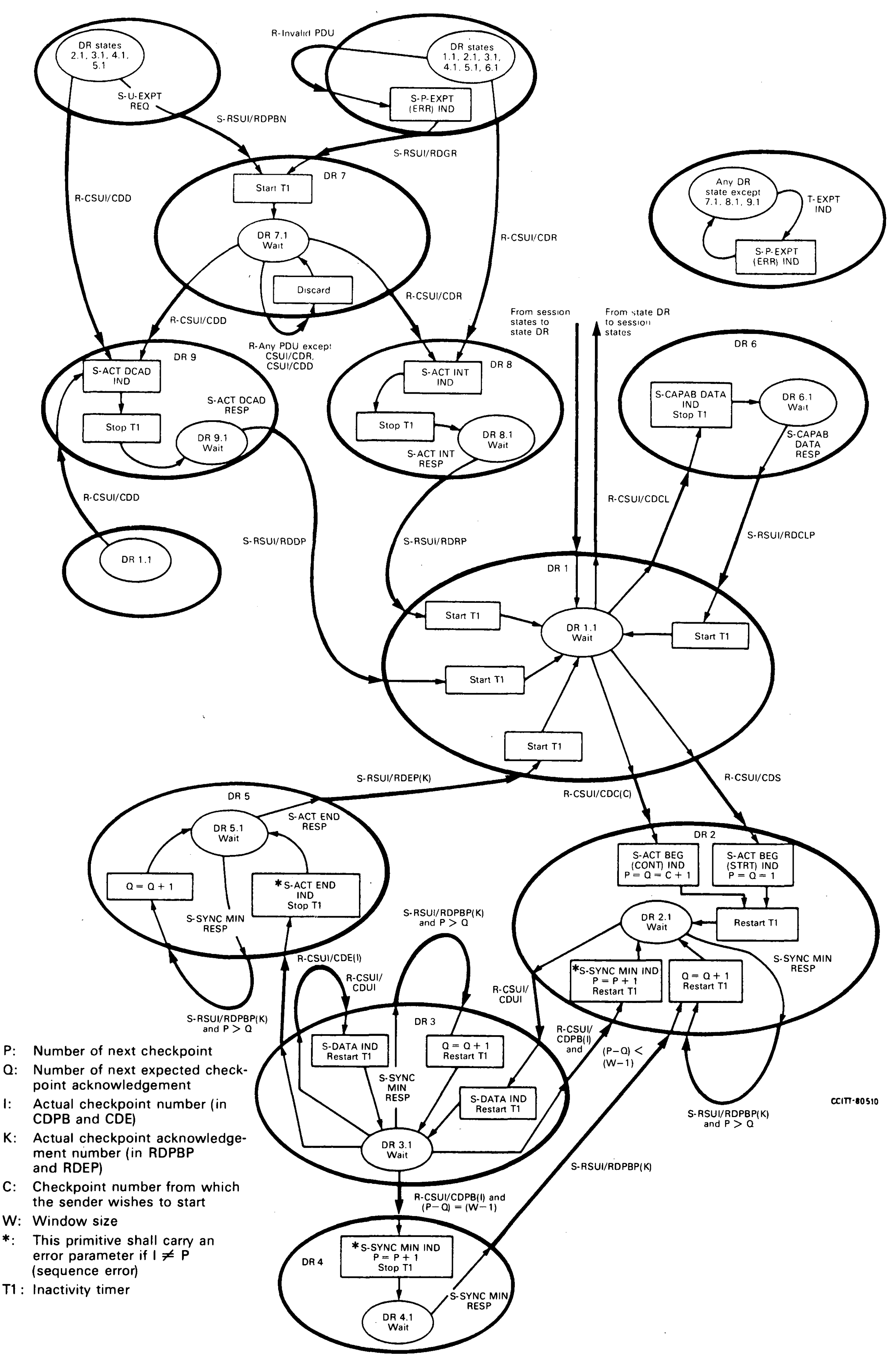


FIGURE G-3/T.62

Teletex document state transition diagram (sending protocol)



P: Number of next checkpoint

Q: Number of next expected checkpoint acknowledgement

I: Actual checkpoint number (in CDPB and CDE)

K: Actual checkpoint acknowledgement number (in RDPBP and RDEP)

C: Checkpoint number from which the sender wishes to start

W: Window size

*: This primitive shall carry an error parameter if I ≠ P (sequence error)

T1: Inactivity timer

FIGURE G-4/T.62

Teletex document state transition diagram (receiving protocol)

ANNEX H

(to Recommendation T.62)

State transition tables for session/document procedures

H.1 *General*

This annex provides state transition tables for session/document procedures for the basic services.

H.2 *Notation details*

H.2.1 *Timers*

H.2.1.1 The following timers are used in the state tables:

a) Timer T1 – Inactivity timer, value as determined by inactivity timer value negotiation

b) Timer T2 – Demand response timer, value 60 seconds

c) Timer T3 – CSA timer of, for example, 4 seconds.

H.2.2 *Notes*

H.2.2.1 Several actions described in the state tables are marked by a number which relates to the following notes:

1) only if T-DISC is not required;

2) ———— [see § H.2.3.2 h) below];

3) alternative error recovery mechanism;

4) this may also be considered as an error;

5) S-SYNC MIN IND with parameter "procedural error";

6) S-SYNC MIN IND with parameter "sequence error";

7) only if the reuse of the transport connection is intended.

H.2.3 *Symbols*

H.2.3.1 For the description of several different conditions Boolean equations and symbols are used.

H.2.3.2 The symbols have the following meanings:

a) $<$ less than;

b) $>$ greater than;

c) $=$ equal;

d) $\neq$ not equal;

e) $\vee$ or;

f) $\wedge$ and;

g) $\neg$ not;

h) ———— event irrelevant in this specific state since error free operation of the considered terminal is assumed.

H.2.4 *Counters*

H.2.4.1 For the description of the dynamic behaviour of parameters such as checkpoint numbers, several counters and parameter abbreviations are introduced.

H.2.4.2 Counters of the source are as follows:

a) S this indicates the next allowed checkpoint reference number for a CDPB or CDE;

b) R this indicates the next expected checkpoint reference number in an RDPBP or RDEP.

H.2.4.3 Counters of the sink are as follows:

a) P this indicates the next expected checkpoint reference number in a CDPB or CDE to be acknowledged by the sink;

b) Q this indicates the next allowed checkpoint reference number to be acknowledged in an RDPBP or RDEP.

H.2.4.4 Parameter abbreviations are as follows:

a) C a checkpoint reference number from which the source will resume transmission (in case of continuation with CDC);

b) I an actual checkpoint reference number in a CDPB or CDE;

c) K an actual checkpoint reference number to be acknowledged in an RDPBP or RDEP;

d) W acknowledgement window size.

H.2.5 *Abbreviations*

H.2.5.1 The abbreviations contained in Table G-1/T.62 apply to the description of service primitives.

H.3 *State tables*

H.3.1 State tables for a calling terminal is shown in Table H-1/T.62.

H.3.2 State tables for a called terminal is shown in Table H-2/T.62.

TABLE H-1/T.62

State transition tables for calling terminal

Calling terminal

Event / State			Idle												Wait			
			0.1				0.2				0.3				7.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		S-CON REQ			T-CON REQ	0.3	START T2	S-CSS		8.1	(——————)				(——————)			
		S-REL REQ	(——————)				(——————)				(——————)				(——————)			
		S-CTRL GIVE REQ	(——————)				(——————)				(——————)				(——————)			
		S-CTRL GIVE RESP	(——————)				(——————)				(——————)				(——————)			
		S-SYNC MIN REQ (I)	(——————)				(——————)				(——————)				(——————)			
		S-SYNC MIN RESP (K)	(——————)				(——————)				(——————)				(——————)			
		S-U-EXPT REQ	(——————)				(——————)				(——————)				(——————)			
		S-ACT END REQ (I)	(——————)				(——————)				(——————)				(——————)			
		S-ACT END RESP (K)	(——————)				(——————)				(——————)				(——————)			
		S-U-ABT REQ	(——————)				(——————)				(——————)				(——————)			
		S-U-ABT RESP	(——————)				(——————)				(——————)					S-RSAP	T-DISCON REQ – 1)	0.1 0.2

TABLE H-1/T.62 *(continued)*

Calling terminal

Event \ State			Idle												Wait			
			0.1				0.2				0.3				7.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		S-ACT BEG (START) REQ	(------------)				(------------)				(------------)				(------------)			
		S-ACT BEG (CONT) REQ (C)	(------------)				(------------)				(------------)				(------------)			
		S-DATA REQ	(------------)				(------------)				(------------)				(------------)			
		S-ACT DCAD REQ	(------------)				(------------)				(------------)				(------------)			
		S-ACT DCAD RESP	(------------)				(------------)				(------------)				(------------)			
		S-ACT INT REQ	(------------)				(------------)				(------------)				(------------)			
		S-ACT INT RESP	(------------)				(------------)				(------------)				(------------)			
		S-CAPAB DATA REQ	(------------)				(------------)				(------------)				(------------)			
		S-CAPAB DATA RESP	(------------)				(------------)				(------------)				(------------)			
		T-CON CONF	(------------)				(------------)				START T2	S-CSS		8.1	(------------)			
		T-DISCON IND	(------------)							0.1			S-CON CONF NEG	0.1			S-P-ABT IND	0.1

TABLE H-1/T.62 *(continued)*

Calling terminal

Event		State	Idle 0.1				Idle 0.2				Idle 0.3				Wait 7.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		T-EXPT IND	(---	---	---	---)			T-DISCON REQ	0.1			T-DISCON REQ S-CON CONF NEG	0.1				7.1
	R-CSS		(---	---	---	---)			T-DISCON REQ	0.1	(---	---	---	---)				7.1
	R-RSSP		(---	---	---	---)			T-DISCON REQ	0.1	(---	---	---	---)				7.1
	R-RSSN		(---	---	---	---)			T-DISCON REQ	0.1	(---	---	---	---)				7.1
	R-CSE		(---	---	---	---)			T-DISCON REQ	0.1	(---	---	---	---)				7.1
	R-RSEP		(---	---	---	---)			T-DISCON REQ	0.1	(---	---	---	---)				7.1
	R-CSA		(---	---	---	---)			T-DISCON REQ	0.1	(---	---	---	---)				7.1
	R-RSAP		(---	---	---	---)			T-DISCON REQ	0.1	(---	---	---	---)				7.1
	R-CSCC		(---	---	---	---)			T-DISCON REQ	0.1	(---	---	---	---)				7.1
	R-RSCCP		(---	---	---	---)			T-DISCON REQ	0.1	(---	---	---	---)				7.1
	R-CSUI/CDS		(---	---	---	---)			T-DISCON REQ	0.1	(---	---	---	---)				7.1

TABLE H-1/T.62 *(continued)*

Calling terminal

Event \ State			Idle												Wait			
			0.1				0.2				0.3				7.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
	R-CSUI/CDC (C)		(			)			T-DISCON REQ	0.1	(			)				7.1
	R-CSUI/CDCL		(			)			T-DISCON REQ	0.1	(			)				7.1
	R-RSUI/RDCLP		(			)			T-DISCON REQ	0.1	(			)				7.1
	R-CSUI/CDE (I)		(			)			T-DISCON REQ	0.1	(			)				7.1
	R-RSUI/RDEP (K)		(			)			T-DISCON REQ	0.1	(			)				7.1
	R-CSUI/CDD		(			)			T-DISCON REQ	0.1	(			)				7.1
	R-RSUI/RDDP		(			)			T-DISCON REQ	0.1	(			)				7.1
	R-CSUI/CDR		(			)			T-DISCON REQ	0.1	(			)				7.1
	R-RSUI/RDRP		(			)			T-DISCON REQ	0.1	(			)				7.1
	R-CSUI/CDUI		(			)			T-DISCON REQ	0.1	(			)				7.1
	R-RSUI/RDGR		(			)			T-DISCON REQ	0.1	(			)				7.1

TABLE H-1/T.62 *(continued)*

Calling terminal

Event			State: Idle												State: Wait			
			0.1				0.2				0.3				7.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
	R-CSUI/CDPB (I)		(———)						T-DISCON REQ	0.1	(———)							7.1
	R-RSUI/RDPBP (K)		(———)						T-DISCON REQ	0.1	(———)							7.1
	R-RSUI/RDPBN		(———)						T-DISCON REQ	0.1	(———)							7.1
	ANY OTHER COMMAND OR RESP OR WRONG FORMAT		(———)						T-DISCON REQ	0.1	(———)							7.1
EXPIRY OF T1			(———)				(———)				(———)				(———)			
EXPIRY OF T2			(———)				(———)				(———)				(———)			
EXPIRY OF T3			(———)				(———)				(———)				(———)			

TABLE H-1/T.62 *(continued)*

Calling terminal

Event: Local event	Event: Protocol event	Event: Service primitive	Wait 8.1: Timer	Wait 8.1: Protocol action	Wait 8.1: Service primitive	Wait 8.1: Final state	9 Document send DS 1.1: Timer	DS 1.1: Protocol action	DS 1.1: Service primitive	DS 1.1: Final state	DS 2.1: Timer	DS 2.1: Protocol action	DS 2.1: Service primitive	DS 2.1: Final state	DS 3.1: Timer	DS 3.1: Protocol action	DS 3.1: Service primitive	DS 3.1: Final state
		S-CON REQ	(-----)				(-----)				(-----)				(-----)			
		S-REL REQ	(-----)				START T2	S-CSE		13.1	(-----)				(-----)			
		S-CTRL GIVE REQ	(-----)				START T2	S-CSCC		10.1	(-----)				(-----)			
		S-CTRL GIVE RESP	(-----)				(-----)				(-----)				(-----)			
		S-SYNC MIN REQ (I) ∧ (S–R)< (W–1) ∧ I=S	(-----)				(-----)				(-----)				START T2	S-CSUI/ CDPB (I) S = S+1		DS 2.1
		S-SYNC MIN REQ (I) ∧ (S–R) = (W–1) ∧ I=S	(-----)				(-----)				(-----)				START T2	S-CSUI/ CDPB (I) S = S+1		DS 4.1
		S-SYNC MIN RESP (K)	(-----)				(-----)				(-----)				(-----)			
		S-U-EXPT REQ	(-----)				(-----)				(-----)				(-----)			
		S-ACT END REQ (I)	(-----)				(-----)				(-----)				START T2	S-CSUI/ CDE (I)		DS 5.1
		S-ACT END RESP (K)	(-----)				(-----)				(-----)				(-----)			
		S-U-ABT REQ	START T 3	S-CSA		14.1	START T 3	S-CSA		14.1	START T 3	S-CSA		14.1	START T 3	S-CSA		14.1

TABLE H-1/T.62 *(continued)*

Calling terminal

Event \ State			Wait				9 Document send											
			8.1				DS 1.1				DS 2.1				DS 3.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		S-U-ABT RESP	(------)				(------)				(------)				(------)			
		S-ACT BEG (START) REQ	(------)					S-CSUI/ CDS S=R=1		DS 2.1	(------)				(------)			
		S-ACT BEG (CONT) REQ (C)	(------)					S-CSUI/ CDC (C) S=R=C+1		DS 2.1	(------)				(------)			
		S-DATA REQ	(------)				(------)					S-CSUI/ CDUI		DS 3.1		S-CSUI/ CDUI		DS 3.1
		S-ACT DCAD REQ	(------)				(------)				START T2	S-CSUI/ CDD		DS 9.1	START T2	S-CSUI/ CDD		DS 9.1
		S-ACT DCAD RESP	(------)				(------)				(------)				(------)			
		S-ACT INT REQ	(------)				(------)				START T2	S-CSUI/ CDR		DS 8.1	START T2	S-CSUI/ CDR		DS 8.1
		S-ACT INT RESP	(------)				(------)				(------)				(------)			
		S-CAPAB DATA REQ	(------)				START T2	S-CSUI/ CDCL		DS 6.1	(------)				(------)			
		S-CAPAB DATA RESP	(------)				(------)				(------)				(------)			
		T-CON CONF	(------)				(------)				(------)				(------)			

TABLE H-1/T.62 *(continued)*

Calling terminal

State / Event			Wait				9 Document send												
			8.1				DS 1.1				DS 2.1				DS 3.1				
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		T-DISCON IND	STOP T2		S-P-ABT IND	0.1			S-P-ABT IND	0.1	STOP T2		S-P-ABT IND	0.1	STOP T2		S-P-ABT IND	0.1
		T-EXPT IND	STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x
	R-CSS		STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSSP		STOP T2		S-CON CONF	DS 1.1			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSSN		STOP T2		T-DISCON REQ S-CON CONF NEG	0.1			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-CSE		STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSEP		STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-CSA		STOP T2		S-ABT IND	7.1			S-ABT IND	7.1	STOP T2		S-ABT IND	7.1	STOP T2		S-ABT IND	7.1
	R-RSAP		STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-CSCC		STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSCCP		STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x

TABLE H-1/T.62 *(continued)*

Calling terminal

Event \ State			Wait				9 Document send											
			8.1				DS 1.1				DS 2.1				DS 3.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
	R-CSUI/ CDS		STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDC (C)		STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDCL		STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDCLP		STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x
	R-CSUI/ CDE (I)		STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDEP (K) ∧ K=R		STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x
	R-CSUI/ CDD		STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDDP		STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x
	R-CSUI/ CDR		STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDRP		STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x
	R-CSUI/ CDUI		STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x

TABLE H-1/T.62 *(continued)*

Calling terminal

Event \ State			Wait				9 Document send											
			8.1				DS 1.1				DS 2.1				DS 3.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
	R-RSUI/ RDGR		STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x
	R-CSUI/ CDPB (I)		STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDPBP (K) ∧K=R ∧S>R		STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	RESTART T2		S-SYNC MIN CONF R=R+1	DS 2.1	RESTART T2		S-SYNC MIN CONF R=R+1	DS 3.1
	R-RSUI/ RDPBP (K) ∧K=R ∧S=R+1		STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-SYNC MIN CONF R=R+1	DS 2.1	STOP T2		S-SYNC MIN CONF R=R+1	DS 3.1
	R-RSUI/ RDPBN		STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-U-EXPT IND 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-U-EXPT IND 3) S-P-EXPT IND (FAIL)	DS 7.1 x
	ANY OTHER DOCUMENT COMMAND OR RESP. OR WRONG FORMAT IN CONNECTION WITH RSUI		STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x
	ANY OTHER COMMAND OR RESP OR WRONG FORMAT		STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
EXPIRY OF T1			(------------)				(------------)				(------------)				(------------)			
EXPIRY OF T2			STOP T2		S-P-EXPT IND (FAIL)	x	(------------)				STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
EXPIRY OF T3			(------------)				(------------)				(------------)				(------------)			

TABLE H-1/T.62 *(continued)*

Calling terminal

Event \ State			9 Document send															
			DS 4.1				DS 5.1				DS 6.1				DS 7.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		S-CON REQ	(------------------)				(------------------)				(------------------)				(------------------)			
		S-REL REQ	(------------------)				(------------------)				(------------------)				(------------------)			
		S-CTRL GIVE REQ	(------------------)				(------------------)				(------------------)				(------------------)			
		S-CTRL GIVE RESP	(------------------)				(------------------)				(------------------)				(------------------)			
		S-SYNC MIN REQ (I)	(------------------)				(------------------)				(------------------)				(------------------)			
		S-SYNC MIN RESP (K)	(------------------)				(------------------)				(------------------)				(------------------)			
		S-U-EXPT REQ	(------------------)				(------------------)				(------------------)				(------------------)			
		S-ACT END REQ (I)	(------------------)				(------------------)				(------------------)				(------------------)			
		S-ACT END RESP (K)	(------------------)				(------------------)				(------------------)				(------------------)			
		S-U-ABT REQ	START T3	S-CSA		14.1	START T3	S-CSA		14.1	START T3	S-CSA		14.1	START T3	S-CSA		14.1
		S-U-ABT RESP	(------------------)				(------------------)				(------------------)				(------------------)			

TABLE H-1/T.62 *(continued)*

Calling terminal

Event		State	9 Document send															
			DS 4.1				DS 5.1				DS 6.1				DS 7.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		S-ACT BEG (START) REQ	(------)				(------)				(------)				(------)			
		S-ACT BEG (CONT) REQ (C)	(------)				(------)				(------)				(------)			
		S-DATA REQ	(------)				(------)				(------)				(------)			
		S-ACT DCAD REQ	START T2	S-CSUI/ CDD		DS 9.1	START T2	S-CSUI/ CDD		DS 9.1	(------)				START T2	S-CSUI/ CDD		DS 9.1
		S-ACT DCAD RESP	(------)				(------)				(------)				(------)			
		S-ACT INT REQ	START T2	S-CSUI/ CDR		DS 8.1	START T2	S-CSUI/ CDR		DS 8.1	START T2	S-CSUI/ CDR		DS 8.1	START T2	S-CSUI/ CDR		DS 8.1
		S-ACT INT RESP	(------)				(------)				(------)				(------)			
		S-CAPAB DATA REQ	(------)				(------)				(------)				(------)			
		S-CAPAB DATA RESP	(------)				(------)				(------)				(------)			
		T-CON CONF	(------)				(------)				(------)				(------)			
		T-DISCON IND	STOP T2		S-P-ABT IND	0.1	STOP T2		S-P-ABT IND	0.1	STOP T2		S-P-ABT IND	0.1			S-P-ABT IND	0.1

TABLE H-1/T.62 *(continued)*

Calling terminal

Event \ State			9 Document send															
			DS 4.1				DS 5.1				DS 6.1				DS 7.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		T-EXPT IND	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x			 S-P-EXPT IND (FAIL)	DS 7.1 x
	R-CSS		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSSP		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSSN		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSE		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSEP		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSA		STOP T2		S-ABT IND	7.1	STOP T2		S-ABT IND	7.1	STOP T2		S-ABT IND	7.1			S-ABT IND	7.1
	R-RSAP		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSCC		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSCCP		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDS		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x

TABLE H-1/T.62 *(continued)*

Calling terminal

Event \ State			9 Document send															
			DS 4.1				DS 5.1				DS 6.1				DS 7.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
	R-CSUI/ CDC (C)		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDCL		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDCLP		STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-CAPAB DATA CONF	DS 1.1				DS 7.1
	R-CSUI/ CDE (I)		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDEP (K) ∧K=R		STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-ACT END CONF	DS 1.1	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x				DS 7.1
	R-CSUI/ CDD		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDDP		STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x				DS 7.1
	R-CSUI/ CDR		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDRP		STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x				DS 7.1
	R-CSUI/ CDUI		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDGR		STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x				DS 7.1

TABLE H-1/T.62 *(continued)*

Calling terminal

State / Event			9 Document send															
			DS 4.1				DS 5.1				DS 6.1				DS 7.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
	R-CSUI/ CDPB (I)		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDPBP (K) ∧ K=R ∧ S>R				S-SYNC MIN CONF R=R+1	DS 2.1			S-SYNC MIN CONF R=R+1	DS 5.1	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x				DS 7.1
	R-RSUI/ RDPBP (K) ∧ K=R ∧ S=R+1		STOP T2		S-SYNC MIN CONF R=R+1	DS 2.1	STOP T2 STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x				DS 7.1
	R-RSUI/ RDPBN		STOP T2		S-U-EXPT IND 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-U-EXPT IND 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x				DS 7.1
	ANY OTHER COMMAND OR RESP OR WRONG FORMAT IN CON- NECTION WITH RSUI		STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x				DS 7.1
	ANY OTHER COMMAND OR RESP OR WRONG FORMAT		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
EXPIRY OF T1			(----	----	----	----)	(----	----	----	----)	(----	----	----	----)	(----	----	----	----)
EXPIRY OF T2			STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	(----	----	----	----)
EXPIRY OF T3			(----	----	----	----)	(----	----	----	----)	(----	----	----	----)	(----	----	----	----)

TABLE H-1/T.62 *(continued)*

Calling terminal

Event \ State			9 Document send								Wait			
			DS 8.1				DS 9.1				10.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		S-CON REQ	(			)	(			)	(			)
		S-REL REQ	(			)	(			)	(			)
		S-CTRL GIVE REQ	(			)	(			)	(			)
		S-CTRL GIVE RESP	(			)	(			)	(			)
		S-SYNC MIN REQ (I)	(			)	(			)	(			)
		S-SYNC MIN RESP (K) ∧ K=Q	(			)	(			)	(			)
		S-U-EXPT REQ	(			)	(			)	(			)
		S-ACT END REQ (I)	(			)	(			)	(			)
		S-ACT END RESP (K)	(			)	(			)	(			)
		S-U-ABT REQ	START T3	S-CSA		14.1	START T3	S-CSA		14.1	START T3	S-CSA		14.1
		S-U-ABT RESP	(			)	(			)	(			)

TABLE H-1/T.62 *(continued)*

Calling terminal

Event \ State			9 Document send								Wait			
			DS 8.1				DS 9.1				10.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		S-ACT BEG (START) REQ	(--------------------------)				(--------------------------)				(--------------------------)			
		S-ACT BEG (CONT) REQ (C)	(--------------------------)				(--------------------------)				(--------------------------)			
		S-DATA REQ	(--------------------------)				(--------------------------)				(--------------------------)			
		S-ACT DCAD REQ	(--------------------------)				(--------------------------)				(--------------------------)			
		S-ACT DCAD RESP	(--------------------------)				(--------------------------)				(--------------------------)			
		S-ACT INT REQ	(--------------------------)				(--------------------------)				(--------------------------)			
		S-ACT INT RESP	(--------------------------)				(--------------------------)				(--------------------------)			
		S-CAPAB DATA REQ	(--------------------------)				(--------------------------)				(--------------------------)			
		S-CAPAB DATA RESP	(--------------------------)				(--------------------------)				(--------------------------)			
		T-CON CONF	(--------------------------)				(--------------------------)				(--------------------------)			
		T-DISCON IND	STOP T2		S-P-ABT IND	0.1	STOP T2		S-P-ABT IND	0.1	STOP T2		S-P-ABT IND	0.1

TABLE H-1/T.62 *(continued)*

Calling terminal

Event \ State			9 Document send								Wait			
			DS 8.1				DS 9.1				10.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		T-EXPT IND				DS 8.1				DS 9.1	STOP T2		S-P-EXPT IND (FAIL)	x
			STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x				
	R-CSS		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSSP		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSSN		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-CSE		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSEP		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-CSA		STOP T2		S-ABT IND	7.1	STOP T2		S-ABT IND	7.1	STOP T2		S-ABT IND	7.1
	R-RSAP		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-CSCC		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSCCP		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2 START T1		S-CTRL GIVE CONF	DR 1.1
	R-CSUI/CDS		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x

TABLE H-1/T.62 *(continued)*

Calling terminal

State / Event			9 Document send								Wait			
			DS 8.1				DS 9.1				10.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
	R-CSUI/ CDC (C)		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDCL		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDCLP					DS 8.1				DS 9.1	STOP T2		S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDE (I)		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDEP (K)					DS 8.1				DS 9.1	STOP T2		S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDD		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDDP					DS 8.1	STOP T2		S-ACT DCAD CONF	DS 1.1	STOP T2		S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDR		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDRP		STOP T2		S-ACT INT CONF	DS 1.1				DS 9.1	STOP T2		S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDUI		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDGR					DS 8.1				DS 9.1	STOP T2		S-P-EXPT IND (FAIL)	x

TABLE H-1/T.62 *(continued)*

Calling terminal

Event \ State			9 Document send								Wait			
			DS 8.1				DS 9.1				10.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
	R-CSUI/ CDPB (I)		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDPBP (K)					DS 8.1				DS 9.1	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDPBN					DS 8.1				DS 9.1	STOP T2		S-P-EXPT IND (FAIL)	x
	ANY OTHER DOCUMENT COMMAND OR RESP OR WRONG FORMAT IN CON-NECTION WITH RSUI					DS 8.1				DS 9.1	STOP T2		S-P-EXPT IND (FAIL)	x
	ANY OTHER COMMAND OR RESP OR WRONG FORMAT		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
EXPIRY OF T1			(——————————)				(——————————)				(——————————)			
EXPIRY OF T2			STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
EXPIRY OF T3			(——————————)				(——————————)				(——————————)			

TABLE H-1/T.62 *(continued)*

Calling terminal

Event		State	11 Document receive															
			DR 1.1				DR 2.1				DR 3.1				DR 4.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		S-CON REQ	(			)	(			)	(			)	(			)
		S-REL REQ	(			)	(			)	(			)	(			)
		S-CTRL GIVE REQ	(			)	(			)	(			)	(			)
		S-CTRL GIVE RESP	(			)	(			)	(			)	(			)
		S-SYNC MIN REQ (I)	(			)	(			)	(			)	(			)
		S-SYNC MIN RESP (K) ∧K=Q	(			)	RESTART T1	S-RSUI/ RDPBP (K)	COUNTER: Q=Q+1	DR 2.1	RESTART T1	S-RSUI/ RDPBP (K)	COUNTER: Q=Q+1	DR 3.1	START T1	S-RSUI/ RDPBP (K)	COUNTER: Q=Q+1	DR 2.1
		S-U-EXPT REQ	(			)	RESTART T1	S-RSUI/ RDPBN		DR 7.1	RESTART T1	S-RSUI/ RDPBN		DR 7.1	START T1	S-RSUI/ RDPBN		DR 7.1
		S-ACT END REQ (I)	(			)	(			)	(			)	(			)
		S-ACT END RESP (K)	(			)	(			)	(			)	(			)
		S-U-ABT REQ	START T3	S-CSA		14.1	START T3	S-CSA		14.1	START T3	S-CSA		14.1	START T3	S-CSA		14.1
		S-U-ABT RESP	(			)	(			)	(			)	(			)

TABLE H-1/T.62 *(continued)*

Calling terminal

Event \ State			11 Document receive															
			DR 1.1				DR 2.1				DR 3.1				DR 4.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		S-ACT BEG (START) REQ	(——————)				(——————)				(——————)				(——————)			
		S-ACT BEG (CONT) REQ (C)	(——————)				(——————)				(——————)				(——————)			
		S-DATA REQ	(——————)				(——————)				(——————)				(——————)			
		S-ACT DCAD REQ	(——————)				(——————)				(——————)				(——————)			
		S-ACT DCAD RESP	(——————)				(——————)				(——————)				(——————)			
		S-ACT INT REQ	(——————)				(——————)				(——————)				(——————)			
		S-ACT INT RESP	(——————)				(——————)				(——————)				(——————)			
		S-CAPAB DATA REQ	(——————)				(——————)				(——————)				(——————)			
		S-CAPAB DATA RESP	(——————)				(——————)				(——————)				(——————)			
		T-CON CONF	(——————)				(——————)				(——————)				(——————)			
		T-DISCON IND	STOP T1		S-P-ABT IND	0.1	STOP T1		S-P-ABT IND	0.1	STOP T1		S-P-ABT IND	0.1			S-P-ABT IND	0.1

TABLE H-1/T.62 *(continued)*

Calling terminal

Event \ State			11 Document receive															
			DR 1.1				DR 2.1				DR 3.1				DR 4.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		T-EXPT IND			S-P-EXPT IND (ERR) 3)	DR 1.1			S-P-EXPT IND (ERR) 3)	DR 2.1			S-P-EXPT IND (ERR) 3)	DR 3.1			S-P-EXPT IND (ERR) 3)	DR 4.1
			STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSS		STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSSP		STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSSN		STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSE		STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSEP		STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSA		STOP T1		S-ABT IND	7.1	STOP T1		S-ABT IND	7.1	STOP T1		S-ABT IND	7.1			S-ABT IND	7.1
	R-RSAP		STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSCC		STOP T1		S-CTRL GIVE IND	12.1	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSCCP		STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDS		RESTART T1		S-ACT (START) IND P=Q=1	DR 2.1	RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	RESTART T1	R-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1
							STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x

TABLE H-1/T.62 *(continued)*

Calling terminal

Event \ State			11 Document receive															
			DR 1.1				DR 2.1				DR 3.1				DR 4.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
	R-CSUI/ CDC (C)		RESTART T1		S-ACT (CONT) IND P=Q=C+1	DR 2.1	RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1
							STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDCL		STOP T1		S-CAPAB DATA IND	DR 6.1	RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1
							STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDCLP		STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDE (I) ∧ (P−Q)< (W−1) ∧ I=P		RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	STOP T1		S-ACT END IND	DR 5.1	START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1
			STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x							S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDEP (K)		STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDD		STOP T1		S-ACT DCAD IND	DR 9.1	STOP T1		S-ACT DCAD IND	DR 9.1	STOP T1		S-ACT DCAD IND	DR 9.1			S-ACT DCAD IND	DR 9.1
	R-RSUI/ RDDP		STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDR		STOP T1		S-ACT INT IND	DR 8.1	STOP T1		S-ACT INT IND	DR 8.1	STOP T1		S-ACT INT IND	DR 8.1			S-ACT INT IND	DR 8.1
	R-RSUI/ RDRP		STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDUI		RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	RESTART T1		S-DATA IND	DR 3.1	RESTART T1		S-DATA IND	DR 3.1	START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1
			STOP T1		S-P-EXPT IND (FAIL)	x											S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDGR		STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x

TABLE H-1/T.62 *(continued)*

Calling terminal

Event			11 Document receive																
			DR 1.1				DR 2.1				DR 3.1				DR 4.1				
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
	R-CSUI/ CDPB (I) ∧(P–Q)< (W–1) ∧I=P		RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	RESTART T1		S-SYNC MIN IND 5)	DR 2.1 3)	RESTART T1		S-SYNC MIN IND	DR 2.1			S-SYNC MIN IND 5)	DR 4.1 3)
			STOP T1		S-P-EXPT IND (FAIL)	x	RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1			COUNTER: P=P+1		START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1
							STOP T1		S-P-EXPT IND (FAIL)	x							S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDPB (I) ∧(P–Q)= (W–1) ∧I=P		RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	RESTART T1		S-SYNC MIN IND 5)	DR 2.1 3)	STOP T1		S-SYNC MIN IND	DR 4.1			S-SYNC MIN IND 5)	DR 4.1 3)
			STOP T1		S-P-EXPT IND (FAIL)	x	RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1			COUNTER: P=P+1		START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1
							STOP T1		S-P-EXPT IND (FAIL)	x							S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDPB (I) ∧I≠P		RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	RESTART T1		S-SYNC MIN IND 5)	DR 2.1 3)	RESTART T1		S-SYNC MIN IND 6)	DR 2.1 3)			S-SYNC MIN IND 5)	DR 4.1
			STOP T1		S-P-EXPT IND (FAIL)	x	RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1
							STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDPBP (K)		STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDPBN		STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	ANY OTHER DOCUMENT COMMAND OR RESP OR WRONG FORMAT IN CONNECTION WITH CSUI		RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1
			STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	ANY OTHER COMMAND OR RESP OR WRONG FORMAT		STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x

TABLE H-1/T.62 *(continued)*

Calling terminal

Event \ State			11 Document receive															
			DR 1.1				DR 2.1				DR 3.1				DR 4.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
EXPIRY OF T1			STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	(-----------------------)			
EXPIRY OF T2			(-----------------------)				(-----------------------)				(-----------------------)				(-----------------------)			
EXPIRY OF T3			(-----------------------)				(-----------------------)				(-----------------------)				(-----------------------)			

TABLE H-1/T.62 *(continued)*

Calling terminal

Event / State			11 Document receive															
			DR 5.1				DR 6.1				DR 7.1				DR 8.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		S-CON REQ	(-------)				(-------)				(-------)				(-------)			
		S-REL REQ	(-------)				(-------)				(-------)				(-------)			
		S-CTRL GIVE REQ	(-------)				(-------)				(-------)				(-------)			
		S-CTRL GIVE RESP	(-------)				(-------)				(-------)				(-------)			
		S-SYNC MIN REQ (I)	(-------)				(-------)				(-------)				(-------)			
		S-SYNC MIN RESP (K) ∧K=Q		S-RSUI/ RDPBP (K)	COUNTER: Q=Q+1	DR 5.1	(-------)				(-------)				(-------)			
		S-U-EXPT REQ	START T1	S-RSUI/ RDPBN		DR 7.1	(-------)				(-------)				(-------)			
		S-ACT END REQ (I)	(-------)				(-------)				(-------)				(-------)			
		S-ACT END RESP (K)	START T1	S-RSUI/ RDEP		DR 1.1	(-------)				(-------)				(-------)			
		S-U-ABT REQ	START T3	S-CSA		14.1	START T3	S-CSA		14.1	START T3	S-CSA		14.1	START T3	S-CSA		14.1
		S-U-ABT RESP	(-------)				(-------)				(-------)				(-------)			

TABLE H-1/T.62 *(continued)*

Calling terminal

Event / State			11 Document receive															
			DR 5.1				DR 6.1				DR 7.1				DR 8.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		S-ACT BEG (START) REQ	(————)				(————)				(————)				(————)			
		S-ACT BEG (CONT) REQ (C)	(————)				(————)				(————)				(————)			
		S-DATA REQ	(————)				(————)				(————)				(————)			
		S-ACT DCAD REQ	(————)				(————)				(————)				(————)			
		S-ACT DCAD RESP	(————)				(————)				(————)				(————)			
		S-ACT INT REQ	(————)				(————)				(————)				(————)			
		S-ACT INT RESP	(————)				(————)				(————)				START T1	S-RSUI/ RDRP		DR 1.1
		S-CAPAB DATA REQ	(————)				(————)				(————)				(————)			
		S-CAPAB DATA RESP	(————)				START T1	S-RSUI/ RDCLP		DR 1.1	(————)				(————)			
		T-CON CONF	(————)				(————)				(————)				(————)			
		T-DISCON IND			S-P-ABT IND	0.1			S-P-ABT IND	0.1	STOP T1		S-P-ABT IND	0.1			S-P-ABT IND	0.1

TABLE H-1/T.62 *(continued)*

Calling terminal

Event: Local event	Event: Protocol event	Event: Service primitive	11 Document receive: DR 5.1 Timer	DR 5.1 Protocol action	DR 5.1 Service primitive	DR 5.1 Final state	DR 6.1 Timer	DR 6.1 Protocol action	DR 6.1 Service primitive	DR 6.1 Final state	DR 7.1 Timer	DR 7.1 Protocol action	DR 7.1 Service primitive	DR 7.1 Final state	DR 8.1 Timer	DR 8.1 Protocol action	DR 8.1 Service primitive	DR 8.1 Final state
		T-EXPT IND			S-P-EXPT IND (ERR) 3)	DR 5.1			S-P-EXPT IND (ERR) 3)	DR 6.1	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
					S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x								
	R-CSS				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSSP				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSSN				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSE				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSEP				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSA				S-ABT IND	7.1			S-ABT IND	7.1	STOP T1		S-ABT IND	7.1			S-ABT IND	7.1
	R-RSAP				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSCC				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSCCP				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDS		START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1				DR 7.1			S-P-EXPT IND (FAIL)	x
					S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x								

TABLE H-1/T.62 *(continued)*

Calling terminal

Event / State			11 Document receive															
			DR 5.1				DR 6.1				DR 7.1				DR 8.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
	R-CSUI/ CDC (C)		START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1				DR 7.1			S-P-EXPT IND (FAIL)	x
					S-P- EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x								
	R-CSUI/ CDCL		START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1				DR 7.1			S-P-EXPT IND (FAIL)	x
					S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x								
	R-RSUI/ RDCLP				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDE (I)		START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1				DR 7.1			S-P-EXPT IND (FAIL)	x
					S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x								
	R-RSUI/ RDEP (K)				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDD				S-ACT DCAD IND	DR 9.1	START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	STOP T1		S-ACT DCAD IND	DR 9.1			S-P-EXPT IND (FAIL)	x
									S-P-EXPT IND (FAIL)	x								
	R-RSUI/ RDDP				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDR				S-ACT INT IND	DR 8.1			S-ACT INT IND	DR 8.1	STOP T1		S-ACT INT IND	DR 8.1			S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDRP				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDUI		START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1				DR 7.1			S-P-EXPT IND (FAIL)	x
					S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x								
	R-RSUI/ RDGR				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x

TABLE H-1/T.62 *(continued)*

Calling terminal

Event / State			11 Document receive															
			DR 5.1				DR 6.1				DR 7.1				DR 8.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
	R-CSUI/ CDPB (I)		(————			————)	START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1				DR 7.1			S-P-EXPT IND (FAIL)	x
			START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1			S-P-EXPT IND (FAIL)	x								
					S-P-EXPT IND (FAIL)	x												
	R-RSUI/ RDPBP (K)				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDPBN				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	ANY OTHER DOCUMENT COMMAND OR RESP OR WRONG FORMAT IN CONNECTION WITH CSUI		START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	START T1	S-RSUI RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1				DR 7.1			S-P-EXPT IND (FAIL)	x
					S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x								
	ANY OTHER COMMAND OR RESP OR WRONG FORMAT				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
EXPIRY OF T1			(————			————)	(————			————)	STOP T1		S-P-EXPT IND (FAIL)	x	(————			————)
EXPIRY OF T2			(————			————)	(————			————)	(————			————)	(————			————)
EXPIRY OF T3			(————			————)	(————			————)	(————			————)	(————			————)

TABLE H-1/T.62 ***(continued)***

Calling terminal

Event \ State			11 Document receive				Wait				Wait				Wait			
			DR 9.1				12.1				13.1				14.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		S-CON REQ	(------)				(------)				(------)				(------)			
		S-REL REQ	(------)				(------)				(------)				(------)			
		S-CTRL GIVE REQ	(------)				(------)				(------)				(------)			
		S-CTRL GIVE RESP	(------)					S-RSCCP		DS 1.1	(------)				(------)			
		S-SYNC MIN REQ (I)	(------)				(------)				(------)				(------)			
		S-SYNC MIN RESP (K)	(------)				(------)				(------)				(------)			
		S-U-EXPT REQ	(------)				(------)				(------)				(------)			
		S-ACT END REQ (I)	(------)				(------)				(------)				(------)			
		S-ACT END RESP (K)	(------)				(------)				(------)				(------)			
		S-U-ABT REQ	START T3	S-CSA		14.1	START T3	S-CSA		14.1	START T3	S-CSA		14.1	(------)			
		S-U-ABT RESP	(------)				(------)				(------)				(------)			

TABLE H-1/T.62 *(continued)*

Calling terminal

Event / State			11 Document receive DR 9.1				Wait 12.1				Wait 13.1				Wait 14.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		S-ACT BEG (START) REQ	(			)	(			)	(			)	(			)
		S-ACT BEG (CONT) REQ (C)	(			)	(			)	(			)	(			)
		S-DATA REQ	(			)	(			)	(			)	(			)
		S-ACT DCAD REQ	(			)	(			)	(			)	(			)
		S-ACT DCAD RESP	START T1	S-RSUI/ RDDP		DR 1.1	(			)	(			)	(			)
		S-ACT INT REQ	(			)	(			)	(			)	(			)
		S-ACT INT RESP	(			)	(			)	(			)	(			)
		S-CAPAB DATA REQ	(			)	(			)	(			)	(			)
		S-CAPAB DATA RESP	(			)	(			)	(			)	(			)
		T-CON CONF	(			)	(			)	(			)	(			)
		T-DISCON IND			S-P-ABT IND	0.1			S-P-ABT IND	0.1	STOP T2		S-P-ABT IND	0.1	STOP T3		S-P-ABT IND	0.1

TABLE H-1/T.62 *(continued)*

Calling terminal

Event \ State			11 Document receive				Wait				Wait				Wait			
			DR 9.1				12.1				13.1				14.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		T-EXPT IND			S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x				14.1
	R-CSS				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x				14.1
	R-RSSP				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x				14.1
	R-RSSN				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x				14.1
	R-CSE				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x				14.1
	R-RSEP				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-REL CONF S-REL CONF/ T-DISC REQ	0.2 7) 0.1				14.1
	R-CSA				S-ABT IND	7.1			S-ABT IND	7.1	STOP T2		S-ABT IND	7.1				14.1
	R-RSAP				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T3		S-ABT CONF S-ABT CONF/ T-DISC REQ	0.2 7) 0.1
	R-CSCC				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x				14.1
	R-RSCCP				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x				14.1
	R-CSUI/ CDS				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x				14.1

TABLE H-1/T.62 *(continued)*

Calling terminal

Event \ State			11 Document receive				Wait				Wait				Wait			
			DR 9.1				12.1				13.1				14.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
	R-CSUI/ CDC (C)				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x				14.1
	R-CSUI/ CDCL				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x				14.1
	R-RSUI/ RDCLP				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x				14.1
	R-CSUI/ CDE (I)				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x				14.1
	R-RSUI/ RDEP (K)				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x				14.1
	R-CSUI/ CDD				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x				14.1
	R-RSUI/ RDDP				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x				14.1
	R-CSUI/ CDR				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x				14.1
	R-RSUI/ RDRP				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x				14.1
	R-CSUI/ CDUI				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x				14.1
	R-RSUI/ RDGR				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x				14.1

TABLE H-1/T.62 ***(continued)***

Calling terminal

Event \ State			11 Document receive				Wait				Wait				Wait			
			DR 9.1				12.1				13.1				14.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
	R-CSUI/ CDPB (I)				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x				14.1
	R-RSUI/ RDPBP (K)				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x				14.1
	R-RSUI/ RDPBN				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x				14.1
	ANY OTHER DOCUMENT COMMAND OR RESP OR WRONG FORMAT				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x				14.1
EXPIRY OF T1			(------------------------------)				(------------------------------)				(------------------------------)				(------------------------------)			
EXPIRY OF T2			(------------------------------)				(------------------------------)				STOP T2		S-P-EXPT IND (FAIL)	x	(------------------------------)			
EXPIRY OF T3			(------------------------------)				(------------------------------)				(------------------------------)				STOP T3		S-P-ABT IND T-DISCON REQ	0.1

TABLE H-1/T.62 *(continued)*

Calling terminal

Event \ State			Wait x			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state
		S-CON REQ	(———————————————————)			
		S-REL REQ	(———————————————————)			
		S-CTRL GIVE REQ	(———————————————————)			
		S-CTRL GIVE RESP	(———————————————————)			
		S-SYNC MIN REQ (I)	(———————————————————)			
		S-SYNC MIN RESP (K)	(———————————————————)			
		S-U-EXPT REQ	(———————————————————)			
		S-ACT END REQ (I)	(———————————————————)			
		S-ACT END RESP (K)	(———————————————————)			
		S-U-ABT REQ	START T3	S-CSA		14.1
		S-U-ABT RESP	(———————————————————)			

TABLE H-1/T.62 *(continued)*

Calling terminal

Event \ State			Wait x			
Local event	**Protocol event**	**Service primitive**	**Timer**	**Protocol action**	**Service primitive**	**Final state**
		S-ACT BEG (START) REQ	(————————————————)			
		S-ACT BEG (CONT) REQ (C)	(————————————————)			
		S-DATA REQ	(————————————————)			
		S-ACT DCAD REQ	(————————————————)			
		S-ACT DCAD RESP	(————————————————)			
		S-ACT INT REQ	(————————————————)			
		S-ACT INT RESP	(————————————————)			
		S-CAPAB DATA REQ	(————————————————)			
		S-CAPAB DATA RESP	(————————————————)			
		T-CON CONF	(————————————————)			
		T-DISCON IND			S-P-ABT IND	0.1

TABLE H-1/T.62 *(continued)*

Calling terminal

Event \ State			Wait			
			x			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state
		T-EXPT IND				x
	R-CSS					x
	R-RSSP					x
	R-RSSN					x
	R-CSE					x
	R-RSEP					x
	R-CSA				S-ABT IND	7.1
	R-RSAP					x
	R-CSCC					x
	R-RSCCP					x
	R-CSUI/ CDS					x

TABLE H-1/T.62 *(continued)*

Calling terminal

Event \ State			Wait			
			x			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state
	R-CSUI/ CDC (C)					x
	R-CSUI/ CDCL					x
	R-RSUI/ RDCLP					x
	R-CSUI/ CDE (I)					x
	R-RSUI/ RDEP (K)					x
	R-CSUI/ CDD					x
	R-RSUI/ RDDP					x
	R-CSUI/ CDR					x
	R-RSUI/ RDRP					x
	R-CSUI/ CDUI					x
	R-RSUI/ RDGR					x

TABLE H-1/T.62 *(end)*

Calling terminal

Event \ State			Wait x			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state
	R-CSUI/ CDPB (I)					x
	R-RSUI/ RDPBP (K)					x
	R-RSUI/ RDPBN					x
	ANY OTHER COMMAND OR RESP OR WRONG FORMAT					x
EXPIRY OF T1			(-------------------------)			
EXPIRY OF T2			(-------------------------)			
EXPIRY OF T3			(-------------------------)			

TABLE H-2/T.62

State transition tables for called terminal

Called terminal

Event		State	Idle								Wait			
			0.1				0.2				7.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		S-CON RESP POS	(———————)				(———————)				(———————)			
		S-CON RESP NEG	(———————)				(———————)				(———————)			
		S-REL RESP	(———————)				(———————)				(———————)			
		S-CTRL GIVE REQ	(———————)				(———————)				(———————)			
		S-CTRL GIVE RESP	(———————)				(———————)				(———————)			
		S-SYNC MIN REQ (I)	(———————)				(———————)				(———————)			
		S-SYNC MIN RESP (K)	(———————)				(———————)				(———————)			
		S-U-EXPT REQ	(———————)				(———————)				(———————)			
		S-ACT END REQ (I)	(———————)				(———————)				(———————)			
		S-ACT END RESP (K)	(———————)				(———————)				(———————)			
		S-U-ABT REQ	(———————)				(———————)				(———————)			

TABLE H-2/T.62 *(continued)*

Called terminal

Event		State	Idle								Wait			
			0.1				0.2				7.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		S-U-ABT RESP	(——)				(——)				START T3	S-RSAP		0.2
											START T1	S-RSAP	1)	
		S-ACT BEG (START) REQ	(——)				(——)				(——)			
		S-ACT BEG (CONT) REQ (C)	(——)				(——)				(——)			
		S-DATA REQ	(——)				(——)				(——)			
		S-ACT DCAD REQ	(——)				(——)				(——)			
		S-ACT DCAD RESP	(——)				(——)				(——)			
		S-ACT INT REQ	(——)				(——)				(——)			
		S-ACT INT RESP	(——)				(——)				(——)			
		S-CAPAB DATA REQ	(——)				(——)				(——)			
		S-CAPAB DATA RESP	(——)				(——)				(——)			
		T-CON IND ∧ T-CON ACCEPT.	START T1		T-CON RESP POS	0.2	(——)				(——)			

TABLE H-2/T.62 *(continued)*

Called terminal

Event / State			Idle								Wait			
			0.1				0.2				7.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		T-CON IND ∧ T-CON ¬ACCEPT.			T-DISC REQ	0.1	(-----------------------------)				(-----------------------------)			
		T-DISCON IND	(-----------------------------)				STOP T1 ∨ T3			0.1			S-P-ABT IND	0.1
		T-EXPT IND	(-----------------------------)				STOP T1 ∨ T3		T-DISCON REQ	0.1				7.1
	R-CSS		(-----------------------------)				STOP T1		S-CON IND	1.1				7.1
	R-RSSP		(-----------------------------)				STOP T1 ∨ T3		T-DISCON REQ	0.1				7.1
	R-RSSN		(-----------------------------)				STOP T1 ∨ T3		T-DISCON REQ	0.1				7.1
	R-CSE		(-----------------------------)				STOP T1 ∨ T3		T-DISCON REQ	0.1				7.1
	R-RSEP		(-----------------------------)				STOP T1 ∨ T3		T-DISCON REQ	0.1				7.1
	R-CSA		(-----------------------------)				STOP T1 ∨ T3		T-DISCON REQ	0.1				7.1
	R-RSAP		(-----------------------------)				STOP T1 ∨ T3		T-DISCON REQ	0.1				7.1
	R-CSCC		(-----------------------------)				STOP T1 ∨ T3		T-DISCON REQ	0.1				7.1

TABLE H-2/T.62 *(continued)*

Called terminal

Event \ State			Idle								Wait			
			0.1				0.2				7.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
	R-RSCCP		(------------------------------)				STOP T1 ∨ T3		T-DISCON REQ	0.1				7.1
	R-CSUI/ CDS		(------------------------------)				STOP T1 ∨ T3		T-DISCON REQ	0.1				7.1
	R-CSUI/ CDC (C)		(------------------------------)				STOP T1 ∨ T3		T-DISCON REQ	0.1				7.1
	R-CSUI/ CDCL		(------------------------------)				STOP T1 ∨ T3		T-DISCON REQ	0.1				7.1
	R-RSUI/ RDCLP		(------------------------------)				STOP T1 ∨ T3		T-DISCON REQ	0.1				7.1
	R-CSUI/ CDE (I)		(------------------------------)				STOP T1 ∨ T3		T-DISCON REQ	0.1				7.1
	R-RSUI/ RDEP (K)		(------------------------------)				STOP T1 ∨ T3		T-DISCON REQ	0.1				7.1
	R-CSUI/ CDD		(------------------------------)				STOP T1 ∨ T3		T-DISCON REQ	0.1				7.1
	R-RSUI/ RDDP		(------------------------------)				STOP T1 ∨ T3		T-DISCON REQ	0.1				7.1
	R-CSUI/ CDR		(------------------------------)				STOP T1 ∨ T3		T-DISCON REQ	0.1				7.1
	R-RSUI/ RDRP		(------------------------------)				STOP T1 ∨ T3		T-DISCON REQ	0.1				7.1

TABLE H-2/T.62 *(continued)*

Called terminal

Event \ State			Idle								Wait			
			0.1				0.2				7.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
	R-CSUI/ CDUI		(--------------------------)				STOP T1VT3		T-DISCON REQ	0.1				7.1
	R-RSUI/ RDGR		(--------------------------)				STOP T1 V T3		T-DISCON REQ	0.1				7.1
	R-CSUI/ CDPB (I)		(--------------------------)				STOP T1 V T3		T-DISCON REQ	0.1				7.1
	R-RSUI/ RDPBP (K)		(--------------------------)				STOP T1 V T3		T-DISCON REQ	0.1				7.1
	R-RSUI/ RDPBN		(--------------------------)				STOP T1 V T3		T-DISCON REQ	0.1				7.1
	ANY OTHER COMMAND OR RESP OR WRONG FORMAT		(--------------------------)				STOP T1 V T3		T-DISCON REQ	0.1				7.1
EXPIRY OF T1			(--------------------------)				STOP T1		T-DISCON REQ	0.1	(--------------------------)			
EXPIRY OF T2			(--------------------------)				(--------------------------)				(--------------------------)			
EXPIRY OF T3			(--------------------------)				(--------------------------)				(--------------------------)			

TABLE H-2/T.62 *(continued)*

Called terminal

Event \ State			Wait				4 Document send											
			1.1				DS 1.1				DS 2.1				DS 3.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		S-CON RESP POS	START T1	S-RSSP		DR 1.1	(------)				(------)				(------)			
		S-CON RESP NEG	START T3	S-RSSN		0.2	(------)				(------)				(------)			
		S-REL RESP	(------)				(------)				(------)				(------)			
		S-CTRL GIVE REQ	(------)				START T2	S-CSCC		5.1	(------)				(------)			
		S-CTRL GIVE RESP	(------)				(------)				(------)				(------)			
		S-SYNC MIN REQ (I) $\wedge$ (S−R) < (W−1) $\wedge$ I=S	(------)				(------)				(------)				START T2	S-CSUI/ CDPB (I) S=S+1		DS 2.1
		S-SYNC MIN REQ (I) $\wedge$ (S−R) = (W−1) $\wedge$ I=S	(------)				(------)				(------)				START T2	S-CSUI/ CDPB (I) S=S+1		DS 4.1
		S-SYNC MIN RESP (K)	(------)				(------)				(------)				(------)			
		S-U-EXPT REQ	(------)				(------)				(------)				(------)			
		S-ACT END REQ (I)	(------)				(------)				(------)				START T2	S-CSUI/ CDE (I)		DS 5.1
		S-ACT END RESP (K)	(------)				(------)				(------)				(------)			

TABLE H-2/T.62 *(continued)*

Called terminal

Event \ State			Wait				4 Document send											
			1.1				DS 1.1				DS 2.1				DS 3.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		S-U-ABT REQ	START T3	S-CSA		14.1	START T3	S-CSA		14.1	START T3	S-CSA		14.1	START T3	S-CSA		14.1
		S-U-ABT RESP	(-------------------------)				(-------------------------)				(-------------------------)				(-------------------------)			
		S-ACT BEG (START) REQ	(-------------------------)					S-CSUI/ CDS S=R=1		DS 2.1	(-------------------------)				(-------------------------)			
		S-ACT BEG (CONT) REQ (C)	(-------------------------)					S-CSUI/ CDC (C) S=R=C+1		DS 2.1	(-------------------------)				(-------------------------)			
		S-DATA REQ	(-------------------------)				(-------------------------)					S-CSUI/ CDUI		DS 3.1		S-CSUI/ CDUI		DS 3.1
		S-ACT DCAD REQ	(-------------------------)				(-------------------------)				START T2	S-CSUI/ CDD		DS 9.1	START T2	S-CSUI/ CDD		DS 9.1
		S-ACT DCAD RESP	(-------------------------)				(-------------------------)				(-------------------------)				(-------------------------)			
		S-ACT INT REQ	(-------------------------)				(-------------------------)				START T2	S-CSUI/ CDR		DS 8.1	START T2	S-CSUI/ CDR		DS 8.1
		S-ACT INT RESP	(-------------------------)				(-------------------------)				(-------------------------)				(-------------------------)			
		S-CAPAB DATA REQ	(-------------------------)				START T2	S-CSUI/ CDCL		DS 6.1	(-------------------------)				(-------------------------)			
		S-CAPAB DATA RESP	(-------------------------)				(-------------------------)				(-------------------------)				(-------------------------)			

TABLE H-2/T.62 *(continued)*

Called terminal

Event: Local event	Event: Protocol event	Event: Service primitive	Wait 1.1: Timer	Wait 1.1: Protocol action	Wait 1.1: Service primitive	Wait 1.1: Final state	4 Document send DS 1.1: Timer	DS 1.1: Protocol action	DS 1.1: Service primitive	DS 1.1: Final state	DS 2.1: Timer	DS 2.1: Protocol action	DS 2.1: Service primitive	DS 2.1: Final state	DS 3.1: Timer	DS 3.1: Protocol action	DS 3.1: Service primitive	DS 3.1: Final state
		T-CON IND	(———)				(———)				(———)				(———)			
		T-DISCON IND			S-P-ABT IND	0.1			S-P-ABT IND	0.1	STOP T2		S-P-ABT IND	0.1	STOP T2		S-P-ABT IND	0.1
		T-EXPT IND			S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x
	R-CSS				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSSP				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSSN				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-CSE				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSEP				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-CSA				S-ABT IND	7.1			S-ABT IND	7.1	STOP T2		S-ABT IND	7.1	STOP T2		S-ABT IND	7.1
	R-RSAP				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-CSCC				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x

TABLE H-2/T.62 *(continued)*

Called terminal

Event \ State			Wait				4 Document send											
			1.1				DS 1.1				DS 2.1				DS 3.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
	R-RSCCP				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDS				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDC (C)				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDCL				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDCLP				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x
	R-CSUI/ CDE (I)				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDEP (K) ∧K=R				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x
	R-CSUI/ CDD				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDDP				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x
	R-CSUI/ CDR				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDRP				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x

TABLE H-2/T.62 *(continued)*

Called terminal

Event \ State			Wait				4 Document send											
			1.1				DS 1.1				DS 2.1				DS 3.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
	R-CSUI/ CDUI				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDGR				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (ERR) 3) --- S-P-EXPT IND (FAIL)	DS 7.1 --- x	STOP T2		S-P-EXPT IND (ERR) 3) --- S-P-EXPT IND (FAIL)	DS 7.1 --- x
	R-CSUI/ CDPB (I)				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDPBP (K) ∧ K=R ∧ S>R				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x			S-SYNC MIN CONF R=R+1	DS 2.1			S-SYNC MIN CONF R=R+1	DS 3.1
	R-RSUI/ RDPBP (K) ∧ K=R ∧ S=R+1				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-SYNC MIN CONF R=R+1	DS 2.1	STOP T2		S-SYNC MIN CONF R=R+1	DS 3.1
	R-RSUI/ RDPBN				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-U-EXPT IND 3) --- S-P-EXPT IND (FAIL)	DS 7.1 --- x	STOP T2		S-U-EXPT IND 3) --- S-P-EXPT IND (FAIL)	DS 7.1 --- x
	ANY OTHER DOCUMENT COMMAND OR RESP OR WRONG FORMAT IN CONNECTION WITH RSUI				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (ERR) 3) --- S-P-EXPT IND (FAIL)	DS 7.1 --- x	STOP T2		S-P-EXPT IND (ERR) 3) --- S-P-EXPT IND (FAIL)	DS 7.1 --- x
	ANY OTHER COMMAND OR RESP OR WRONG FORMAT				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x

TABLE H-2/T.62 *(continued)*

Called terminal

Event / State			Wait				4 Document send											
			1.1				DS 1.1				DS 2.1				DS 3.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
EXPIRY OF T1			(-------------------------------)				(-------------------------------)				(-------------------------------)				(-------------------------------)			
EXPIRY OF T2			(-------------------------------)				(-------------------------------)				STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
EXPIRY OF T3			(-------------------------------)				(-------------------------------)				(-------------------------------)				(-------------------------------)			

TABLE H-2/T.62 *(continued)*

Called terminal

Event		State	4 Document send															
			DS 4.1				DS 5.1				DS 6.1				DS 7.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		S-CON RESP POS	(———)				(———)				(———)				(———)			
		S-CON RESP NEG	(———)				(———)				(———)				(———)			
		S-REL RESP	(———)				(———)				(———)				(———)			
		S-CTRL GIVE REQ	(———)				(———)				(———)				(———)			
		S-CTRL GIVE RESP	(———)				(———)				(———)				(———)			
		S-SYNC MIN REQ (I)	(———)				(———)				(———)				(———)			
		S-SYNC MIN RESP (K)	(———)				(———)				(———)				(———)			
		S-U-EXPT REQ	(———)				(———)				(———)				(———)			
		S-ACT END REQ (I)	(———)				(———)				(———)				(———)			
		S-ACT END RESP (K)	(———)				(———)				(———)				(———)			
		S-U-ABT REQ	START T3	S-CSA		14.1	START T3	S-CSA		14.1	START T3	S-CSA		14.1	START T3	S-CSA		14.1

TABLE H-2/T.62 *(continued)*

Called terminal

Event \ State			4 Document send															
			DS 4.1				DS 5.1				DS 6.1				DS 7.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		S-U-ABT RESP	(------	------	------	------)	(------	------	------	------)	(------	------	------	------)	(------	------	------	------)
		S-ACT BEG (START) REQ	(------	------	------	------)	(------	------	------	------)	(------	------	------	------)	(------	------	------	------)
		S-ACT BEG (CONT) REQ (C)	(------	------	------	------)	(------	------	------	------)	(------	------	------	------)	(------	------	------	------)
		S-DATA REQ	(------	------	------	------)	(------	------	------	------)	(------	------	------	------)	(------	------	------	------)
		S-ACT DCAD REQ	START T2	S-CSUI/ CDD		DS 9.1	START T2	S-CSUI/ CDD		DS 9.1	(------	------	------	------)	START T2	S-CSUI/ CDD		DS 9.1
		S-ACT DCAD RESP	(------	------	------	------)	(------	------	------	------)	(------	------	------	------)	(------	------	------	------)
		S-ACT INT REQ	START T2	S-CSUI/ CDR		DS 8.1	START T2	S-CSUI/ CDR		DS 8.1	START T2	S-CSUI/ CDR		DS 8.1	START T2	S-CSUI/ CDR		DS 8.1
		S-ACT INT RESP	(------	------	------	------)	(------	------	------	------)	(------	------	------	------)	(------	------	------	------)
		S-CAPAB DATA REQ	(------	------	------	------)	(------	------	------	------)	(------	------	------	------)	(------	------	------	------)
		S-CAPAB DATA RESP	(------	------	------	------)	(------	------	------	------)	(------	------	------	------)	(------	------	------	------)
		T-CON IND	(------	------	------	------)	(------	------	------	------)	(------	------	------	------)	(------	------	------	------)

TABLE H-2/T.62 *(continued)*

Called terminal

Event		State	4 Document send															
			DS 4.1				DS 5.1				DS 6.1				DS 7.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		T-DISCON IND	STOP T2		S-P-ABT IND	0.1	STOP T2		S-P-ABT IND	0.1	STOP T2		S-P-ABT IND	0.1			S-P-ABT IND	0.1
		T-EXPT IND	STOP T2		S-P-EXPT IND (ERR) 3)	DS 7.1	STOP T2		S-P-EXPT IND (ERR) 3)	DS 7.1	STOP T2		S-P-EXPT IND (ERR) 3)	DS 7.1				DS 7.1
					S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSS		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSSP		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSSN		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSE		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSEP		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSA		STOP T2		S-ABT IND	7.1	STOP T2		S-ABT IND	7.1	STOP T2		S-ABT IND	7.1			S-ABT IND	7.1
	R-RSAP		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSCC		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSCCP		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x

TABLE H-2/T.62 *(continued)*

Called terminal

Event			4 Document send															
		State	DS 4.1				DS 5.1				DS 6.1				DS 7.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
	R-CSUI CDS		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDC (C)		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDCL		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDCLP		STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-CAPAB DATA CONF	DS 1.1				DS 7.1
	R-CSUI/ CDE (I)		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDEP (K) ∧ K=R		STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-ACT END CONF	DS 1.1	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x				DS 7.1
	R-CSUI CDD		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDDP		STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x				DS 7.1
	R-CSUI/ CDR		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDRP		STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x				DS 7.1
	R-CSUI/ CDUI		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x

TABLE H-2/T.62 *(continued)*

Called terminal

Event: Local event	Protocol event	Service primitive	State: 4 Document send DS 4.1 Timer	Protocol action	Service primitive	Final state	DS 5.1 Timer	Protocol action	Service primitive	Final state	DS 6.1 Timer	Protocol action	Service primitive	Final state	DS 7.1 Timer	Protocol action	Service primitive	Final state
	R-RSUI/ RDGR		STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x				DS 7.1
	R-CSUI/ CDPB (I)		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDPBP (K) ∧K=R ∧S>R				S-SYNC MIN CONF R=R+1	DS 2.1			S-SYNC MIN CONF R=R+1	DS 5.1	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x				DS 7.1
	R-RSUI/ RDPBP (K) ∧K=R ∧S=R+1		STOP T2		S-SYNC MIN CONF R=R+1	DS 2.1	STOP T2 STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x				DS 7.1
	R-RSUI/ RDPBN		STOP T2		S-U-EXPT IND 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-U-EXPT REQ 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x				DS 7.1
	ANY OTHER COMMAND OR RESP OR WRONG FORMAT IN CON-NECTION WITH RSUI		STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x	STOP T2		S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DS 7.1 x				DS 7.1
	ANY OTHER COMMAND OR RESP OR WRONG FORMAT		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
EXPIRY OF T1			(————————)				(————————)				(————————)				(————————)			
EXPIRY OF T2			STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	(————————)			
EXPIRY OF T3			(————————)				(————————)				(————————)				(————————)			

TABLE H-2/T.62 *(continued)*

Called terminal

Event \ State			4 Document send								Wait			
			DS 8.1				DS 9.1				5.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		S-CON RESP POS	(————			————)	(————			————)	(————			————)
		S-CON RESP NEG	(————			————)	(————			————)	(————			————)
		S-REL RESP	(————			————)	(————			————)	(————			————)
		S-CTRL GIVE REQ	(————			————)	(————			————)	(————			————)
		S-CTRL GIVE RESP	(————			————)	(————			————)	(————			————)
		S-SYNC MIN REQ (I)	(————			————)	(————			————)	(————			————)
		S-SYNC MIN RESP (K) ∧K=Q	(————			————)	(————			————)	(————			————)
		S-U-EXPT REQ	(————			————)	(————			————)	(————			————)
		S-ACT END REQ (I)	(————			————)	(————			————)	(————			————)
		S-ACT END RESP (K)	(————			————)	(————			————)	(————			————)
		S-U-ABT REQ	START T3	S-CSA		14.1	START T3	S-CSA		14.1	START T3	S-CSA		14.1

TABLE H-2/T.62 *(continued)*

Called terminal

Event \ State			4 Document send								Wait			
			DS 8.1				DS 9.1				5.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		S-U-ABT RESP	(------)				(------)				(------)			
		S-ACT BEG (START) REQ	(------)				(------)				(------)			
		S-ACT BEG (CONT) REQ (C)	(------)				(------)				(------)			
		S-DATA REQ	(------)				(------)				(------)			
		S-ACT DCAD REQ	(------)				(------)				(------)			
		S-ACT DCAD RESP	(------)				(------)				(------)			
		S-ACT INT REQ	(------)				(------)				(------)			
		S-ACT INT RESP	(------)				(------)				(------)			
		S-CAPAB DATA REQ	(------)				(------)				(------)			
		S-CAPAB DATA RESP	(------)				(------)				(------)			
		T-CON IND	(------)				(------)				(------)			

TABLE H-2/T.62 *(continued)*

Called terminal

Event \ State			4 Document send								Wait			
			DS 8.1				DS 9.1				5.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		T-DISCON IND	STOP T2		S-P-ABT IND	0.1	STOP T2		S-P-ABT IND	0.1	STOP T2		S-P-ABT IND	0.1
		T-EXPT IND				DS 8.1				DS 9.1	STOP T2		S-P-EXPT IND (FAIL)	x
			STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x				
	R-CSS		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSSP		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSSN		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-CSE		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSEP		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-CSA		STOP T2		S-ABT IND	7.1	STOP T2		S-ABT IND	7.1	STOP T2		S-ABT IND	7.1
	R-RSAP		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-CSCC		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSCCP		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	RESTART T2		S-CTRL GIVE CONF	DR 1.1

TABLE H-2/T.62 *(continued)*

Called terminal

State / Event			4 Document send								Wait			
			DS 8.1				DS 9.1				5.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
	R-CSUI/ CDS		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDC (C)		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDCL		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDCLP					DS 8.1				DS 9.1	STOP T2		S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDE (I)		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDEP (K)					DS 8.1				DS 9.1	STOP T2		S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDD		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDDP					DS 8.1	STOP T2		S-ACT DCAD CONF	DS 1.1	STOP T2		S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDR		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDRP		STOP T2		S-ACT INT CONF	DS 1.1				DS 9.1	STOP T2		S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDUI		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x

TABLE H-2/T.62 *(continued)*

Called terminal

Event \ State			4 Document send								Wait			
			DS 8.1				DS 9.1				5.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
	R-RSUI/ RDGR					DS 8.1				DS 9.1	STOP T2		S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDPB (I)		STOP T2		S-P-EXPT IND (FAIL)	x				DS 9.1	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDPBP (K)					DS 8.1				DS 9.1	STOP T2		S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDPBN					DS 8.1				DS 9.1	STOP T2		S-P-EXPT IND (FAIL)	x
	ANY OTHER DOCUMENT COMMAND OR RESP OR WRONG FORMAT IN CON-NECTION WITH RSUI					DS 8.1				DS 9.1	STOP T2		S-P-EXPT IND (FAIL)	x
	ANY OTHER COMMAND OR RESP OR WRONG FORMAT		STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
EXPIRY OF T1			(--------	--------	--------	--------)	(--------	--------	--------	--------)	(--------	--------	--------	--------)
EXPIRY OF T2			STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x	STOP T2		S-P-EXPT IND (FAIL)	x
EXPIRY OF T3			(--------	--------	--------	--------)	(--------	--------	--------	--------)	(--------	--------	--------	--------)

TABLE H-2/T.62 *(continued)*

Called terminal

Event / State			2 Document receive															
			DR 1.1				DR 2.1				DR 3.1				DR 4.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		S-CON RESP POS	(			)	(			)	(			)	(			)
		S-CON RESP NEG	(			)	(			)	(			)	(			)
		S-REL RESP	(			)	(			)	(			)	(			)
		S-CTRL GIVE REQ	(			)	(			)	(			)	(			)
		S-CTRL GIVE RESP	(			)	(			)	(			)	(			)
		S-SYNC MIN REQ (I)	(			)	(			)	(			)	(			)
		S-SYNC MIN RESP (K) $\wedge$K=Q	(			)	RESTART T1	S-RSUI/ RDPBP (K)	COUNTER: Q=Q+1	DR 2.1	RESTART T1	S-RSUI/ RDPBP (K)	COUNTER: Q=Q+1	DR 3.1	START T1	S-RSUI/ RDPBP (K)	COUNTER: Q=Q+1	DR 2.1
		S-U-EXPT REQ	(			)	RESTART T1	S-RSUI/ RDPBN		DR 7.1	RESTART T1	S-RSUI/ RDPBN		DR 7.1	START T1	S-RSUI/ RDPBN		DR 7.1
		S-ACT END REQ (I)	(			)	(			)	(			)	(			)
		S-ACT END RESP (K)	(			)	(			)	(			)	(			)
		S-U-ABT REQ	START T3	S-CSA		14.1	START T3	S-CSA		14.1	START T3	S-CSA		14.1	START T3	S-CSA		14.1

TABLE H-2/T.62 *(continued)*

Called terminal

Event: Local event	Event: Protocol event	Event: Service primitive	2 Document receive: DR 1.1 Timer	Protocol action	Service primitive	Final state	DR 2.1 Timer	Protocol action	Service primitive	Final state	DR 3.1 Timer	Protocol action	Service primitive	Final state	DR 4.1 Timer	Protocol action	Service primitive	Final state
		S-U-ABT RESP	(------)				(------)				(------)				(------)			
		S-ACT BEG (START) REQ	(------)				(------)				(------)				(------)			
		S-ACT BEG (CONT) REQ (C)	(------)				(------)				(------)				(------)			
		S-DATA REQ	(------)				(------)				(------)				(------)			
		S-ACT DCAD REQ	(------)				(------)				(------)				(------)			
		S-ACT DCAD RESP	(------)				(------)				(------)				(------)			
		S-ACT INT REQ	(------)				(------)				(------)				(------)			
		S-ACT INT RESP	(------)				(------)				(------)				(------)			
		S-CAPAB DATA REQ	(------)				(------)				(------)				(------)			
		S-CAPAB DATA RESP	(------)				(------)				(------)				(------)			
		T-CON IND	(------)				(------)				(------)				(------)			

TABLE H-2/T.62 *(continued)*

Called terminal

Event / State			2 Document receive															
			DR 1.1				DR 2.1				DR 3.1				DR 4.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		T-DISCON IND	STOP T1		S-P-ABT IND	0.1	STOP T1		S-P-ABT IND	0.1	STOP T1		S-P-ABT IND	0.1			S-P-ABT IND	0.1
		T-EXPT IND			S-P-EXPT IND (ERR) 3)	DR 1.1			S-P-EXPT IND (ERR) 3)	DR 2.1			S-P-EXPT IND (ERR) 3)	DR 3.1			S-P-EXPT IND (ERR) 3)	DR 4.1
			STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSS		STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSSP		STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSSN		STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSE		STOP T1		S-REL IND	6.1	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSEP		STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSA		STOP T1		S-ABORT IND	7.1	STOP T1		S-ABORT IND	7.1	STOP T1		S-ABORT IND	7.1			S-ABORT IND	7.1
	R-RSAP		STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSCC		STOP T1		S-CTRL GIVE IND	3.1	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSCCP		STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x

TABLE H-2/T.62 *(continued)*

Called terminal

Event		State	2 Document receive															
			DR 1.1				DR 2.1				DR 3.1				DR 4.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
	R-CSUI/ CDS		RESTART T1		S-ACT BEG (START) IND P=Q=1	DR 2.1	RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1
							STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDC (C)		RESTART T1		S-ACT BEG (CON) IND P=Q=C+1	DR 2.1	RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1
							STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDCL		STOP T1		S-CAPAB DATA IND	DR 6.1	RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1
							STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDCLP		STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDE (I) ∧ (P−Q)⩽ (W−1) ∧ I=P		RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	STOP T1		S-ACT END IND	DR 5.1	START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1
			STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x							S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDEP (K)		STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDD		STOP T1		S-ACT DCAD IND	DR 9.1	STOP T1		S-ACT DCAD IND	DR 9.1	STOP T1		S-ACT DCAD IND	DR 9.1			S-ACT DCAD IND	DR 9.1
	R-RSUI/ RDDP		STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDR		STOP T1		S-ACT INT IND	DR 8.1	STOP T1		S-ACT INT IND	DR 8.1	STOP T1		S-ACT INT IND	DR 8.1			S-ACT INT IND	DR 8.1
	R-RSUI/ RDRP		STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDUI		RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	RESTART T1		S-DATA IND	DR 3.1	RESTART T1		S-DATA IND	DR 3.1	START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1
			STOP T1		S-P-EXPT IND (FAIL)	x											S-P-EXPT IND (FAIL)	x

TABLE H-2/T.62 *(continued)*

Called terminal

Event			2 Document receive: DR 1.1				DR 2.1				DR 3.1				DR 4.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
	R-RSUI/ RDGR		STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDPB (I) ∧ (P−Q)< (W−1) ∧ I=P		RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	RESTART T1		S-SYNC MIN IND 5)	DR 2.1 3)	RESTART T1		S-SYNC MIN IND	DR 2.1			S-SYNC MIN IND 5)	DR 4.1 3)
			STOP T1		S-P-EXPT IND (FAIL)	x	RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1			COUNTER: P=P+1		START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1
							STOP T1		S-P-EXPT IND (FAIL)	x							S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDPB (I) ∧ (P−Q)= (W−1) ∧ I=P		RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	RESTART T1		S-SYNC MIN IND 5)	DR 2.1 3)	STOP T1		S-SYNC MIN IND	DR 4.1			S-SYNC MIN IND 5)	DR 4.1 3)
			STOP T1		S-P-EXPT IND (FAIL)	x	RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1			COUNTER: P=P+1		START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1
							STOP T1		S-P-EXPT IND (FAIL)	x							S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDPB (I) ∧I≠P		RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	RESTART T1		S-SYNC MIN IND 5)	DR 2.1 3)	RESTART T1		S-SYNC MIN IND 6)	DR 2.1 3)			S-SYNC MIN IND 5)	DR 4.1
			STOP T1		S-P-EXPT IND (FAIL)	x	RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1
							STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDPBP (K)		STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDPBN		STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	ANY OTHER DOCUMENT COMMAND OR RESP OR WRONG FORMAT IN CONNECTION WITH CSUI		RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	RESTART T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1
			STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x

TABLE H-2/T.62 ***(continued)***

Called terminal

Event \ State			2 Document receive																
			DR 1.1				DR 2.1				DR 3.1				DR 4.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
	ANY OTHER COMMAND OR RESP OR WRONG FORMAT		STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
EXPIRY OF T1			STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x	(------------------------------)			
EXPIRY OF T2			(------------------------------)				(------------------------------)				(------------------------------)				(------------------------------)			
EXPIRY OF T3			(------------------------------)				(------------------------------)				(------------------------------)				(------------------------------)			

TABLE H-2/T.62 *(continued)*

Called terminal

Event \ State			2 Document receive															
			DR 5.1				DR 6.1				DR 7.1				DR 8.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		S-CON RESP POS	(--------)				(--------)				(--------)				(--------)			
		S-CON RESP NEG	(--------)				(--------)				(--------)				(--------)			
		S-REL RESP	(--------)				(--------)				(--------)				(--------)			
		S-CTRL GIVE REQ	(--------)				(--------)				(--------)				(--------)			
		S-CTRL GIVE RESP	(--------)				(--------)				(--------)				(--------)			
		S-SYNC MIN REQ (I)	(--------)				(--------)				(--------)				(--------)			
		S-SYNC MIN RESP (K) ∧K=Q		S-RSUI/ RDPBP (K)	COUNTER: Q=Q+1	DR 5.1	(--------)				(--------)				(--------)			
		S-U-EXPT REQ	START T1	S-RSUI/ RDPBN		DR 7.1	(--------)				(--------)				(--------)			
		S-ACT END REQ (I)	(--------)				(--------)				(--------)				(--------)			
		S-ACT END RESP (K)	START T1	S-RSUI/ RDEP		DR 1.1	(--------)				(--------)				(--------)			
		S-U-ABT REQ	START T3	S-CSA		14.1	START T3	S-CSA		14.1	START T3	S-CSA		14.1	START T3	S-CSA		14.1

TABLE H-2/T.62 *(continued)*

Called terminal

Event: Local event	Event: Protocol event	Event: Service primitive	2 Document receive: DR 5.1 Timer	DR 5.1 Protocol action	DR 5.1 Service primitive	DR 5.1 Final state	DR 6.1 Timer	DR 6.1 Protocol action	DR 6.1 Service primitive	DR 6.1 Final state	DR 7.1 Timer	DR 7.1 Protocol action	DR 7.1 Service primitive	DR 7.1 Final state	DR 8.1 Timer	DR 8.1 Protocol action	DR 8.1 Service primitive	DR 8.1 Final state
		S-U-ABT RESP	(—)				(—)				(—)				(—)			
		S-ACT BEG (START) REQ	(—)				(—)				(—)				(—)			
		S-ACT BEG (CONT) REQ (C)	(—)				(—)				(—)				(—)			
		S-DATA REQ	(—)				(—)				(—)				(—)			
		S-ACT DCAD REQ	(—)				(—)				(—)				(—)			
		S-ACT DCAD RESP	(—)				(—)				(—)				(—)			
		S-ACT INT REQ	(—)				(—)				(—)				(—)			
		S-ACT INT RESP	(—)				(—)				(—)				START T1	S-RSUI/ RDRP		DR 1.1
		S-CAPAB DATA REQ	(—)				(—)				(—)				(—)			
		S-CAPAB DATA RESP	(—)				START T1	S-RSUI/ RDCLP		DR 1.1	(—)				(—)			
		T-CON IND	(—)				(—)				(—)				(—)			

TABLE H-2/T.62 *(continued)*

Called terminal

Event / State			2 Document receive															
			DR 5.1				DR 6.1				DR 7.1				DR 8.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		T-DISCON IND			S-P-ABT IND	0.1			S-P-ABT IND	0.1	STOP T1		S-P-ABT IND	0.1			S-P-ABT IND	0.1
		T-EXPT IND			S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DR 5.1 x			S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DR 6.1 x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSS				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSSP				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSSN				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSE				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSEP				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSA				S-ABT IND	7.1			S-ABT IND	7.1	STOP T1		S-ABT IND	7.1			S-ABT IND	7.1
	R-RSAP				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSCC				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSCCP				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x

TABLE H-2/T.62 *(continued)*

Called terminal

Event \ State			2 Document receive															
			DR 5.1				DR 6.1				DR 7.1				DR 8.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
	R-CSUI/ CDS		START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1				DR 7.1			S-P-EXPT IND (FAIL)	x
					S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x								
	R-CSUI/ CDC (C)		START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1				DR 7.1			S-P-EXPT IND (FAIL)	x
					S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x								
	R-CSUI/ CDCL		START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1				DR 7.1			S-P-EXPT IND (FAIL)	x
					S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x								
	R-RSUI/ RDCLP				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDE (I)		START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1				DR 7.1			S-P-EXPT IND (FAIL)	x
					S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x								
	R-RSUI/ RDEP (K)				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDD				S-ACT DCAD IND	DR 9.1	START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	STOP T1		S-ACT DCAD IND	DR 9.1			S-P-EXPT IND (FAIL)	x
									S-P-EXPT IND (FAIL)	x								
	R-RSUI/ RDDP				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDR				S-ACT INT IND	DR 8.1			S-ACT INT IND	DR 8.1	STOP T1		S-ACT INT IND	DR 8.1			S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDRP				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDUI•		START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1				DR 7.1			S-P-EXPT IND (FAIL)	x
					S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x								

TABLE H-2/T.62 *(continued)*

Called terminal

Event \ State			2 Document receive															
			DR 5.1				DR 6.1				DR 7.1				DR 8.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
	R-RSUI/ RDGR				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-CSUI/ CDPB (I)		(——————————)				START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1				DR 7.1			S-P-EXPT IND (FAIL)	x
			START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3) S-P-EXPT IND (FAIL)	DR 7.1 x			S-P-EXPT IND (FAIL)	x								
	R-RSUI/ RDPBP (K)				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	R-RSUI/ RDPBN				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
	ANY OTHER DOCUMENT COMMAND OR RESP OR WRONG FORMAT IN CONNECTION WITH CSUI		START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1	START T1	S-RSUI/ RDGR	S-P-EXPT IND (ERR) 3)	DR 7.1				DR 7.1			S-P-EXPT IND (FAIL)	x
					S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x								
	ANY OTHER COMMAND OR RESP OR WRONG FORMAT				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T1		S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x
EXPIRY OF T1			(——————————)				(——————————)				STOP T1		S-P-EXPT IND (FAIL)	x	(——————————)			
EXPIRY OF T2			(——————————)				(——————————)				(——————————)				(——————————)			
EXPIRY OF T3			(——————————)				(——————————)				(——————————)				(——————————)			

TABLE H-2/T.62 *(continued)*

Called terminal

Event \ State			2 Document receive DR 9.1				Wait 3.1				Wait 6.1				Wait 14.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		S-CON RESP POS	(—			—)	(—			—)	(—			—)	(—			—)
		S-CON RESP NEG	(—			—)	(—			—)	(—			—)	(—			—)
		S-REL RESP	(—			—)	(—			—)	START T1	S-RSEP		0.2	(—			—)
		S-CTRL GIVE REQ	(—			—)	(—			—)	(—			—)	(—			—)
		S-CTRL GIVE RESP	(—			—)		S-RSCCP		DS 1.1	(—			—)	(—			—)
		S-SYNC MIN REQ (I)	(—			—)	(—			—)	(—			—)	(—			—)
		S-SYNC MIN RESP (K)	(—			—)	(—			—)	(—			—)	(—			—)
		S-U-EXPT REQ	(—			—)	(—			—)	(—			—)	(—			—)
		S-ACT END REQ (I)	(—			—)	(—			—)	(—			—)	(—			—)
		S-ACT END RESP (K)	(—			—)	(—			—)	(—			—)	(—			—)
		S-U-ABT REQ	START T3	S-CSA		14.1	START T3	S-CSA		14.1	START T3	S-CSA		14.1	(—			—)

TABLE H-2/T.62 *(continued)*

Called terminal

Event \ State			2 Document receive				Wait				Wait				Wait			
			DR 9.1				3.1				6.1				14.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		S-U-ABT RESP	(——	——	——	——)	(——	——	——	——)	(——	——	——	——)	(——	——	——	——)
		S-ACT BEG (START) REQ	(——	——	——	——)	(——	——	——	——)	(——	——	——	——)	(——	——	——	——)
		S-ACT BEG (CONT) REQ (C)	(——	——	——	——)	(——	——	——	——)	(——	——	——	——)	(——	——	——	——)
		S-DATA REQ	(——	——	——	——)	(——	——	——	——)	(——	——	——	——)	(——	——	——	——)
		S-ACT DCAD REQ	(——	——	——	——)	(——	——	——	——)	(——	——	——	——)	(——	——	——	——)
		S-ACT DCAD RESP	START T1	S-RSUI/ RDDP		DR 1.1	(——	——	——	——)	(——	——	——	——)	(——	——	——	——)
		S-ACT INT REQ	(——	——	——	——)	(——	——	——	——)	(——	——	——	——)	(——	——	——	——)
		S-ACT INT RESP	(——	——	——	——)	(——	——	——	——)	(——	——	——	——)	(——	——	——	——)
		S-CAPAB DATA REQ	(——	——	——	——)	(——	——	——	——)	(——	——	——	——)	(——	——	——	——)
		S-CAPAB DATA RESP	(——	——	——	——)	(——	——	——	——)	(——	——	——	——)	(——	——	——	——)
		T-CON IND	(——	——	——	——)	(——	——	——	——)	(——	——	——	——)	(——	——	——	——)

TABLE H-2/T.62 *(continued)*

Called terminal

State / Event			2 Document receive DR 9.1				Wait 3.1				Wait 6.1				Wait 14.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
		T-DISCON IND			S-P-ABT IND	0.1			S-P-ABT IND	0.1			S-P-ABT IND	0.1	STOP T3		S-P-ABT IND	0.1
		T-EXPT IND			S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x				14.1
	R-CSS				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x				14.1
	R-RSSP				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x				14.1
	R-RSSN				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x				14.1
	R-CSE				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x				14.1
	R-RSEP				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x				14.1
	R-CSA				S-ABT IND	7.1			S-ABT IND	7.1			S-ABT IND	7.1				14.1
	R-RSAP				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x	STOP T3		S-ABT CONF S-ABT CONF T-DISCON REQ	0.2 7) 0.1
	R-CSCC				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x				14.1
	R-RSCCP				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x				14.1

TABLE H-2/T.62 *(continued)*

Called terminal

Event \ State			2 Document receive				Wait				Wait				Wait			
			DR 9.1				3.1				6.1				14.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
	R-CSUI/ CDS				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x				14.1
	R-CSUI/ CDC (C)				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x				14.1
	R-CSUI/ CDCL				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x				14.1
	R-RSUI/ RDCLP				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x				14.1
	R-CSUI/ CDE (I)				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x				14.1
	R-RSUI/ RDEP (K)				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x				14.1
	R-CSUI/ CDD				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x				14.1
	R-RSUI/ RDDP				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x				14.1
	R-CSUI/ CDR				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x				14.1
	R-RSUI/ RDRP				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x				14.1
	R-CSUI/ CDUI				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x				14.1

TABLE H-2/T.62 *(continued)*

Called terminal

Event \ State			2 Document receive DR 9.1				Wait 3.1				Wait 6.1				Wait 14.1			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state	Timer	Protocol action	Service primitive	Final state
	R-RSUI/ RDGR				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x				14.1
	R-CSUI/ CDPB (I)				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x				14.1
	R-RSUI/ RDPBP (K)				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x				14.1
	R-RSUI/ RDPBN				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x				14.1
	ANY OTHER DOCUMENT COMMAND OR RESP OR WRONG FORMAT				S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x			S-P-EXPT IND (FAIL)	x				14.1
EXPIRY OF T1			(------------------------)				(------------------------)				(------------------------)				(------------------------)			
EXPIRY OF T2			(------------------------)				(------------------------)				(------------------------)				(------------------------)			
EXPIRY OF T3			(------------------------)				(------------------------)				(------------------------)				STOP T3		S-P-ABT IND T-DISCON REQ	0.1

TABLE H-2/T.62 *(continued)*

Called terminal

Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state
State: Wait x						
		S-CON RESP POS	(------------------------------)			
		S-CON RESP NEG	(------------------------------)			
		S-REL RESP	(------------------------------)			
		S-CTRL GIVE REQ	(------------------------------)			
		S-CTRL GIVE RESP	(------------------------------)			
		S-SYNC MIN REQ (I)	(------------------------------)			
		S-SYNC MIN RESP (K)	(------------------------------)			
		S-U-EXPT REQ	(------------------------------)			
		S-ACT END REQ (I)	(------------------------------)			
		S-ACT END RESP (K)	(------------------------------)			
		S-U-ABT REQ	START T3	S-CSA		14.1

TABLE H-2/T.62 *(continued)*

Called terminal

Event \ State			Wait x			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state
		S-U-ABT RESP	(			)
		S-ACT BEG (START) REQ	(			)
		S-ACT BEG (CONT) REQ (C)	(			)
		S-DATA REQ	(			)
		S-ACT DCAD REQ	(			)
		S-ACT DCAD RESP	(			)
		S-ACT INT REQ	(			)
		S-ACT INT RESP	(			)
		S-CAPAB DATA REQ	(			)
		S-CAPAB DATA RESP	(			)
		T-CON IND	(			)

TABLE H-2/T.62 *(continued)*

Called terminal

Event \ State			Wait			
			x			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state
		T-DISCON IND			S-P-ABT IND	0.1
		T-EXPT IND				x
	R-CSS					x
	R-RSSP					x
	R-RSSN					x
	R-CSE					x
	R-RSEP					x
	R-CSA				S-ABT IND	7.1
	R-RSAP					x
	R-CSCC					x
	R-RSCCP					x

TABLE H-2/T.62 *(continued)*

Called terminal

Event \ State			Wait			
			x			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state
	R-CSUI/ CDS					x
	R-CSUI/ CDC (C)					x
	R-CSUI/ CDCL					x
	R-RSUI/ RDCLP					x
	R-CSUI/ CDE (I)					x
	R-RSUI/ RDEP (K)					x
	R-CSUI/ CDD					x
	R-RSUI/ RDDP					x
	R-CSUI/ CDR					x
	R-RSUI/ RDRP					x
	R-CSUI/ CDUI					x

TABLE H-2/T.62 *(end)*

Called terminal

Event / State			Wait			
			x			
Local event	Protocol event	Service primitive	Timer	Protocol action	Service primitive	Final state
	R-RSUI/ RDGR					x
	R-CSUI/ CDPB (I)					x
	R-RSUI/ RDPBP (K)					x
	R-RSUI/ RDPBN					x
	ANY OTHER COMMAND OR RESP OR WRONG FORMAT					x
EXPIRY OF T1			(---------------------------)			
EXPIRY OF T2			(---------------------------)			
EXPIRY OF T3			(---------------------------)			

CONTROL PROCEDURES FOR TELETEX AND G4 FACSIMILE SERVICES BASED ON RECOMMENDATIONS X.215 AND X.225

CONTENTS

0 Introduction

0.1 This Recommendation is related to other Recommendations.

In particular it is related to certain Recommendations as defined by the Reference Model for Open Systems Interconnection (X.200).

This Recommendation is based on the description of the session service (X.215) and the session protocol (X.225) as shown in Figure 1/T.62 *bis.*

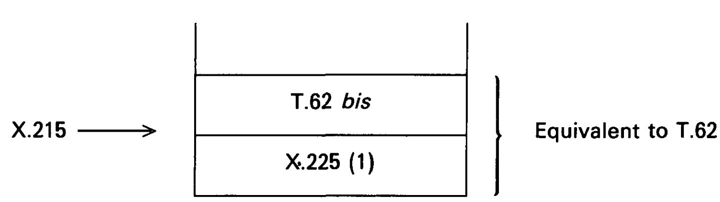


FIGURE 1/T.62 *bis*

Note 1 – Only the services and protocol elements relevant to Recommendation T.62 procedures are used (see Table 1/T.62 *bis* in § 4.1).

Note 2 – The session protocol described in Recommendation X.225 is based on the services provided by the transport layer as described in Recommendations X.214 and X.224.

For compatibility with Teletex and Group 4 facsimile additional rules (in accordance with Recommendation T.70, § 5, including Annexes A and B) must be applied when using the transport service and protocol (Recommendations X.214 and X.224, class 0).

0.2 The control procedure for Teletex and Group 4 facsimile are currently described in Recommendation T.62.

Recommendation T.62 may be superseded by this Recommendation and the appropriate session layer service and protocol described in the Recommendations X.215 and X.225.

When using either Recommendation T.62 *bis* (based on the X-Series Recommendations) or Recommendation T.62 (based on Recommendation T.70) it is intended that the externally visible protocols are equal.

It is the intention that Recommendations X.215 and X.225 together with this Recommendation do have tha same level of detail and accuracy as Recommendation T.62 already has. However, for the time being Recommendation T.62 will be kept and in cases of discrepancy and/or incompatibility, Recommendation T.62 will take precedence over Recommendations X.215 and X.225 together with the application rules described in this Recommendation.

This Recommendation covers all of Recommendation T.62 including the Annexes.

1 Scope and field of application

This Recommendation defines:

1) A set of rules for using the OSI Session Service.
2) The additional requirements for the implementation to conform to the control procedures for Teletex and Group 4 facsimile services.

The set of rules consists of:

- The actions to be taken by the session user for performing the control procedures.
- The description of the use of the session service primitives and their parameters.
- The encoding of parameters not covered by the session layer (for these parameters see also § 5.2). These parameters are described as additional parameters for each primitive and each SPDU where appropriate. The length and value of these parameters are provided by the SS-user and no checking is made by the session layer itself.

2 References

Recommendations F.161, F.200, X.215, X.225, T.563, T.503, T.521, T.6, T.35, T.60, T.61, T.62, T.400-Series, T.390 and X.200.

3 Actions for performing the control procedures for Teletex and Group 4 facsimile

This section describes the Teletex application protocol in terms of actions involving the session service primitives.

3.1 *General*

The control procedures for Teletex and Group 4 facsimile are designed to allow data to be transferred and managed between terminals in the form of documents. The present Recommendation only provides for the transfer of documents. As a consequence, no transfer of data can take place outside a document.

- A *document* is composed of one or more *pages.*
- Pages are sent sequentially and each page has to be individually *acknowledged.* However, several pages may be sent without waiting for the acknowledgement and the number of pages which can be sent in this manner is called the *window-size.*
- The transfer of a document is executed from the *source* to the *sink* (see §§ 3.2.3 and 3.4). For the purpose of the description, in the remainder of the text, the source is also called the *sender* and the sink is also called the *receiver.*

3.2 *Session connection establishment phase*

3.2.1 The calling SS-user initiates the connection by issuing the S-CONNECT request primitive.

The called SS-user may accept or refuse the connection by issuing the S-CONNECT response primitive.

It is the responsibility of the initiator of the connection to examine the parameters sent by the remote terminal at session initiation and to determine whether the session should continue. If it is not to be continued, the session shall be ended normally.

3.2.2 A session connection is identified by means of:

a) the basic session reference (mandatory parameter) composed of:
   - terminal identifier of the called terminal;
   - terminal identifier of the calling terminal;
   - date and time;

b) an optional additional session reference number, to uniquely identify the session connection.

3.2.3 At session connection establishment, the data, minor synchronize and major/activity tokens shall be available and assigned to the initiator side. Thus at session initiation the initiator is defined as being the current source of text information and is therefore the source terminal.

3.2.4 When accepting the connection the called SS-user may request the session control by issuing the primitive S-TOKEN-PLEASE request.

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 session and terminal capabilities parameters of the S-CONNECT primitives at session initiation and/or by the parameters of S-CAPABILITY-DATA primitives.

3.2.5 The following rules shall apply to the private use and presently not defined parameters:

a) The use of these parameters in other primitives than S-CONNECT and S-CAPABILITY-DATA must be negotiated upon in advance by S-CONNECT or S-CAPABILITY-DATA. Presence of these parameters unexpectedly in other primitives may result in procedural errors.

b) The absence of a parameter of this kind in a response to S-CONNECT or S-CAPABILITY-DATA must be interpreted as an indication that the terminal is not capable of handling any of these functions.

3.3 *Session termination phase*

The session connection is terminated by means of the S-RELEASE services for normal (or error-free) termination.

The S-U-ABORT/S-P-ABORT services 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. S-U-ABORT/S-P-ABORT shall only used when there is no other suitable way of ending the session.

In the two-way alternate or one way communication mode, only the sender of the S-CONNECT request may send the S-RELEASE request when he is the current source.

Note – The transport connection may be reused as a local implementation choice and this may depend on an application decision which may be passed across the session service interface.

3.4 *Document management*

The document concept, as defined in Recommendation T.62, is mapped onto the activity concept of the session protocol. Consequently, the document number corresponds to the activity identifier. The transfer of a document is delimited by a start and an end.

A document is sent by the source (sender) to the sink (receiver) and this transfer may only take place when the source owns all the available tokens.

When the sink wants to send a document it may express this requirement by issuing a S-TOKEN-PLEASE primitive. When the transfer of a document is terminated, the sender may give the control to the receiver by issuing a S-CONTROL-GIVE primitive. But there is no requirement for sending text information prior to issuing a S-CONTROL-GIVE primitive. When the protocol element exchange corresponding to this primitive is executed, all the tokens are assigned to the receiver; consequently it becomes the source (or sender) and the former source becomes the sink (or receiver). A document transfer may then be started from the new source to the new sink.

3.4.1 *Start of document*

The S-ACTIVITY-START service indicates the start of a document. It also indicates the start of the first page.

3.4.2 *Page boundaries*

3.4.2.1 The S-SYNC-MINOR service indicates the boundary between pages. It also indicates a checkpoint for error recovery purposes and invites the sink to accept responsibility for the previously received page. In the basic services a checkpoint must be inserted at each page boundary using S-MINOR-SYNC request. Each checkpoint must be explicitly acknowledged in the right sequence, by using S-SYNC-MINOR response. Consequently the checkpoint reference number corresponds to the minor synchronization point serial number.

The S-SYNC-MINOR response shall be used to indicate that the receiver accepts responsibility for that page. If the receiver does not accept the responsibility for the page he shall use the S-U-EXCEPTION-REPORT service. In this case the transmission must be interrupted by the sender using the S-ACTIVITY-INTERRUPT or DISCARD services.

The receiver may reject reception for a detected error, but he is not obliged to check the document for errors. Once a page has been positively acknowledged, any error recovery for the subsequent detection of an error is beyond the scope of these control procedures.

3.4.2.2 When a source terminal receives an S-SYNC-MINOR confirmation with the receiving ability jeopardized (RAJ) parameter set to 1 (see § 4.4.6) during a document transmission, it may continue to transmit one or more pages until the window is closed. In this context the following rules apply:

a) if the source subsequently receives an S-SYNC-MINOR confirmation with the RAJ parameter set to 0 (see § 4.4.6), it will be able to continue transmission;

b) if the source subsequently receives an S-U-EXCEPTION-REPORT with a parameter value "SS-user receiving ability jeopardized" (indicating "memory overflow"), the document transmission should be terminated abnormally. The source shall issue either a S-ACTIVITY-DISCARD request or a S-ACTIVITY-INTERRUPT request.

3.4.2.3 When a sink terminal sends an S-SYNC-MINOR response with the receiving ability jeopardized parameter set to 1, and subsequent memory overflow results in sending S-U-EXCEPTION-REPORT, the value of the reason code will be "SS-user receiving ability jeopardized" (indicating "unable to continue the session").

3.4.3 *End of document*

3.4.3.1 The S-ACTIVITY-END service shall be used to indicate the end of a document. It also indicates the end of the final page and as such represents the final checkpoint. The S-ACTIVITY-END response gives a positive acknowledgement to the last checkpoint. In the basic services this is the last page reference number.

When confirming this service, the receiver shall indicate that:

a) he has not detected an error;

b) he accepts responsibility for the received document;

c) he is ready to receive a new S-ACTIVITY-START or S-ACTIVITY-RESUME request.

To refuse the checkpoint indicated in S-ACTIVITY-END indication, the SS-user shall use the S-U-EXCEPTION-REPORT service.

3.4.3.2 Only if the sink terminal has sent an S-ACTIVITY-END response and received a valid S-ACTIVITY-START, S-ACTIVITY-RESUME, S-ACTIVITY-DATA, S-DISCONNECT or S-CONTROL-GIVE indication, it is certain that the source terminal will not use error recovery procedures regarding the preceding document. In all other cases it can happen that after sending an S-ACTIVITY-END response a repetition of pages takes place and the duplications may be deleted by the sink terminal.

3.4.4 *Interruption of a document*

Documents may be interrupted or discarded by using the S-ACTIVITY-INTERRUPT or S-ACTIVITY-DISCARD services.

3.4.4.1 The S-ACTIVITY-INTERRUPT service shall be used to indicate the abnormal ending of a document but the part of the document received so far should not be discarded. When the receiver of a document sends a S-ACTIVITY-INTERRUPT response, this means that he has already accepted the responsibility for the received document (up to the last checkpoint for which a positive acknowledgement has been sent). It does not indicate that he will be able to perform the linking of the followig parts of the interrupted document.

3.4.4.2 The S-ACTIVITY-DISCARD service shall be used to indicate the abnormal ending of a document and that the receiver of the document 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 1 – The S-ACTIVITY-DISCARD service is an invitation to discad the whole of the document and not merely the part of the document transmitted since the last S-ACTIVITY-RESUME.

Note 2 – The receiving terminal may discard the document from its memory (but has no obligation to do so) and/or indicate to the operator that this part of the document has no value. If the text is not deleted, the operator shall be informed.

Note 3 – The use of the S-ACTIVITY-DISCARD service for Group 4 facsimile is for further study.

3.4.4.3 There are two ways that the sender is permitted to recover from an interrupted transmission:

a) a cancellation is achieved by the subsequent use of the S-ACTIVITY-RESUME and S-ACTIVITY-DISCARD services and the transmission will be resumed by the S-ACTIVITY-START service;

b) the sender may resume by use of the S-ACTIVITY-RESUME service, starting at that point in the document corresponding to the last checkpoint for which an acknowledgement was received.

3.4.4.4 If, during document transmission, an abnormal condition occurs, with the exception of the one described in § 3.4.4.5, the following rules apply:

a) In the case that a document transmission was initiated by S-ACTIVITY-START request and no minor synchronization point has been positively acknowledged, either the S-ACTIVITY-DISCARD or INTERRUPT service should be used. If the S-ACTIVITY-INTERRUPT service is used it should be interpreted as an S-ACTIVITY-DISCARD. In this case, however, it is necessary to reply with an S-ACTIVITY-INTERRUPT response to the S-ACTIVITY-INTERRUPT indication as required by the session service definition. It is only a matter of different semantic interpretation of the service by the session service user.

b) In all other cases S-ACTIVITY-INTERRUPT or DISCARD service should be used.

3.4.4.5 The following rules apply if the session is aborted during document transmission:

a) If document transmission was initiated by S-ACTIVITY-START request and no minor synchronization point has been positively acknowledged during that transmission, both sending and receiving entities shall treat the failure as if the S-ACTIVITY-DISCARD service had been correctly initiated and completed.

b) In other cases, both sending and receiving entities shall treat the failure as if the S-ACTIVITY-INTERRUPT service had been correctly initiated and completed.

3.4.5 *Resumption of a document*

The S-ACTIVITY-RESUME service indicates the continuation of a document that has previously been partially transmitted.

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.

Note 1 – The checkpoint reference number appearing in the primitive S-ACTIVITY-RESUME is the last checkpoint reference number for which a positive acknowledgement has been received. It should be noted that positive acknowledgement may have been sent by the sink terminal but not received by the source terminal.

Note 2 – If several continuations are required to complete transmission of a document, they are all linked to the partial transmission in which the activity start service was used. The sequence of checkpoint reference numbers is then used to identify the correct sequencing of parts to be linked, this sequence and all such continuations must be transmitted in this order.

Note 3 – It is the responsibility of the receiver to discard any text information that has been duplicated in the process of continuation of an interrupted transmission.

3.4.6 *Exchange of terminal capabilities*

Outside document transfer (outside activities) the *S-CAPABILITY-DATA* service may be used to exchange information to enable a check of the terminal capabilities (both standardized and private use) and to investigate the storage capability of the remote terminal.

The primitive shall include a parameter with a list of receiving capabilities that may be needed at the receiver by the sender of this primitive.

Storage that has been reserved by the S-CAPABILITY-DATA service can be released after session termination or when a new S-CAPABILITY-DATA indication with storage requirement indication is received.

3.4.7 *Exception conditions*

3.4.7.1 Detection of a protocol error may cause the SS-provider to issue a S-P-EXCEPTION-REPORT indication. On receipt of a S-P-EXCEPTION-REPORT indication, the SS-user shall use the S-ACTIVITY-INTERRUPT or S-ACTIVITY-DISCARD service (subject to the tokens restrictions); it may also use the S-U-ABORT service.

3.4.7.2 The receiver of a document may issue an S-U-EXCEPTION-REPORT request at any time after having received an S-ACTIVITY-START or S-ACTIVITY-RESUME indication. It may issue an S-U-EXCEPTION-REPORT request after having received an S-SYNC-MINOR indication, or an S-ACTIVITY-END indication instead of giving the confirmation.

When receiving an S-U-EXCEPTION-REPORT indication, the SS-user shall use either the S-ACTIVITY-INTERRUPT or S-ACTIVITY-DISCARD service; it may also use the S-U-ABORT service.

3.5 *Miscellaneous*

3.5.1 *Acknowledgement window*

3.5.1.1 The window mechanism has been introduced in order to allow continuous transmission of pages. It may also be used by the receiving terminal to resolve local time problems without affecting the continuous transmission.

Note – For efficiency reasons, the receiving terminal will transmit the response to acknowledge outstanding checkpoing(s) as soon as possible.

The design of the terminal should be such that continuous reception is possible in normal operation of the terminal (e.g. with an average Teletex page content of 1600 octets). The use of the window mechanism should take into account the quality of service requirements in Recommendations F.200 and F.161.

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.

3.5.1.2 The following rules should apply to the use of window size:

a) The indication of the window size parameter is not mandatory for the Teletex service, but is mandatory for the Group 4 facsimile service (in the S-CONNECT request and response). It may have a value in the range of 1 to 255. The absence of this parameter in S-CONNECT request or response must be interpreted as the default value of three for the Teletex service.

b) All Teletex terminals should support a window size of 3. Group 4 facsimile terminals of Classes 2 and 3 should be able to support a window size of 3 when interworking with Teletex. Enhanced Teletex terminals (e.g. with mixed-mode capability) and all Group 4 facsimile terminals may require other window sizes.

c) The source terminal is free to use any window size that does not exceed the window size indicated by the sink terminal (in S-CONNECT request or response).

d) If the sender of S-CONNECT request or response is a basic Teletex terminal which does not indicate any parameter for the window size, the receiver should be aware that the sender may ignore any window size indicated and use the window size of 3.

3.5.2 *Negotiation of optional capabilities*

Two methods are provided. The first is used at session initiation to exchange a limited list of capabilities (S-CONNECT service). The second method may be used when required, after session initiation, to indicate the sender's requirements for extended capabilities (S-CAPABILITY-DATA, S-ACTIVITY-START, S-ACTIVITY-RESUME services).

3.5.3 *Negotiation of storage requirements*

Storage availability can be indicated in the following ways:

a) When a Teletex session 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) When a Group 4 facsimile session is established, it can only be assumed that the called terminal has adequate recording paper to print at least one page of information (for basic Class 1 apparatus). Negotiation of storage requirements is mandatory for Group 4 Classes 2 and 3 facsimile apparatus. Having negotiated this requirement, exceptionally, a receive memory overflow may 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.

c) 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.

d) The S-CAPABILITY-DATA service also provides the possibility to investigate the storage availability at the receiving terminal prior to the transmission of a document.

3.5.4 *Timer handling*

The timer handling is based on the occurrence of certain events. These events may be protocol elements or service primitives and it is assumed that there is no time delay between the occurrence of a session service primitive and the related protocol element and vice versa.

Two types of timer are defined:

- inactivity timer;
- demand-response timer.

3.5.5 *Inactivity timer*

3.5.5.1 During the lifetime of a session correction each partner is responsible for detection of any period of inactivity in excess of inactivity timer value determined by negotiation (indicating, for example, a failure or another inability to continue productive use of the session).

3.5.5.2 The inactivity timer is used by the sink terminal to detect any period during which no protocol element is exchanged. Such period must be detected whenever the transport connection exists.

This timer is started or restarted on reception or sending of each event by the sink terminal when further action is expected from the source terminal.

This timer is stopped on reception of an event by the sink terminal when no further action is expected from the source terminal.

When the timer expires, the S-ABORT service shall be used.

Further information can also be found in Figure B-1/T.62 *bis.*

3.5.5.3 The following rules apply to the negotiation of the value of the inactivity timer:

a) An inactivity timer value different from 60 seconds will apply only if this parameter is indicated by both terminals, i.e. negotiation, at session establishment (via S-CONNECT) or document boundaries (via S-CAPABILITY-DATA).

b) If both terminals indicate an inactivity timer value, the following rules apply for the duration of the session or until a subsequent negotiation has taken place:

   i) the smaller of the two values applies when both values are greater than or equal to 60 seconds;

   ii) the larger of the two values applies when both values are less than 60 seconds.

   iii) a timer value of 60 seconds applies if one value is above and one is below 60 seconds.

3.5.6 *Demand response timer*

3.5.6.1 This timer is responsible for detection of any period of time during which the sink terminal has failed to send a response/acknowledgement. The value of that timer is 60 seconds. Negotiation of the demand response timer value is for further study.

3.5.6.2 In general, this timer has to be started for each event which is issued by the source terminal towards the sink terminal and for which a response/acknowledgement is expected.

It is stopped when a response is received. When the timer expires, the S-ABORT service shall be used.

3.5.6.3 In the following special cases, specific actions are required:

- on the occurrence of an abort primitive/SPDU (sent or received), the demand response timer is stopped if it has been started;
- reception of an exception-report indication (or associated SPDU) shall be considered as the response to the primitive (SPDU) sent previously. Consequently the associated action is to stop the timer.

Further information can also be found in Figures B-1/T.62 *bis* and B-2/T.62 *bis*.

3.5.7 *Document reference number*

Document reference numbers (DRNs) shall be assigned as decimal digits, preferably, but not necessarily, starting from 001. DRNs shall then sequentially be incremented by one for each successive document. DRNs shall be assigned to all documents in a session, irrespective of the document type identifier or whether S-ACTIVITY-START or S-ACTIVITY-RESUME is used as the initiating primitive. The number does not necessarily have to comprise 3 digits and leading zeros do not necessarily have to be transmitted. In all cases the leading zeros must be ignored.

Note – In order to uniquely identify the documents exchanged, it is recommended that the same DRNs should not appear within a session. However, it is noted that some existing terminals may cause duplication of DRNs when documents are exchanged in both directions.

4 **Usage of the session service** (Recommendation X.215)

4.1 *General*

The rules given hereinafter indicate how the session service must be used by the higher layer entity.

It is assumed that where a parameter is non mandatory in the protocol, it is also non mandatory in the corresponding primitive. When a default value applies in the protocol, the same default value applies at the service interface.

The services which are used are indicated in Table 1/T.62 *bis* with the corresponding functional units.

The data, synchronization minor and major/activity tokens must be available. The release token is not available.

The term "additional parameter" as used in this Recommendation applies to parameters which are not included in the session service described by Recommendation X.215 but which are nevertheless essential to describe interaction between the session service user and the session layer itself, when it is to be used in a form compatible with control procedures for Teletex and Group 4 facsimile (consequently they have to be taken into account when implementing the session layer for such use). These parameters contain information carried by the session protocol elements independently of the "user data" parameter contained in the session protocol elements which are described in § 3 of this document.

4.2 *Session connection establishment*

The following service primitive is used:

S-CONNECT.

4.2.1 *The parameters of the S-CONNECT are used as follows*

4.2.1.1 *Session connection identifier*

a) The calling SS-user reference shall only contain the calling terminal identifier. This mandatory parameter (request and indication primitives) identifies the calling terminal. This is a sequence of graphic characters as defined in Recommendation F.200.

b) The called SS-user reference shall only contain the called terminal identifier. This mandatory parameter (response and confirm primitives) provides the terminal identification of the sender of the S-CONNECT response primitive. This is a sequence of graphic characters as defined in Recommendation F.200.

c) The common reference shall only contain the date and time. This parameter is both mandatory and identical on all primitives. It gives the date and time and it is a sequence of graphic characters as defined in Recommendation F.200. It is used in conjunction with the terminal identifications of both terminals in a session as a reference to that session.

d) The additional reference information shall only contain the additional session reference number. If it is used by the initiator and by the responder, it shall have the same value in the response as in the request. If it is not used by the initiator it shall not be included in the request. If it is not used by the responder it shall not be included in the response. This number shall be used in addition to the basic session reference (calling and called terminal identifiers, date and time) when this basic session reference is not sufficient to uniquely identify the session and such unique identification is required. In this case it shall also be used together with the basic session reference, when referring to this session in an S-ACTIVITY-RESUME primitive. The reference number is a fixed length of two decimal digits as coded in Recommendation T.61.

TABLE 1/T.62 *bis*

Functional units	Service primitives
Kernel	S-CONNECT S-RELEASE S-U-ABORT S-P-ABORT S-DATA
Half duplex	S-TOKEN-PLEASE
Minor synchronisation	S-SYNC-MINOR.
Activity management	S-ACTIVITY-START S-ACTIVITY-RESUME S-ACTIVITY-INTERRUPT S-ACTIVITY-DISCARD S-ACTIVITY-END S-CONTROL-GIVE
Capability data exchange	S-CAPABILITY-DATA
Exceptions	S-P-EXCEPTION-REPORT S-U-EXCEPTION-REPORT

4.2.1.2 *Calling and called SSAP addresses*

The session layer addressing is not used in Teletex and Group 4 facsimile services (these parameters are not used).

4.2.1.3 *Quality of service*

This parameter must be set so as not to use expedited data (transport expedited is not available in Teletex) and in such a way that extended concatenation is not selected.

4.2.1.4 *Session requirements*

This parameter may be omitted and in this case the default value applies. The following functional units shall be selected:

- minor synchronization,
- activity management,
- capability data exchange,
- half-duplex,
- exceptions.

4.2.1.5 *Initial synchronization point serial number*

This parameter is not used in Teletex and Group 4 facsimile services.

4.2.1.6 *Initial assignment of tokens*

This parameter may be omitted and in that case, the default value applies. All available tokens are assigned to the calling entity.

4.2.1.7 *Result* (only in response and confirmation)

This parameter is used to accept or refuse the session connection. In case of refusal, this parameter may also convey up to 69 characters. Only characters convertible one-to-one to the telex alphabet (ITA2) shall be allowed and Teletex code shall be used.

4.2.1.8 *User data*

This non-mandatory parameter is used to convey data of the presentation and/or application protocol(s). All information necessary to negotiate the document interchange protocol parameters defined in the T.400-Series of Recommendations is contained in this parameter field.

4.2.2 *Additional parameters*

The following parameters may also be included:

4.2.2.1 *Non-basic session capabilities*

If used, this non-mandatory parameter indicates which non-basic session capabilities are available as receiving capabilities of the sender of this primitive.

TABLE 2/T.62 *bis*

Parameter		Function	Encoding
Miscellaneous session capabilities	nm	– Session suspension – Interactive operation	4.2.3.1
Window size	nm	– Negotiation of window size	4.2.3.2

4.2.2.2 *Service identifier*

This mandatory parameter indicates whether the sender of this primitive intends to use the Telematic services.

Note 1 – For the basic Teletex services, the service identifiers in the S-CONNECT request and response must be identical.

Note 2 – In case of interconnections between the terminals of different services, the service identifiers in the S-CONNECT request and response may not be identical.

4.2.2.3 *Inactivity timer*

This non-mandatory parameter is used to negotiate the value of the inactivity timer.

4.2.2.4 *Non-basic terminal capabilities*

These parameters indicate which of the non-basic capabilities listed in the table below for the Teletex service, are available as receiving capabilities of the sender of this request. These parameters are mandatory if the equipment is capable of any of the specific functions listed in the table below. Absence of the parameter indicates that the specific function is not available.

TABLE 3/T.62 *bis*

Parameter		Function	Encoding
Control character sets	nm	Reverse line feed	4.2.3.5
Page formats	nm	ISO A4 vertical and horizontal orientation	4.2.3.7
Miscellaneous terminal capabilities	nm	Character spacing of 2.12 mm (12 characters per 25.4 mm) Character spacing of 1.69 mm (15 characters per 24.4 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	4.2.3.8

Note – The definitions of these presentation capabilities may be found in Recommendation T.60. Future extensions and private-use capabilities are to be accommodated with the capability data exchange service.

4.2.2.5 *Private use parameters*

These parameters are not mandatory. Their definition and use are not standardized (see § 3.2).

4.2.2.6 *Non-standardized capabilities*

This non-mandatory parameter is used to ascertain compatibility regarding the use of non-standardized terminal capabilities.

4.2.3 *Encoding of the S-CONNECT additional parameters value*

4.2.3.1 *Miscellaneous session capabilities*

This PV field shall indicate possible modes of operation. The encoding of the first octet shall be:

a) bit 1: reserved

b) bit 2: reserved (for session suspension)

c) bit 3 set to 1 indicates the terminal capability for interactive operation (data transfer outside activity boundaries).

All other bits are reserved for future standardization.

4.2.3.2 *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).

4.2.3.3 *Service identifier*

The coding for the service identifier is as follows:

Bits	87654321	Service
	00000001	Telematic

All other encodings are for further study.

4.2.3.4 *Inactivity timer*

a) Bits 8 and 7 indicate the unit of inactivity timer value and bits 6 to 1 indicate the binary value in the range of 1 to 63.

Bits	87	Unit of timer
	00	Second(s);
	01	Minute(s);
	10	Hour(s);
	11	Reserved for extension.

b) All bits of the first octet set to zero indicates the inactivity timer value is of infinity, i.e. the timer is disabled.

4.2.3.5 *Control character sets* (refer to Recommendations T.60 and T.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 to designate that set, as defined in Recommendation T.61. Where more than one such character set are to be indicated, the ESC character fulfills the purpose of a separator between the character set indicators.

4.2.3.6 *Non-standardized capabilities*

The first octet represents the registered CCITT country code as specified in Recommendation T.35 to be used to identify non-standard capabilities. Additional octets may be specified by each country Administration.

4.2.3.7 *Teletex page formats* (refer to Recommendations T.60 and T.61)

The value of the first octet of the parameter value will indicate the capability of a page format, as defined in Table 4/T.62 *bis*. If the terminal is capable of more than one format, these will be indicated in the first and subsequent octets, one octet per value (see Note 1 of Table 4/T.62 *bis*). No separator between the values will be given. The length indicator of the parameter will indicate if more than one value is given. All parameter values shall be inserted in increasing order of their binary values.

TABLE 4/T.62 *bis*

Bits	8	7	6	5	4	3	2	1		Format
	0	0	0	0	0	0	0	1	(option)	ISO A4, horizontal and vertical
	0	0	0	0	0	0	1	0	(option)	North American, horizontal and vertical
	1	0	0	0	0	1	0	0	(option)	ISO A4 extended (ISO standard 3535), vertical
	0	1	0	0	0	1	0	0	(option)	ISO A4 extended (ISO standard 3535), horizontal
	1	0	0	0	1	0	0	0	(option)	North American Legal, vertical
	0	1	0	0	1	0	0	0	(option)	North American Legal, horizontal
	0	0	0	0	0	0	1	1	(option)	ISO A4, horizontal and vertical (for use by Japanese Kanji and Chinese ideogram terminals)
	0	0	0	1	0	0	0	0	(option)	ISO B5, horizontal and vertical (for use by Japanese Kanji and Chinese ideogram terminals)
	0	0	1	0	0	0	0	0	(option)	ISO B4, horizontal and vertical (for use by Japanese Kanji and Chinese ideogram terminals)

Note 1 – The whole octet has to be considered when decoded, as the meaning is coded as a value, not as a single bit position within the octet. All other values are reserved, i.e. it is not allowed to «combine» the indication of several formats into the same octet by setting more than one bit to «one».

Note 2 – The following rule is used for the coding of bits 7 and 8:

Bits 8	7	Meaning
0	0	Vertical and horizontal
0	1	Horizontal only
1	0	Vertical only.

4.2.3.8 *Miscellaneous terminal capabilities*

A variable length field indicating the receiving capabilities for non-basic standardized values of character spacing, line spacing and graphic renditions. Each parameter value of such a function shall be indicated by the control sequence (CSI, PI LI F) as defined in Recommendation T.61. This applies to the function select horizonal spacing (SHS) for a character pitch, select vertical spacing (SVS) for a line pitch and select graphic rendition (SGR) for a graphic rendition. This also applies to the functions graphic size modification (GSM) and select presentation direction (SPD) for Japanese Kanji and Chinese ideogram capabilities and to character orientation function (COF) for Chinese ideogram capabilities. When more than one such character sequence is to be indicated, a single space shall be inserted between them. Only one parameter value is allowed within a CSI sequence.

4.3 *Session termination phase*

The following service primitives are used:

S-RELEASE

S-U-ABORT

S-P-ABORT

4.3.1 *The parameters of the S-RELEASE are used as follows*

Result: this parameter will indicate "affirmative" (only in confirmation and response).

SS-user-data: this parameter is not used in Teletex and Group 4 facsimile services.

4.3.2 *S-U-ABORT*

Using this primitive will be interpreted as "local terminal error".

SS-user-data : this parameter is not used in Teletex and Group 4 facsimile services.

4.3.3 *S-P-ABORT*

Receipt of this primitive is defined in Recommendations X.215 and X.225.

4.4 *Data transfer phase*

The following service primitives are used:

S-ACTIVITY-START

S-ACTIVITY-RESUME

S-ACTIVITY-INTERPRET

S-ACTIVITY-DISCARD

S-ACTIVITY-END

S-SYNC-MINOR

S-U-EXCEPTION-REPORT

S-P-EXCEPTION-REPORT

S-CONTROL-GIVE

S-TOKEN-PLEASE

S-CAPABILITY-DATA

S-DATA

4.4.1 *S-ACTIVITY-START*

4.4.1.1 *The parameters of S-ACTIVITY-START are used as follows*

- *Activity identifier:* This mandatory parameter shall contain the document reference number (see § 3.5.6).
- *SS-user-data:* This non-mandatory parameter is used to convey data of the presentation and/or application protocol(s). All information necessary to negotiate the document interchange protocol parameters, defined in the T.400-Series of Recommendations, is contained in this parameter field.

4.4.1.2 *Additional parameters*

The following parameters may also be included:

a) *Document type identifier:* Not a mandatory field. If a normal document is used, this parameter shall not be indicated. If other types of document are used, the inclusion of this field is obligatory.

   (Description of types of document are in Annex A.)

b) *Service interworking identifier:* Not a mandatory field. This 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.

   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 Recommendations F.200, T.90 and T.91;

   ii) Teletex/Videotex interworking – for further study;

   iii) Teletex/facsimile interworking – for further study.

c) *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.

d) *Private use parameters:* Non mandatory. Definition of such parameters is not standardized (see § 3.2).

4.4.1.3 *Encoding of the S-ACTIVITY-START additional parameters value*

a) *Document type identifier*

Absence of this parameter shall indicate a normal document. This parameter, if used, is a binary encoded field of fixed length of one octet identifying the documnent type as follows:

Bits 87654321	Type of document
00000001	Operator document
00000010	Control document
00000011	Monitor document

All other encodings are reserved for future standardization.

b) *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.

c) *Indication of required terminal capability* (non-basic Teletex terminal capabilities)

– Graphic character sets (refer to Recommendations T.60 and T.61)

A variable length field indicating the receiving capabilities for non-basic standardized graphic character sets. Each such graphic character sets or DRCS (dynamically redefinable character set) for Japanese Kanji and Chinese ideogram characters shall be indicated by the sequence of characters used to designate that set, as defined in Recommendation T.61. Where more than one such character set are to be indicated, the ESC character fulfills the purpose of a separator between the character set indicators.

The following descriptions apply to the use of a DRCS set for Japanese Kanji and Chinese ideogram characters:

i) if the DRCS set is indicated as a parameter value associated with a S-ACTIVITY-START or S-ACTIVITY-RESUME, this should be followed by combinations of a character code (CC) to be registered to the DRCS set and its character dot pattern (DP);

ii) the field length of a character code is defined by the DRCS set and that of a character dot pattern is indicated as parameter values of a character box height and a character box width parameters.

Note – The value of this parameter in either S-ACTIVITY-START or S-ACTIVITY-RESUME will be as follows:

DRCS CC1 DP1 CC2 DP2 . . . CCi DPi

– Control character sets (see § 4.2.3.5)

– Teletex page format (see § 4.2.3.7)

– Miscellaneous Teletex terminal capabilities (see § 4.2.3.8)

– Character box height

A variable length field indicating the receiving capabilities for the number of dots of the character box height. The number of dots shall be indicated by the numeric parameter as defined in Recommendation T.61.

Further study is required for indicating more than one value.

– Character box width

A variable length field indicating the receiving capabilities for the number of dots of the character box height. The number of dots shall be indicated by the numeric parameter as defined in Recommendation T.61.

Further study is required for indicating more than one value.

4.4.2 *S-ACTIVITY-RESUME*

4.4.2.1 *The parameters of S-ACTIVITY-RESUME are used as follows*

– *Old session connection identifier* (mandatory only if linking is attempted on a new session connection): this non-mandatory parameter shall contain the old session connection identifier, identifying the session in which the first part of the document was sent.

a) calling SS-user-reference (mandatory) see § 4.2.1;

b) called SS-user-reference (mandatory) see § 4.2.1;

c) common reference (mandatory) see § 4.2.1;

d) additional reference information (non-mandatory) see § 4.2.1.

– *Old activity identifier*: this mandatory parameter shall contain the activity identifier (document reference number) of the corresponding S-ACTIVITY-START.

– *Synchronization point serial number*: this mandatory parameter shall contain the synchronization point serial number (checkpoint reference number) from which the transmission is being continued.

– *Activity identifier*: the new activity identifier shall contain the document reference number as defined in § 3.5.7.

– *SS-user-data*: this non-mandatory parameter is used to convey data of the presentation and/or application protocol(s). All information necessary to negotiate the document interchange protocol parameters, defined in the T.400-Series of Recommendations, is contained in this parameter field.

4.4.2.2 *Additional parameters*

The following parameters may also be included:

a) *Document type identifier* [see § 4.4.1.2 a)].

b) *Service interworking identifier* [see § 4.4.1.2 b)].

c) Optionally, any other parameter field that appears in the S-ACTIVITY-START at the start of the document may be repeated in the S-ACTIVITY-RESUME. Indication of required terminal capability is mandatory if standardized optional terminal capabilities are required for the document. A terminal receivinga S-ACTIVITY-RESUME that does not contain all of the terminal capabilities should not reject the continuation of the document.

4.4.2.3 *Encoding of the S-ACTIVITY-RESUME additional parameters*

a) *Document type identifier* [see § 4.4.1.3 a)].

b) *Service interworking identifier* [see § 4.4.1.3 b)].

c) *Indication of required terminal capability* (see § 4.4.1.3 c)].

4.4.3 *S-ACTIVITY-INTERRUPT*

The parameters of S-ACTIVITY-INTERRUPT are used as follows:

Reason: if used, this non-mandatory parameter shall contain only one of the following reasons:

a) unable to continue the session (e.g. due to memory full, out of recording paper);

b) sequence error;

c) local terminal error;

d) unrecoverable procedural error;

e) no specific reason stated (used for reasons other than those listed).

4.4.4 *S-ACTIVITY-DISCARD*

The parameters of S-ACTIVITY-DISCARD are used as follows:

Reason: if used, this non-mandatory parameter shall contain only one of the following reasons:

a) unable to continue the session (e.g. due to memory full, out of recording paper);

b) sequence error;

c) local terminal error;

d) unrecoverable procedural error;

e) no specific reason stated (used for reasons other than those listed).

4.4.5 *S-ACTIVITY-END*

The parameters of S-ACTIVITY-END used as follows:

– *Synchronization point serial number*: this mandatory parameter represents the synchronization point serial number (final checkpoint reference number) to which a response shall be made.

– *SS-user-data*: this parameter is not used, in Teletex and Group 4 facsimile services.

4.4.6 *S-SYNC-MINOR*

The parameters of S-SYNC-MINOR are used as follows:

- *Type:* this mandatory parameter (only in request and indication) will indicate "explicit".
- *Synchronization point serial number:* this mandatory parameter is the checkpoint reference number, which, in the basic services, is the page reference number.
- *SS-user-data:* this parameter is not used in the request/indication. In the response/confirmation it represents the parameter "receiving ability jeopardized". This mandatory parameter (in response and confirmation) indicates whether or not the ability of the receiving terminal to continue to accept the traffic is jeopardized.

  The SS-user shall ensure that the first octet is encoded as follows:

Bits 87654321	Meaning
00000000	Further traffic can be accepted
00000001	Ability to receive further traffic is jeopardized.

  All other binary values are reserved for future standardization.

4.4.7 *S-U-EXCEPTION-REPORT*

The parameters of S-U-EXCEPTION-REPORT are used as follows:

- *Reason:* the value of this mandatory parameter should be one of the following:
  a) unable to continue the session (e.g. due to memory full, out of recording paper). This value corresponds to the value "SS-user receiving ability jeopardized";
  b) sequence error;
  c) local terminal error;
  d) unrecoverable procedural error;
  e) no specific reason stated (used for reasons other than those listed.
- *SS-user-data:* this parameter is not used in Teletex and Group 4 facsimile services.

4.4.8 *S-P-EXCEPTION-REPORT*

4.4.8.1 *The parameters of S-P-EXCEPTION-REPORT are used as follows*

Reason: this mandatory parameter will indicate "protocol error".

4.4.8.2 *Additional parameters*

Reflect parameter value: this mandatory parameter shall contain the bit pattern of the SPDU in error, up to and including the detected error.

4.4.9 *S-CONTROL-GIVE*

Use of these primitives are defined in Recommendations X.215 and X.225.

4.4.10 *S-TOKEN-PLEASE*

The parameters of S-TOKEN-PLEASE are used as follows:

- *Token:* this mandatory parameter shall contain the session control function parameter and will indicate "data token".
- *SS-user-data:* this parameter is not used in Teletex and Group 4 facsimile services.

4.4.11 *S-CAPABILITY-DATA*

4.4.11.1 *The parameters of S-CAPABILITY-DATA are used as follows*

SS-user-data: This non-mandatory parameter is used to convey data of the presentation and/or application protocol(s). All information necessary to negotiate the document interchange protocol parameters, defined in the T.400-Series of Recommendations, is contained in this parameter field.

4.4.11.2 *Additional parameters*

The following parameters may also be included:

a) *Inactivity timer:* this non-mandatory parameter is used to negotiate the value of the inactivity timer.

b) *Storage capacity negotiation:* this non-mandatory parameter is used to negotiate the available memory of the remote terminal.

c) *Private use parameters:* these parameters are not mandatory. Their definition and use are not standardized.

d) *Non-standardized capabilities:* this non-mandatory parameter is used to ascertain compatibility regarding the use of non-standardized terminal capabilities.

And either

e) *Acceptance of S-CAPABILITY-DATA parameter:* this non-mandatory parameter is used to confirm that all the requested non-basic Teletex terminal capabilities are available at the receiver (only in response and confirmation).

f) *Non-basic Teletex terminal capabilities* [see § 4.4.1.3 c)]: this non-mandatory parameter indicates one of the following:

- the complete list of all the capabilities requested in the CDCL;
- a list of the requested capabilities that are available at the receiver. Absence of parameters associated with non-basic capabilities indicates that the requested capabilities are not available at the receiver;
- a complete list of non-basic receiving capabilities irrespective of the requested ones.

4.4.11.3 *Encoding of S-CAPABILITY-DATA additional parameters*

a) *Inactivity timer* (see § 4.2.3.4);

b) *Non-basic Teletex terminal capabilities* [see § 4.4.1.3 c)];

c) *Acceptance of S-CAPABILITY-DATA parameter.*

Bit 1 of the first octet set to 1 indicates acceptance of all non-basic terminal capabilities requested by a S-CAPABILITY-DATA request (except those indicated in the SS-user-data). All other bit values are reserved for future standardization.

d) *Storage capacity negotiation*

A fixed sequence of two octets to indicate the required amount of storage:

1) Bit 1 of the first octet set to 1 indicates that a terminal has recerved the requested amount of storage.

2) Bit 2 of the first octet set to 1 indicates that the binary field in the following octet contains a number indicating storage capacity required/reserved in kilo-octets.

3) Bit 5 of the first octet set to 1 indicates that the binary field in the following octet contains a number which, when multiplied by 16, indicates storage capacity required/reserved in kilo-octets.

4) Bit 6 of the first octet set to 1 indicates that the binary field in the following octet contains a number which, when multiplied by 256, indicates storage capacity required/reserved in kilo-octets.

5) Bit 3 of the first octet set to 1 indicates that a terminal cannot estimate its memory capacity.

6) Bit 4 of the first octet set to 1 indicates that a terminal cannot now reserve the requested amount of memory.

7) In the first octet, only one of bit 2, 5 and 6 may be set to one. For negotiation of storage capacity less than or equal to 255 kilo-octets, bit 2 shall be used.

   Note – Use of bit 5 for negotiation of a storage capacity greater than 65 kilo-octets but less or equal to 255 kilo-octets is not to be interpreted as a procedural error by the receiver.

8) Bits 7 and 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.

In cases 1), 5) and 6), the second octet may be ignored by the recipient of the S-CAPABILITY-DATA confirmation.

e) *Non-standardized capabilities*

The first octet represents the registered CCITT country code as specified in Recommendation T.35 to be used to identify non-standard capabilities. Additional octets may be specified by each country's Administration.

4.4.12 *D-DATA*

Uses of these primitives are defined in Recommendations X.215 and X.225.

5 Recommendations for implementing the session layer

To support the control procedures the following specifications apply in addition to Recommendation X.225.

5.1 *Additional parameters*

To conform with the control procedures for Teletex and Group 4 facsimile, the implementation must be able to generate and decode the additional parameters in the SPDUs.

Note – The session layer is only concerned with the coding of these parameters and their incorporation in the SPDUs, it is not concerned with the parameter values. This means that the specification of maximum length and parameter value encoding is part of the application layer specification.

5.1.1 *Connect SPDU*

TABLE 5/T.62 *bis*

PIG	n/nm	Code (dec.)	Code (hex.)	PI	o/nm	Code (dec.)	Code (hex.)
Non-basic session capabilities	nm	2	2	Miscellaneous session capabilities	nm	13	D
				Window size	nm	14	E
				Service identifier	m	8	8
				Inactivity timer	nm	18	12
Non-basic teletex terminal capabilities	nm	65	41	Control character sets	nm	73	49
				Teletex page formats	nm	74	4A
				Miscellaneous ttx terminal capabilities	nm	75	4B
Private use	nm	224 to 231	E0 to E7	Private use	nm	232 to 255	E8 to FF
				Non standardized capabilities	nm	232	E8

5.1.2 *Accept SPDU*

TABLE 6/T.62 *bis*

PGI	n/nm	Code (dec.)	Code (hex.)	PI	m/nm	Code (dec.)	Code (hex.)
Non-basic session capabilities	nm	2	2	Miscellaneous session capabilities	nm	13	D
				Window size	nm	14	E
				Service identifier	m	8	8
				Inactivity timer	nm	18	12
Non-basic teletex terminal capabilities	nm	65	41	Control character sets	nm	73	49
				Teletex page formats	nm	74	4A
				Miscellaneous ttx terminal capabilities	nm	75	4B
Private use	nm	224 to 231	E0 to E7	Private use	nm	232 to 255	E8 to FF
				Non standardized capabilities	nm	232	E8

5.1.3 *Refuse SPDU*

TABLE 7/T.62 *bis*

PIG	m/nm	Code (dec.)	Code (hex.)	PI	m/nm	Code (dec.)	Code (hex.)
Non-basic session capabilities	nm	2	2	Miscellaneous session capabilities	nm	13	D
				Window size	nm	14	E
				Service identifier	m	8	8
Non-basic teletex terminal capabilities	nm	65	41	Control character sets	nm	73	49
				Teletex page formats	nm	74	4A
				Miscellaneous ttx terminal capabilities	nm	75	4B
Private use	nm	224 to 231	E0 to E7	Private use	nm	232 to 255	E8 to FF
User data	nm	193	C1				

5.1.4 *ACTIVITY-START SPDU/ACTIVITY-RESUME SPDU*

TABLE 8/T.62 *bis*

PGI	m/nm	Code (dec.)	Code (hex.)	PI	m/nm	Code (dec.)	Code (hex.)
				Service interworking identifier	nm	40	28
				Document type identifier	nm	48	30
Non basic teletex terminal capabilities	nm	65	41	Graphic character set	nm	72	48
				Control character set	nm	73	49
				Teletex page formats	nm	74	4A
				Miscellaneous teletex terminal capabilities	nm	72	4B
				Character box height	nm	77	4D
				Character box width	nm	78	4E
Private use	nm	224 to 231	E0 to E7	Private use	nm	232 to 255	E8 to FF

5.1.5 *CAPABILITY-DATA SPDU*

TABLE 9/T.62 *bis*

PGI	m/nm	Code (dec.)	Code (hex.)	PI	m/nm	Code (dec.)	Code (hex.)
				Inactivity timer	nm	18	12
				Storage capacity negotiation	nm	45	2D
Non basic teletex terminal capabilities	nm	65	41	Graphic character set	nm	72	48
				Control character set	nm	73	49
				Teletex page formats	nm	74	4A
				Miscellaneous teletex terminal capabilities	nm	75	4B
				Character box height	nm	77	4D
				Character box width	nm	78	4E
Private use	nm	224 to 231	E0 to E7	Private use	nm	232 to 255	E8 to FF
				Non standardized capabilities	nm	232	E8

5.1.6 *CAPABILITY-DATA-ACK SPDU*

TABLE 10/T.62 *bis*

PGI	n/nm	Code (dec.)	Code (hex.)	PI	m/nm	Code (dec.)	Code (hex.)
				Inactivity timer	nm	18	12
				Acceptance of CAPABILITY-DATA parameters	nm	44	2C
				Storage capability negotiation	nm	45	2D
Non basic teletex terminal capabilities	nm	65	41	Graphic character set	no	72	48
				Control character set	nm	73	49
				Teletex page formats	nm	74	4A
				Miscellaneous teletex terminal capabilities	nm	75	4B
				Character box height	nm	77	4D
				Character box width	nm	78	4E
Private use	nm	224 to 231	E0 to E7	Private use	nm	232 to 255	E8 to FF
				Non standardized capabilities	nm	232	E8

5.2 *Implementation choices*

The choices for implementing the OSI session layer are indicated below in order to allow interworking with Teletex and Group 4 facsimile equipment.

5.2.1 The S-TOKEN-PLEASE service must be implemented so that, in Teletex and Group 4 facsimile services mode of operations:

- the PT SPDU is in principle concatenated with a category 2 SPDU. The way this service is implemented for modes of operations different from Teletex and Group 4 facsimile services is a local matter;
- when the session is intentionally left inactive for a period of time, the PT SPDU can be sent without being concatenated. For the Teletex and Group 4 facsimile service this requires a preceding negotiation of the inactivity timer to a different value from the default value.

Note – The SPDU GIVE TOKENs (GT) may never be transmitted alone nor may include a "token item" parameter because the use of the S-GIVE-TOKEN service is not permitted in basic Teletex and Group 4 facsimile.

5.2.2 When sending one of the following SPDUs the whole parameter must be absent (i.e. PI, LI, PV fields) when the PV field has to be absent (i.e. when LI = 0): token item parameter in PT and GT SPDUs, user data in FN, DN, AB, ED, AE, AEA, AS and AR SPDUs, enclosure item in DT SPDU and sync type item in MIP SPDU.

5.2.3 The sum of the numbers of digits contained in the checkpoint reference number (synchronization point serial number) and the document reference number (activity identifier) shall not exceed six, to permit printing in the available space in the call identification line as defined in Recommendation F.200. There is no constraint on the maximum number of digits in either number, as long as this limitation is not exceeded.

5.2.4 The reception of a length indicator with a value lower than 255 in a 3 octets field must not lead to a protocol error.

5.2.5 When receiving an AB SPDU the AA SPDU must be sent back even if the transport connection is not to be kept (X.225 allows the user to choose between disconnecting the transport or sending the SPDU AA when AB is received).

The telematic services do not use the "reflect parameter values" parameter in the AB SPDU.

5.2.6 When receiving the CN, AC, CD or CDA SPDUs the non-standardized parameter codes or the parameters which are not part of these SPDU encoding, must be ignored.

5.2.7 The TIM timer value must be 4 seconds.

5.2.8 The PGI "connect/accept" (code 5) and the PI "session requirements" (code 20) must not be transmitted in the CN or AC SPDU, if their values are the same as their default values. The parameters version number (code 22) and transport disconnect (code 17) must not be transmitted in the RF SPDU. The RF SPDU may also contain an additional user data parameter.

5.2.9 The absence of non mandatory PI or PGI indicates that no such functions are available. Therefore PIs or PGIs with LI set to zero should be avoided.

5.2.10 When a PV conains 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 T.61.

5.2.11 Segmentation is not used.

5.2.12 *Definition of valid/invalid session protocol data units*

In addition to the rules expressed in X.225, the following applies.

5.2.12.1 *Invalid PDUs (definitions and rules)*

If the PDUs do not meet the following conditions, such PDUs are invalid:

a) the sum of LIs of PGIs and freestanding PIs is equal to the overall LI;

b) the sum of the LIs of PIs embedded within recognized PGIs is equal to the PGIs LI;

c) for all mandatory parameters, the PGIs or PIs are present and the LIs are not equal to zero.

Note 1 – In the case of AB, AA and RF PDUs, the same checking rules may be applied. However, it is recognized that no externally visible procedure is provided to react to the detection of such invalid PDUs.

Note 2 – Invalid ED or ER can either be rejected or processed normally to start error recovery.

Note 3 – When receiving an invalid CN it is recommended that the connection be refused by sending a RF with the appropriate parameters and not to release the transport connection.

Note 4 – An equipment is not required to make any checking at all on parameters it does not support. In such cases it may also omit the checking of the overall LI. In particular, it should be noted that no recognized parameters, e.g. new parameters, may appear either between supported parameters or after the complete set of supported parameters.

5.2.12.2 *Valid PDUs (rules for mandatory acceptance of PDUs)*

An SPDU shall not be rejected if it does not meet the rejection conditions described in § C.2. They must not be rejected for any of the following conditions:

a) the presence of a non-mandatory PI or PGI having an LI = 0;

b) the presence of any 3-octet LI, the coding of which follows the rules described in this Recommendation and in Recommendation X.225;

c) the presence of any correctly formed PV for which future values can be assigned;

d) the presence of one or more undefined PIs or PGIs in CN or CD and their corresponding responses;

e) the presence of a T.61 coded hyphen ("-") instead of a colon (":") as the parameter between the hours and minutes of the date and time PV in CN;

f) the length of the synchronization point serial number in MIA greater or less than the length of the synchronization point serial number in the corresponding MIP (with more or less preceding zeros);

g) more PV in AC or RF than in CN.

Note – The scope of these rules is restricted to the determination of protocol element validity (formal validity) and they do not impact on rejection or protocol elements due to the functions they invoke.

ANNEX A

(to Recommendation T.62 *bis*)

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**

A device that is capable of transmitting and receiving Teletex documents in accordance with the basic requirements of Recommendation T.60.

A.1.2 **calling terminal**

The terminal that initiates the procedures to establish a connection.

A.1.3 **called terminal**

A terminal with whom a calling terminal wants to estabish a connection.

A.1.4 **Group 4 facsimile apparatus**

A device that is capable of transmitting and receiving facsimile documents in accordance with the basic requirements of Recommendation T.563.

A.1.5 **service interworking**

The facility of sending and receiving information between a Teletex terminal and a terminal of another service, e.g. telex.

A.2 *Session layer mode of communication*

For the session layer, three different modes of communication are identified:

A.2.1 **one-way communication (OWC)**

User 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.

A.2.2 **two-way alternate (TWA)**

User information is transferre 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. This is also called the half-duplex mode.

A.2.3 **two-way simultaneous (TWS)**

User information is transferred in both directions simultaneously, i.e. both terminals are simultaneously a source as well as a sink. This is also called the duplex mode.

A.3 *Terms specific to document*

A.3.1 **document**

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 **page**

The basic element of office correspondence in the telematic service. One A4 (or A4L, North American standard or North American legal) page or the information that may be presented on it.

A.3.3 **checkpoint**

A checkpoint 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**

The maximum number of checkpoints that a sender can transmit without receiving an acknowledgement from the receiver.

ANNEX B

(to Recommendation T.62 *bis*)

B.1 Each state diagram is in only one state at any time.

B.2 Each state is represented as an ellipse, which contains a number for reference and a descriptive name.

B.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.

B.4 Where a transition may originate from any of several states, it may be indicated by a broad arrow terminating on the destination state and labelled with the permissible states of originating and with the event or events that cause that entry into the destination state.

B.5 An event is either the sending (S-) or reception (R-) of a request or a response or an indicated local operation.

B.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.

B.7 Upon sending any request that causes entry into a state named “demand response”, the sending of any additional requests is not permitted until a response is received. A demand response timer is started, and if a response is not received prior to expiration of that time-out, session terminating is mandatory.

B.8 The effect of each event that causes a state transition must be completed prior to consideration of a subsequent event.

B.9 During a session, each session partner has a responsibility for monitoring for proper operation as follows:

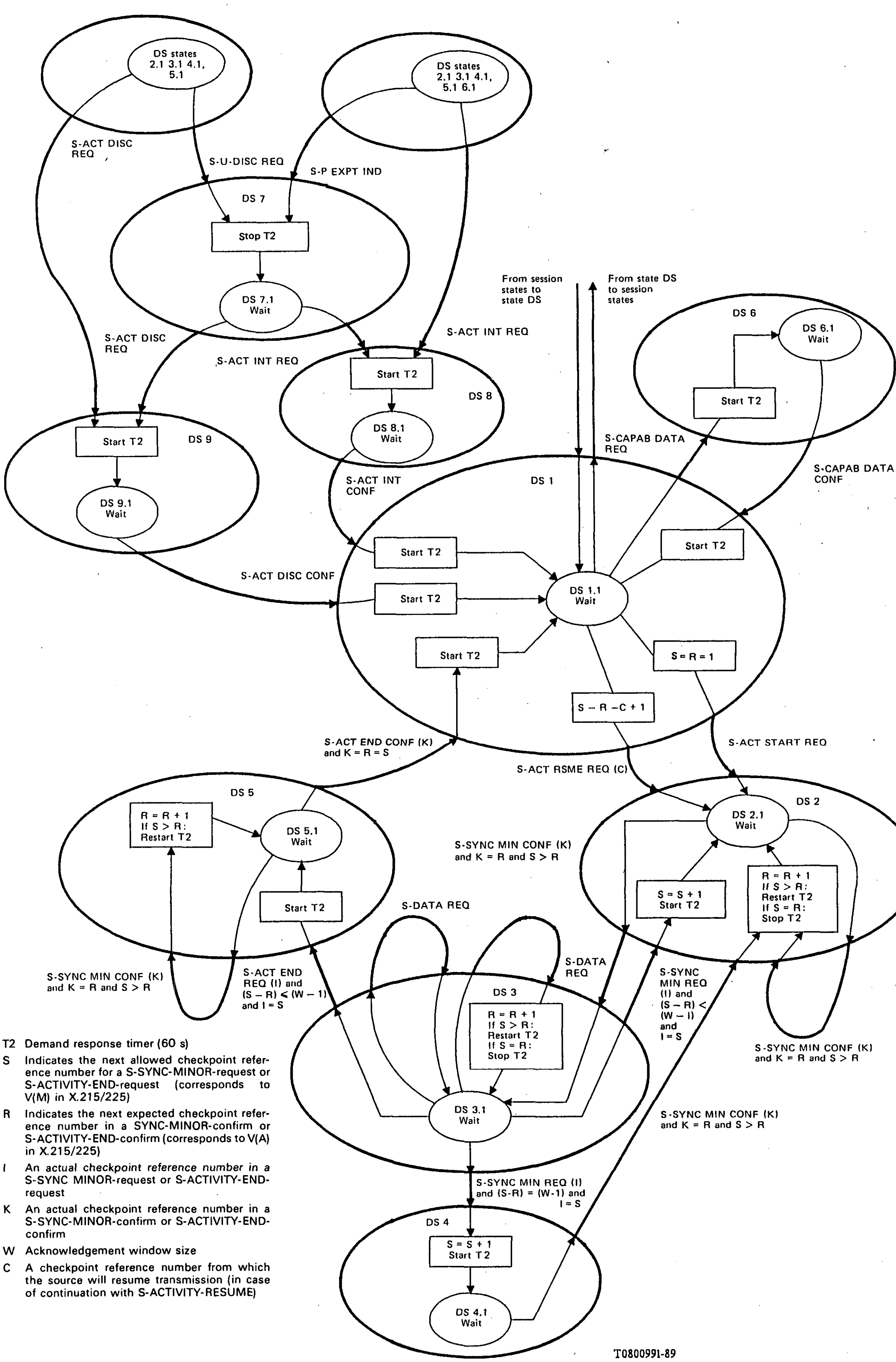
a) maintenance of the currently agreed source/sink relationship,

b) proper use of request/response procedural sequences as described in the state diagrams and the rules of their operation,

c) monitoring of 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 the error recovery procedures defined for each state diagram is mandatory, or where such error recorvery procedures are not specifically defined, session termination (abnormal end) is mandatory. This is necessary in order to avoid unproductive use of telematic facilities, incurring unnecessary charges where the service is not being used effectively, and causing degradation of the service.

B.10 The purpose of the state diagrams is to assist in defining proper use of the elements of procedure, and not to define any particular implementation.



T2 Demand response timer (60 s)

S Indicates the next allowed checkpoint reference number for a S-SYNC-MINOR-request or S-ACTIVITY-END-request (corresponds to V(M) in X.215/225)

R Indicates the next expected checkpoint reference number in a SYNC-MINOR-confirm or S-ACTIVITY-END-confirm (corresponds to V(A) in X.215/225)

I An actual checkpoint reference number in a S-SYNC MINOR-request or S-ACTIVITY-END-request

K An actual checkpoint reference number in a S-SYNC-MINOR-confirm or S-ACTIVITY-END-confirm

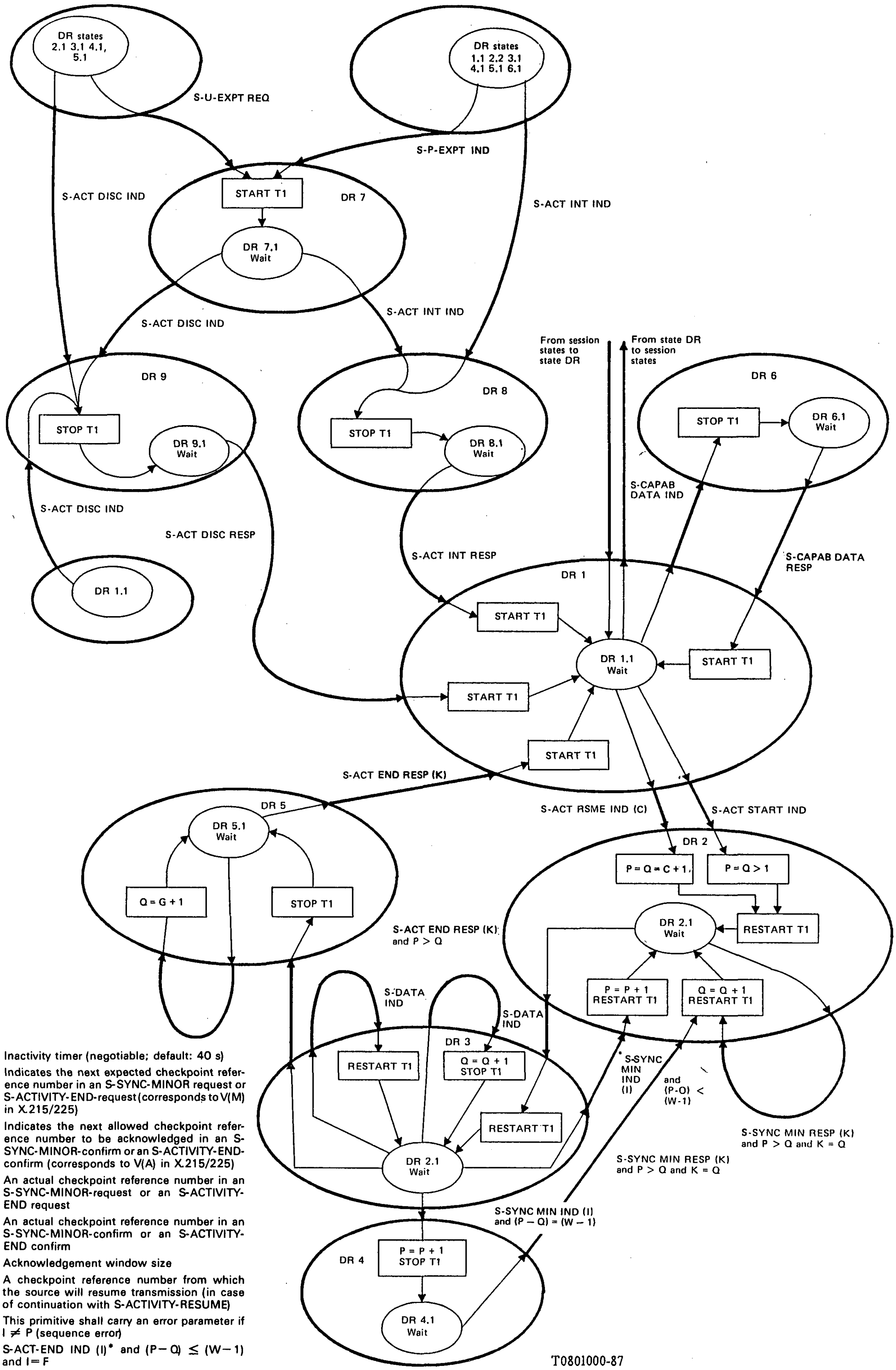
W Acknowledgement window size

C A checkpoint reference number from which the source will resume transmission (in case of continuation with S-ACTIVITY-RESUME)

T0800991-89

FIGURE B-1/T.62 *bis*

Detailed state transition diagram for the sending side



T1 Inactivity timer (negotiable; default: 40 s)

P Indicates the next expected checkpoint reference number in an S-SYNC-MINOR request or S-ACTIVITY-END-request (corresponds to V(M) in X.215/225)

Q Indicates the next allowed checkpoint reference number to be acknowledged in an S-SYNC-MINOR-confirm or an S-ACTIVITY-END-confirm (corresponds to V(A) in X.215/225)

I An actual checkpoint reference number in an S-SYNC-MINOR-request or an S-ACTIVITY-END request

K An actual checkpoint reference number in an S-SYNC-MINOR-confirm or an S-ACTIVITY-END confirm

W Acknowledgement window size

C A checkpoint reference number from which the source will resume transmission (in case of continuation with S-ACTIVITY-RESUME)

* This primitive shall carry an error parameter if $I \neq P$ (sequence error)

1) S-ACT-END IND (I)* and $(P-Q) \leq (W-1)$ and I = F

FIGURE B-2/T.62 *bis*

Detailed state transition diagram for the receiving side

ANNEX C

(to Recommendation T.62 *bis*)

C.1 *General*

C.1.1 An indication of the type of document that is transferred shall be given at the start of the document; if not, the normal type of document is used.

C.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).

C.1.3 No additional procedure elements or changes in state transition diagrams are required.

C.2 *Normal document*

C.2.1 This is the normal type of document to be used to transfer text in the telematic services. Upon reception the document may be immediately printed (in the case of Group 4 facsimile Class 1) or be immediately stored (all other terminals).

C.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.

C.3 *Operator document* (optional)

The operator document represents a type of priority message. It can be used in the conventional mode of operation.

It is intended to be presented immediately to the operator (although the decision to present it is left to the receving 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, preferably (due to the application), it shall 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.

C.4 *Control document*

C.4.1 The control document can be used in communication with intermediate store-and-forward equipment; e.g. interworking with the telex service, in standardized options and national applications.

C.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 procedures) as a normal document. The use of the control document is outside the scope of this Recommendation.

C.4.3 Teletex terminals shall be able to support the control documents defined in Recommendation T.90 for interworking with the telex service.

C.5 *Monitor document* (optional)

C.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.

C.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 D

(to Recommendation T.62 *bis*)

Protocols for interactive applications

These protocols are under study.

PROVISIONS FOR VERIFICATION OF TELETEX TERMINAL COMPLIANCE

(Malaga-Torremolinos, 1984; modified at Melbourne, 1988)

The CCITT,

considering,

(a) that Administrations planning to offer the Teletex service will require provisions to facilitate the verification of compliance of Teletex terminals;

(b) that Recommendation F.200 fixes the rules to be followed in the automatic international Teletex service;

(c) that Recommendation T.60 defines the requirements for terminal equipment used in the international Teletex service;

(d) that Recommendation T.61 defines the character repertoire and coded character sets for the international Teletex service;

(e) that Recommendation T.62 defines the control procedures for the Teletex service;

(f) that a standardized "test text" could provide a means to facilitate the verification of the presentation capabilities of Teletex terminals,

unanimously declares the following:

1 Introduction

1.1 *Objective*

This Recommendation contains a reference test text and associated encoding of characters to facilitate Administrations' verification of the text presentation capabilities of Teletex terminals.

1.2 *Scope*

1.2.1 The reference test text contained herein is based on Recommendations F.200, T.60, T.61 and T.62, and contains only the basic Teletex repertoire of graphic characters and control functions.

1.2.2 The reference test text is intended to assist verification and does not necessarily guarantee the compliance of Teletex terminals subjected to it.

1.2.3 The reference test text does not supersede Recommendations F.200, T.60, T.61 or T.62 which continue to be the definitive specifications for the Teletex character repertoire, its associated coding representation and control procedures.

1.2.4 Additional provisions to facilitate the verification of Teletex terminals are required and are for further study.

2 General

2.1 *General description of test text*

The test text consists of a document of two pages, the first presented in the horizontal format (see Annex A) and the second in the vertical format (see Annex B).

2.2 *Description of page 1 (Annex A)*

The first page begins with the control functions PFS, IGS, SHS, FF and CR.

Note – The IGS function has been included for completeness of control functions. However, its parameter values have not been defined and require further study. Terminals may ignore the IGS function but must be capable of receiving it.

The control functions are followed by a framing line to test the required capability of printing 100 characters beginning at the home position. The sequence 1234567890 should appear exactly 10 times. One group of ten digits is superscripted to demonstrate the availability of the upper extreme of the printing area.

This is followed by the "diacritical mark" test, in which every required combination of letters and diacritical marks is produced. This section is single-spaced [SVS(0)] and occupies lines 3 to 28 inclusive.

Midway through line 28, an SVS(1) sequence (9/11 3/1 2/0 4/12) is sent; this results in 1.5 line spacing beginning with the next LF function (line 29).

Immediately following the CR LF sequence terminating line 30, five BS characters (0/8) are sent followed by two Xs (5/8). This tests for the existence of five character positions to the left of the home position, and the ability to print in them, as well as correct functioning of the BS format effector. A CR (0/13) is then sent to return to the home position – a rightward movement of the active position – and the line number.

The centre of line 31 exercises the ability to combine diacritical marks with letters and nonspacing underline.

At line 32, an SVS(2) activates a line spacing of 2.

Finally, line 34 completes the framing, illustrating that we can print in all extreme character positions (line 34 is actually the 38th single-spaced line on the page and therefore the last required). One group of digits is subscripted and underlined to further demonstrate the availability of the extremes of the printing area.

2.3 *Description of page two (Annex B)*

The start of page 2 is indicated by a protocol element (as defined in Recommendation T.62) which resets all control functions to a default state in accordance with Recommendation T.61, § 3.3. For this page no presentation control functions are sent prior to the carriage return (CR) form feed (FF) sequence that introduces the text of the page. Therefore, the terminal should revert to the default control function values [PFS(0) and SVS(0)], resulting in a vertical page format and single line spacing.

This is followed by a framing line to demonstrate the capability of printing 72 positions starting at the home position. One group of ten digits is superscripted to demonstrate the availability of the upper extreme of the printing area.

A complete character set test follows, in row and column form. All characters in both the primary and supplementary sets are displayed on lines 12 to 30 inclusive.

Lines 1 to 18 are printed with single line spacing. Line 19 contains an SVS(1) sequence, resulting in 1.5 line spacing beginning with line 20.

Line 21 contains the control function SHS without parameter value (default value for horizontal spacing). This function will have no effect on the presentation of the page, but the receiving terminal should accept the coding.

Line 33 contains the control function "SUB" which may have a graphical representation (¿ in this document). The graphical representation of this control function (SUB) in Annex B and Annex D is only one of several presentation possibilities as defined in Recommendation T.61, § 3.3.5. Terminals receiving a substitute character may either represent it with a spacing character or ignore it.

Line 32 contains an SVS(2), resulting in double spacing from line 32.

Line 34 contains twice SGR(4), resulting in the underlining of the first three words after which underlining is stopped; it starts again under the fourth word.

Note that underlining between the third and fourth word must be absent.

Comment:

The sequence of first a SGR(0) without the default parameters code and second a SGR(0) with the parameter is chosen so to avoid the rest of the text of the page from being underlined totally in the case that the omission of the default parameter is not recognized.

Immediately after the new line sequence at the end of line 34, five BS (0/8) are sent, followed by two Xs, a CR (0/13) and the line number (35), which should appear in the home position. This again demonstrates the backspace function, the existence of five print positions to the left of the home position in the vertical format, and CR causing a rightward movement of the active position to the home position.

Line 35 exhibits the combination of the nonspacing underline character (12/12) with various graphic characters.

Line 36 exercises PLU (8/12) and PLD (8/11), alone and in combination with the nonspacing underline. In the middle group, the nonspacing underline precedes the "start super/subscript" command, and in the last group it follows the super/subscript command.

Line 37 combines PLU and PLD with the SGR(4) presentation function. In the first group, SGR(4) precedes the first character and remains effective for all characters, while in the second group it is sent prior to the first character and also after each "start super/subscript" command. Also on this line, an X followed by an LF (0/10) is sent without the CR. This results in the next line number 38 being printed beneath and one position to the right of the X.

Note that in lines 36 and 37 underlining may be suppressed in those character positions where it causes overprinting (Recommendation T.61, § 3.1.7).

Line 39 contains a SVS(0) sequence in which the default parameter (for one spacing) is omitted, resulting in one line spacing, beginning with line 40.

Finally, line 41 completes the framing, demonstrating the capability of printing in all extreme positions (line 41 corresponds to 55 single spaced lines). A group of ten digits is subscripted and underlined to illustrate complete capability in the extremes.

3 Reference test text

Annexes A and B graphically represent the test text, whereas Annexes C and D represent the applicable coding to realize the test.

```
12345678901234567890123456789012345678901234567890123456789012345678901234567890 1234567890 1234567890
2                               PRESENTATION TEST TEXT                   Page 1
3    a A  á Á  à À  â Â  ä Ä  ã Ã        ă Ă        å Å        ā Ā        ą Ą
4    b B
5    c C  ć Ć       ĉ Ĉ            č Č                   ċ Ċ        ç Ç
6    d D                           ď Ď
7    e E  é É  è È  ê Ê  ë Ë       ě Ě                   ė Ė  ē Ē        ę Ę
8    f F
9    g G  ǵ         ĝ Ĝ                 ğ Ğ              ġ Ġ          Ģ
10   h H            ĥ Ĥ
11   i I  í Í  ì Ì  î Î  ï Ï  ĩ Ĩ                          İ  ī Ī        į Į
12   j J            ĵ Ĵ
13   k K                                                         ķ Ķ
14   l L  ĺ Ĺ                      ľ Ľ                           ļ Ļ
15   m M
16   n N  ń Ń                 ñ Ñ  ň Ň                           ņ Ņ
17   o O  ó Ó  ò Ò  ô Ô  ö Ö  õ Õ            ő Ő             ō Ō
18   p P
19   q Q
20   r R  ŕ Ŕ                      ř Ř                           ŗ Ŗ
21   s S  ś Ś       ŝ Ŝ            š Š                           ş Ş
22   t T                           ť Ť                           ţ Ţ
23   u U  ú Ú  ù Ù  û Û  ü Ü  ũ Ũ       ŭ Ŭ  ű Ű  ů Ů        ū Ū        ų Ų
24   v V
25   w W            ŵ Ŵ
26   x X
27   y Y  ý Ý       ŷ Ŷ  ÿ Ÿ
28   z Z  ź Ź                      ž Ž                   ż Ż
29     Here the line spacing is set to '1-1/2' [SVS(1)].
30
XX 31                  T̆ŢĈR̆B
32
33     Here the line spacing is set to '2' [SVS(2)].
3434567890123456789012345678901234567890123456789012345678901234567890123456789 1234567890 1234567890
```

ANNEX B

(to Recommendation T.63)

1234567890123456789012345678901234567890123456789012345678901234567890 1234567890 12

Presentation Test Text　　　　Page 2

No parameters were specified for this new page. Therefore, by default, line spacing should be '1' [SVS(0)], and page format should be vertical [PFS(0)].

Character Set Test

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0				0	@	P		p				°			Ω	K
1			!	1	A	Q	a	q			¡	±	`		Æ	æ
2			"	2	B	R	b	r			¢	²	´		Đ	đ
3			#	3	C	S	c	s			£	³	^		ª	ð
4			¤	4	D	T	d	t			$	×	~		Ħ	ħ
5			%	5	E	U	e	u			¥	µ	¯			ı
6			&	6	F	V	f	v			#	¶	˘		Ĳ	ĳ

Here the line spacing is set to '1-1/2' [SVS(1)].

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
7			’	7	G	W	g	w			§	·	˙		Ŀ	ŀ
8			(	8	H	X	h	x			¤	÷	¨		Ł	ł
9			)	9	I	Y	i	y							Ø	ø
10			*	:	J	Z	j	z					˚		Œ	œ
11			+	;	K	[	k				«	»	¸		º	ß
12			,	<	L		l	|				¼	_		Þ	þ
13			—	=	M	]	m					½	˝		Ŧ	ŧ
14			.	>	N		n					¾	˛		Ŋ	ŋ
15			/	?	O	-	o					¿	ˇ		ŉ	

Here the line spacing is set to '2' [SVS(2)].

<u>Format Effector Tests</u>　　　　<u>[SGR(4)]</u>

XX <u>non spacing underline</u>

E$_i$ = M$_i$c^2　　<u>E$_i$ = M$_i$c^2</u>　　$E_i = M_i c^2$

<u>E$_i$ = M$_i$c^2</u>　　$E_i = M_i c^2$　　X

Here the line spacing is set to '1' [SVS].

345678901234567890123456789012345678901234567890123456789012345678901234567890 1234567890 12

ANNEX C

(to Recommendation T.63)

Teletex presentation test text coding

Page 1										
9/11	3/1	2/0	4/10							[PFS(1)]
9/11	3/0	2/0	4/11	0/12	0/13					[SHS(0)] [FF] [CR]
Line 1										
3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/0	1234567890
3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/0	1234567890
3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/0	1234567890
3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/0	1234567890
3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/0	1234567890
3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/0	1234567890
3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/0	1234567890
3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/0	1234567890
8/12										[PLU]
3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/0	1234567890
8/11										[PLD]
3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/0	1234567890
0/10	0/13									[LF] [CR]
Line 2										
3/2	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2
2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	
2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	5/0	5/2	PR
4/5	5/3	4/5	4/14	5/4	4/1	5/4	4/9	4/15	4/14	ESENTATION
2/0	5/4	4/5	5/3	5/4	2/0	5/4	4/5	5/8	5/4	TEST TEXT
2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	
2/0	5/0	6/1	6/7	6/5	2/0	3/1				Page 1
0/13	0/10									[CR] [LF]
Line 3										
3/3	2/0	2/0	2/0	6/1	2/0	4/1				3 a A
2/0	2/0	12/2	6/1	2/0	12/2	4/1				á Á
2/0	2/0	12/1	6/1	2/0	12/1	4/1				à À
2/0	2/0	12/3	6/1	2/0	12/3	4/1				â Â
2/0	2/0	12/8	6/1	2/0	12/8	4/1				ä Ä
2/0	2/0	12/4	6/1	2/0	12/4	4/1				ã Ã
2/0	2/0	2/0	2/0	2/0						
2/0	2/0	12/6	6/1	2/0	12/6	4/1				ă Ă
2/0	2/0	2/0	2/0	2/0						
2/0	2/0	12/10	6/1	2/0	12/10	4/1				å Å
2/0	2/0	2/0	2/0	2/0						
2/0	2/0	12/5	6/1	2/0	12/5	4/1				ā Ā
2/0	2/0	2/0	2/0	2/0						
2/0	2/0	12/14	6/1	2/0	12/14	4/1				ą Ą
0/13	0/10									[CR] [LF]
Line 4										
3/4	2/0	2/0	2/0	6/2	2/0	4/2				4 b B
0/13	0/10									[CR] [LF]

Line 5

3/5	2/0	2/0	2/0	6/3	2/0	4/3	5 c C
2/0	2/0	12/2	6/3	2/0	12/2	4/3	ć Ć
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	12/3	6/3	2/0	12/3	4/3	ĉ Ĉ
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	12/15	6/3	2/0	12/15	4/3	č Č
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	12/7	6/3	2/0	12/7	4/3	ċ Ċ
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	12/11	6/3	2/0	12/11	4/3	ç Ç
0/13	0/10						[CR] [LF]

Line 6

3/6	2/0	2/0	2/0	6/4	2/0	4/4	6 d D
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	12/15	6/4	2/0	12/15	4/4	ď Ď
0/13	0/10						[CR] [LF]

Line 7

3/7	2/0	2/0	2/0	6/5	2/0	4/5	7 e E
2/0	2/0	12/2	6/5	2/0	12/2	4/5	é É
2/0	2/0	12/1	6/5	2/0	12/1	4/5	è È
2/0	2/0	12/3	6/5	2/0	12/3	4/5	ê Ê
2/0	2/0	12/8	6/5	2/0	12/8	4/5	ë Ë
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	12/15	6/5	2/0	12/15	4/5	ě Ě
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	12/7	6/5	2/0	12/7	4/5	ė Ė
2/0	2/0	12/5	6/5	2/0	12/5	4/5	ē Ē
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	12/14	6/5	2/0	12/14	4/5	ę Ę
0/13	0/10						[CR] [LF]

Line 8

3/8	2/0	2/0	2/0	6/6	2/0	4/6	8 f F
0/13	0/10						[CR] [LF]

Line 9

3/9	2/0	2/0	2/0	6/7	2/0	4/7	9 g G
2/0	2/0	12/2	6/7	2/0	2/0		ǵ
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	12/3	6/7	2/0	12/3	4/7	ĝ Ĝ
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	12/6	6/7	2/0	12/6	4/7	ğ Ğ
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	12/7	6/7	2/0	12/7	4/7	ġ Ġ
2/0	2/0	2/0	2/0				
2/0	2/0	2/0	2/0	2/0	12/11	4/7	Ģ
0/13	0/10						[CR] [LF]

Line 10

3/1	3/0	2/0	2/0	6/8	2/0	4/8	10 h H
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	12/3	6/8	2/0	12/3	4/8	ĥ Ĥ
0/13	0/10						[CR] [LF]

Line 11

3/1	3/1	2/0	2/0	6/9	2/0	4/9	11 i I
2/0	2/0	12/2	6/9	2/0	12/2	4/9	í Í
2/0	2/0	12/1	6/9	2/0	12/1	4/9	ì Ì
2/0	2/0	12/3	6/9	2/0	12/3	4/9	î Î
2/0	2/0	12/8	6/9	2/0	12/8	4/9	ï Ï
2/0	2/0	12/4	6/9	2/0	12/4	4/9	ĩ Ĩ
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0				
2/0	2/0	2/0	2/0	2/0	12/7	4/9	İ
2/0	2/0	12/5	6/9	2/0	12/5	4/9	ī Ī
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	12/14	6/9	2/0	12/14	4/9	į Į
0/13	0/10						[CR] [LF]

Line 12

3/1	3/2	2/0	2/0	6/10	2/0	4/10	12 j J
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	12/3	6/10	2/0	12/3	4/10	ĵ Ĵ
0/13	0/10						[CR] [LF]

Line 13

3/1	3/3	2/0	2/0	6/11	2/0	4/11	13 k K
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	12/11	6/11	2/0	12/11	4/11	ķ Ķ
0/13	0/10						[CR] [LF]

Line 14

3/1	3/4	2/0	2/0	6/12	2/0	4/12	14 l L
2/0	2/0	12/2	6/12	2/0	12/2	4/12	ĺ Ĺ
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	12/15	6/12	2/0	12/15	4/12	ľ Ľ
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	12/11	6/12	2/0	12/11	4/12	ļ Ļ
0/13	0/10						[CR] [LF]

Line 15

3/1	3/5	2/0	2/0	6/13	2/0	4/13	15 m M
0/13	0/10						[CR] [LF]

Line 16

3/1	3/6	2/0	2/0	6/14	2/0	4/14	16 n N
2/0	2/0	12/2	6/14	2/0	12/2	4/14	ń Ń
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	12/4	6/14	2/0	12/4	4/14	ñ Ñ
2/0	2/0	12/15	6/14	2/0	12/15	4/14	ň Ň
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	12/11	6/14	2/0	12/11	4/14	ņ Ņ
0/13	0/10						[CR] [LF]

```
Line 17
 3/1    3/7    2/0    2/0   6/15    2/0   4/15        17  o O
 2/0    2/0   12/2   6/15    2/0   12/2   4/15            ó Ó
 2/0    2/0   12/1   6/15    2/0   12/1   4/15            ò Ò
 2/0    2/0   12/3   6/15    2/0   12/3   4/15            ô Ô
 2/0    2/0   12/8   6/15    2/0   12/8   4/15            ö Ö
 2/0    2/0   12/4   6/15    2/0   12/4   4/15            õ Õ
 2/0    2/0    2/0    2/0    2/0
 2/0    2/0    2/0    2/0    2/0
 2/0    2/0  12/13   6/15    2/0  12/13   4/15            ő Ő
 2/0    2/0    2/0    2/0    2/0
 2/0    2/0    2/0    2/0    2/0
 2/0    2/0   12/5   6/15    2/0   12/5   4/15            ō Ō
0/13   0/10                                           [CR] [LF]

Line 18
 3/1    3/8    2/0    2/0    7/0    2/0    5/0        18  p P
0/13   0/10                                           [CR] [LF]

Line 19
 3/1    3/9    2/0    2/0    7/1    2/0    5/1        19  q Q
0/13   0/10                                           [CR] [LF]

Line 20
 3/2    3/0    2/0    2/0    7/2    2/0    5/2        20  r R
 2/0    2/0   12/2    7/2    2/0   12/2    5/2            ŕ Ŕ
 2/0    2/0    2/0    2/0    2/0
 2/0    2/0    2/0    2/0    2/0
 2/0    2/0    2/0    2/0    2/0
 2/0    2/0    2/0    2/0    2/0
 2/0    2/0  12/15    7/2    2/0  12/15    5/2            ř Ř
 2/0    2/0    2/0    2/0    2/0
 2/0    2/0    2/0    2/0    2/0
 2/0    2/0    2/0    2/0    2/0
 2/0    2/0    2/0    2/0    2/0
 2/0    2/0    2/0    2/0    2/0
 2/0    2/0  12/11    7/2    2/0  12/11    5/2            ŗ Ŗ
0/13   0/10                                           [CR] [LF]

Line 21
 3/2    3/1    2/0    2/0    7/3    2/0    5/3        21  s S
 2/0    2/0   12/2    7/3    2/0   12/2    5/3            ś Ś
 2/0    2/0    2/0    2/0    2/0
 2/0    2/0   12/3    7/3    2/0   12/3    5/3            ŝ Ŝ
 2/0    2/0    2/0    2/0    2/0
 2/0    2/0    2/0    2/0    2/0
 2/0    2/0  12/15    7/3    2/0  12/15    5/3            š Š
 2/0    2/0    2/0    2/0    2/0
 2/0    2/0    2/0    2/0    2/0
 2/0    2/0    2/0    2/0    2/0
 2/0    2/0    2/0    2/0    2/0
 2/0    2/0    2/0    2/0    2/0
 2/0    2/0  12/11    7/3    2/0  12/11    5/3            ş Ş
0/13   0/10                                           [CR] [LF]
```

Line 22

3/2	3/2	2/0	2/0	7/4	2/0	5/4	22 t T
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	12/15	7/4	2/0	12/15	5/4	ť Ť
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	12/11	7/4	2/0	12/11	5/4	ţ Ţ
0/13	0/10						[CR] [LF]

Line 23

3/2	3/3	2/0	2/0	7/5	2/0	5/5	23 u U
2/0	2/0	12/2	7/5	2/0	12/2	5/5	ú Ú
2/0	2/0	12/1	7/5	2/0	12/1	5/5	ù Ù
2/0	2/0	12/3	7/5	2/0	12/3	5/5	û Û
2/0	2/0	12/8	7/5	2/0	12/8	5/5	ü Ü
2/0	2/0	12/4	7/5	2/0	12/4	5/5	ũ Ũ
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	12/6	7/5	2/0	12/6	5/5	ŭ Ŭ
2/0	2/0	12/13	7/5	2/0	12/13	5/5	ű Ű
2/0	2/0	12/10	7/5	2/0	12/10	5/5	ů Ů
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	12/5	7/5	2/0	12/5	5/5	ū Ū
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	12/14	7/5	2/0	12/14	5/5	ų Ų
0/13	0/10						[CR] [LF]

Line 24

3/2	3/4	2/0	2/0	7/6	2/0	5/6	24 v V
0/13	0/10						[CR] [LF]

Line 25

3/2	3/5	2/0	2/0	7/7	2/0	5/7	25 w W
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	12/3	7/7	2/0	12/3	5/7	ŵ Ŵ
0/13	0/10						[CR] [LF]

Line 26

3/2	3/6	2/0	2/0	7/8	2/0	5/8	26 x X
0/13	0/10						[CR] [LF]

Line 27

3/2	3/7	2/0	2/0	7/9	2/0	5/9	27 y Y
2/0	2/0	12/2	7/9	2/0	12/2	5/9	ý Ý
2/0	2/0	2/0	2/0	2/0			
2/0	2/0	12/3	7/9	2/0	12/3	5/9	ŷ Ŷ
2/0	2/0	12/8	7/9	2/0	12/8	5/9	ÿ Ÿ
0/13	0/10						[CR] [LF]

Line 28

3/2	3/8	2/0	2/0	7/10	2/0	5/10			28 z Z
2/0	2/0	12/2	7/10	2/0	12/2	5/10			´z ´Z
2/0	2/0	2/0	2/0	2/0					
2/0	2/0	2/0	2/0	2/0					
9/11	3/1	2/0	4/12						[SVS(1)]
2/0	2/0	2/0	2/0	2/0					
2/0	2/0	2/0	2/0	2/0					
2/0	2/0	12/15	7/10	2/0	12/15	5/10			ˇz ˇZ
2/0	2/0	2/0	2/0	2/0					
2/0	2/0	2/0	2/0	2/0					
2/0	2/0	2/0	2/0	2/0					
2/0	2/0	12/7	7/10	2/0	12/7	5/10			˙z ˙Z
0/13	0/10								[CR] [LF]

Line 29

3/2	3/9	2/0	2/0	2/0	2/0	2/0	4/8	6/5	29 He
7/2	6/5	2/0	7/4	6/8	6/5	2/0	6/12	6/9	re the li
6/14	6/5	2/0	7/3	7/0	6/1	6/3	6/9	6/14	ne spacin
6/7	2/0	6/9	7/3	2/0	7/3	6/5	7/4	2/0	g is set
7/4	6/15	2/0	2/7	3/1	2/13	3/1	2/15	3/2	to '1-1/2
2/7	2/0	5/11	5/3	5/6	5/3	2/8	3/1	2/9	' [SVS (1)
5/13	2/14	0/13	0/10						]. [CR] [LF]

Line 30

3/3	3/0	0/13	0/10	30 [CR] [LF]

Line 31

0/8	0/8	0/8	0/8	0/8	5/8	5/8	0/13	[5x[BS]] XX [CR]
3/3	3/1	2/0	2/0	2/0	2/0	2/0	2/0	31
2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	
2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	
2/0	2/0	2/0						
12/12	12/15	5/4	12/12	12/11	5/4	12/12	12/3	_ˇT_.T_ˆ
4/3	12/12	12/15	5/2	12/12	4/2			C_ˇR_B
0/13	0/10							[CR] [LF]

Line 32

3/3	3/2	9/11	3/2	2/0	4/12	0/13	32 [SVS(2)] [CR]
0/10							[LF]

Line 33

3/3	3/3	2/0	2/0	2/0	2/0	2/0	4/8	6/5	33 He
7/2	6/5	2/0	7/4	6/8	6/5	2/0	6/12	6/9	re the li
6/14	6/5	2/0	7/3	7/0	6/1	6/3	6/9	6/14	ne spacin
6/7	2/0	6/9	7/3	2/0	7/3	6/5	7/4	2/0	g is set
7/4	6/15	2/0	2/7	3/2	2/7	2/0	5/11	5/3	to '2' [S
5/6	5/3	2/8	3/2	2/9	5/13	2/14			VS(2)]
0/13	0/10								[CR] [LF]

Line 34

3/3	3/4	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/0	3434567890
3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/0	1234567890
3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/0	1234567890
3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/0	1234567890
3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/0	1234567890
3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/0	1234567890
3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/0	1234567890
3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/0	1234567890
8/11	9/11	3/4	6/13							[PLD] [SGR(4)]
3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/0	1234567890
8/12	9/11	3/0	6/13							[PLU] [SGR(0)]
3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/0	1234567890

ANNEX D

(to Recommendation T.63)

0/13	0/12									[CR] [FF]
Line 1										
3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/0	1234567890
3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/0	1234567890
3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/0	1234567890
3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/0	1234567890
3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/0	1234567890
3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/0	1234567890
8/12										[PLU]
3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/0	1234567890
8/11										[PLD]
3/1	3/2	0/13	0/10							12 [CR] [LF]
Line 2										
3/2	0/13	0/10								2 [CR] [LF]
Line 3										
3/3	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	3
2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	
2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	5/0	5/2	PR
4/5	5/3	4/5	4/14	5/4	4/1	5/4	4/9	4/15	4/14	ESENTATION
2/0	5/4	4/5	5/3	5/4	2/0	5/4	4/5	5/8	5/4	TEST TEXT
2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	
2/0	5/0	6/1	6/7	6/5	2/0	3/2	0/13	0/10		Page 2 [CR] [LF]
Line 4										
3/4	0/13	0/10								4 [CR] [LF]
Line 5										
3/5										5
2/0	2/0	2/0	2/0	2/0	4/14	6/15	2/0	7/0	6/1	No pa
7/2	6/1	6/13	6/5	7/4	6/5	7/2	7/3	2/0	7/7	rameters w
6/5	7/2	6/5	2/0	7/3	7/0	6/5	6/3	6/9	6/6	ere specif
6/9	6/5	6/4	2/0	6/6	6/15	7/2	2/0	7/4	6/8	ied for th
6/9	7/3	2/0	6/14	6/5	7/7	2/0	7/0	6/1	6/7	is new pag
6/5	2/14	2/0	5/4	6/8	6/5	7/2	6/5	6/6	6/15	e. Therefo
7/2	6/5	2/12	0/13	0/10						re, [CR] [LF]
Line 6										
3/6										6
2/0	2/0	2/0	2/0	2/0	6/2	7/9	2/0	6/4	6/5	by de
6/6	6/1	7/5	6/12	7/4	2/12	2/0	6/12	6/9	6/14	fault, lin
6/5	2/0	7/3	7/0	6/1	6/3	6/9	6/14	6/7	2/0	e spacing
7/3	6/8	6/15	7/5	6/12	6/4	2/0	6/2	6/5	2/0	should be
2/7	3/1	2/7	2/0	5/11	5/3	5/6	5/3	2/8	3/0	'1' [SVS(0
2/9	5/13	2/12	2/0	6/1	6/14	6/4	2/0	7/0	6/1	)], and pa
6/7	6/5	0/13	0/10							ge [CR] [LF]
Line 7										
3/7										7
2/0	2/0	2/0	2/0	2/0	6/6	6/15	7/2	6/13	6/1	forma
7/4	2/0	7/3	6/8	6/15	7/5	6/12	6/4	2/0	6/2	t should b
6/5	2/0	7/6	6/5	7/2	7/4	6/9	6/3	6/1	6/12	e vertical
2/0	5/11	5/0	4/6	5/3	2/8	3/0	2/9	5/13	2/14	[PFS(0)].
0/13	0/10									[CR] [LF]

```
Line 8
 3/8   0/13  0/10                                                     8 [CR] [LF]

Line 9
 3/9   2/0   2/0   2/0   2/0   2/0   2/0   2/0   2/0   2/0           9
 2/0   2/0   2/0   2/0   2/0   2/0   2/0   2/0   2/0   2/0
 2/0   2/0   2/0   2/0   2/0   4/3   6/8   6/1   7/2   6/1               Chara
 6/3   7/4   6/5   7/2   2/0   5/3   6/5   7/4   2/0   5/4           cter Set T
 6/5   7/3   7/4   0/13  0/10                                         est [CR] [LF]

Line 10
 3/1   3/0   0/13  0/10                                               10 [CR] [LF]

Line 11
 3/1   3/1   2/0   2/0   2/0   2/0   2/0   2/0   2/0   3/0           11         0
 2/0   2/0   3/1   2/0   2/0   3/2   2/0   2/0   3/3   2/0             1  2  3
 2/0   3/4   2/0   2/0   3/5   2/0   2/0   3/6   2/0   2/0            4  5  6
 3/7   2/0   2/0   3/8   2/0   2/0   3/9   2/0   3/1   3/0           7  8  9 10
 2/0   3/1   3/1   2/0   3/1   3/2   2/0   3/1   3/3   2/0             11 12 13
 3/1   3/4   2/0   3/1   3/5                                         14 15
0/13   0/10                                                          [CR] [LF]

Line 12
 3/1   3/2   2/0   2/0   2/0   2/0   2/0   3/0   2/0                 12       0
 2/0   2/0   2/0   2/0   2/0   2/0
 2/0   2/0   2/0   3/0   2/0   2/0   4/0   2/0   2/0                     0  @
 5/0   2/0   2/0   2/0   2/0   2/0   7/0   2/0   2/0                 P      p
 2/0   2/0   2/0   2/0   2/0   2/0   2/0   2/0   2/0
11/0   2/0   2/0   2/0   2/0   2/0   2/0   2/0   2/0                 °
14/0   2/0   2/0   15/0  0/13  0/10                                  Ω  ĸ [CR] [LF]

Line 13
 3/1   3/3   2/0   2/0   2/0   2/0   2/0   3/1   2/0                 13       1
 2/0   2/0   2/0   2/0   2/0   2/0
 2/1   2/0   2/0   3/1   2/0   2/0   4/1   2/0   2/0                 !  1   A
 5/1   2/0   2/0   6/1   2/0   2/0   7/1   2/0   2/0                 Q  a   q
 2/0   2/0   2/0   2/0   2/0   2/0   10/1  2/0   2/0                    `   ¡
11/1   2/0   2/0   12/1  2/0   2/0   2/0   2/0   2/0   2/0           ±
14/1   2/0   2/0   15/1  0/13  0/10                                  Æ  æ [CR] [LF]

Line 14
 3/1   3/4   2/0   2/0   2/0   2/0   2/0   3/2   2/0                 14       2
 2/0   2/0   2/0   2/0   2/0   2/0
 2/2   2/0   2/0   3/2   2/0   2/0   4/2   2/0   2/0                 "  2   B
 5/2   2/0   2/0   6/2   2/0   2/0   7/2   2/0   2/0                 R  b   r
 2/0   2/0   2/0   2/0   2/0   2/0   10/2  2/0   2/0                        ¢
11/2   2/0   2/0   12/2  2/0   2/0   2/0   2/0   2/0   2/0           ²  ´
14/2   2/0   2/0   15/2  0/13  0/10                                  Đ  đ [CR] [LF]

Line 15
 3/1   3/5   2/0   2/0   2/0   2/0   2/0   3/3   2/0                 15       3
 2/0   2/0   2/0   2/0   2/0   2/0
 2/3   2/0   2/0   3/3   2/0   2/0   4/3   2/0   2/0                 #  3   C
 5/3   2/0   2/0   6/3   2/0   2/0   7/3   2/0   2/0                 S  c   s
 2/0   2/0   2/0   2/0   2/0   2/0   10/3  2/0   2/0                        £
11/3   2/0   2/0   12/3  2/0   2/0   2/0   2/0   2/0   2/0           ³  ^
14/3   2/0   2/0   15/3  0/13  0/10                                  ª  ð [CR] [LF]
```

Line 16

3/1	3/6	2/0	2/0	2/0	2/0	2/0	3/4	2/0		16 4
2/0	2/0	2/0	2/0	2/0	2/0					
2/4	2/0	2/0	3/4	2/0	2/0	4/4	2/0	2/0		¤ 4 D
5/4	2/0	2/0	6/4	2/0	2/0	7/4	2/0	2/0		T d t
2/0	2/0	2/0	2/0	2/0	2/0	10/4	2/0	2/0		$
11/4	2/0	2/0	12/4	2/0	2/0	2/0	2/0	2/0	2/0	× ¯
14/4	2/0	2/0	15/4	0/13	0/10					Ħ ħ [CR] [LF]

Line 17

3/1	3/7	2/0	2/0	2/0	2/0	2/0	3/5	2/0		17 5
2/0	2/0	2/0	2/0	2/0	2/0					
2/5	2/0	2/0	3/5	2/0	2/0	4/5	2/0	2/0		% 5 E
5/5	2/0	2/0	6/5	2/0	2/0	7/5	2/0	2/0		U e u
2/0	2/0	2/0	2/0	2/0	2/0	10/5	2/0	2/0		¥
11/5	2/0	2/0	12/5	2/0	2/0	2/0	2/0	2/0	2/0	µ ¯
2/0	2/0	2/0	15/5	0/13	0/10					ı [CR] [LF]

Line 18

3/1	3/8	2/0	2/0	2/0	2/0	2/0	3/6	2/0		18 6
2/0	2/0	2/0	2/0	2/0	2/0					
2/6	2/0	2/0	3/6	2/0	2/0	4/6	2/0	2/0		& 6 F
5/6	2/0	2/0	6/6	2/0	2/0	7/6	2/0	2/0		V f v
2/0	2/0	2/0	2/0	2/0	2/0	10/6	2/0	2/0		#
11/6	2/0	2/0	12/6	2/0	2/0	2/0	2/0	2/0	2/0	¶ ˘
14/6	2/0	2/0	15/6	0/13	0/10					Ĳ ĳ [CR] [LF]

Line 19

3/1	3/9	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	19
2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	
2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	
2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	
9/11	3/1	2/0	4/12							[SVS(1)]
2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	
2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	
2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	
3/1	3/9	0/13	0/10							19 [CR] [LF]

Line 20

3/2	3/0	2/0	2/0	2/0	2/0	4/8	6/5	7/2	20 Her
6/5	2/0	7/4	6/8	6/5	2/0	6/12	6/9	6/14	e the lin
6/5	2/0	7/3	7/0	6/1	6/3	6/9	6/14	6/7	e spacing
2/0	6/9	7/3	2/0	7/3	6/5	7/4	2/0	7/4	is set t
6/15	2/0	2/7	3/1	2/13	3/1	2/15	3/2	2/7	o '1-1/2'
2/0	5/11	5/3	5/6	5/3	2/8	3/1	2/9	5/13	[SVS(1)]
2/14	0/13	0/10							.[CR] [LF]

Line 21

3/2	3/1	9/11	2/0	4/11	0/13	0/10	21 [SHS] [CR] [LF]

Line 22

3/2	3/2	2/0	2/0	2/0	2/0	2/0	3/7	2/0		22		7	
2/0	2/0	2/0	2/0	2/0	2/0								
2/7	2/0	2/0	3/7	2/0	2/0	4/7	2/0	2/0		'	7	G	
5/7	2/0	2/0	6/7	2/0	2/0	7/7	2/0	2/0		W	g	w	
2/0	2/0	2/0	2/0	2/0	2/0	10/7	2/0	2/0				§	
11/7	2/0	2/0	12/7	2/0	2/0	2/0	2/0	2/0	2/0	·	˙		
14/7	2/0	2/0	15/7	0/13	0/10					Ŀ	ŀ	[CR]	[LF]

Line 23

3/2	3/3	2/0	2/0	2/0	2/0	2/0	3/8	2/0		23		8	
2/0	2/0	2/0	2/0	2/0	2/0								
2/8	2/0	2/0	3/8	2/0	2/0	4/8	2/0	2/0		(	8	H	
5/8	2/0	2/0	6/8	2/0	2/0	7/8	2/0	2/0		X	h	x	
2/0	2/0	2/0	2/0	2/0	2/0	10/8	2/0	2/0				¤	
11/8	2/0	2/0	12/8	2/0	2/0	2/0	2/0	2/0	2/0	÷	¨		
14/8	2/0	2/0	15/8	0/13	0/10					Ł	ł	[CR]	[LF]

Line 24

3/2	3/4	2/0	2/0	2/0	2/0	2/0	3/9	2/0		24		9	
2/0	2/0	2/0	2/0	2/0	2/0								
2/9	2/0	2/0	3/9	2/0	2/0	4/9	2/0	2/0		)	9	I	
5/9	2/0	2/0	6/9	2/0	2/0	7/9	2/0	2/0		Y	i	y	
2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0					
2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0					
14/9	2/0	2/0	15/9	0/13	0/10					Ø	ø	[CR]	[LF]

Line 25

3/2	3/5	2/0	2/0	2/0	2/0	3/1	3/0	2/0		25		10	
2/0	2/0	2/0	2/0	2/0	2/0								
2/10	2/0	2/0	3/10	2/0	2/0	4/10	2/0	2/0		*	:	J	
5/10	2/0	2/0	6/10	2/0	2/0	7/10	2/0	2/0		Z	j	z	
2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0					
2/0	2/0	2/0											
12/10	2/0	2/0	2/0	2/0	2/0	2/0				˚			
14/10	2/0	2/0	15/10	0/13	0/10					Œ	œ	[CR]	[LF]

Line 26

3/2	3/6	2/0	2/0	2/0	2/0	3/1	3/1	2/0		26		11	
2/0	2/0	2/0	2/0	2/0	2/0								
2/11	2/0	2/0	3/11	2/0	2/0	4/11	2/0	2/0		+	;	K	
5/11	2/0	2/0	6/11	2/0	2/0	2/0	2/0	2/0		[	k		
2/0	2/0	2/0	2/0	2/0	2/0	10/11	2/0	2/0				«	
11/11	2/0	2/0	12/11	2/0	2/0	2/0	2/0	2/0	2/0	»	¸		
14/11	2/0	2/0	15/11	0/13	0/10					Ω	ß	[CR]	[LF]

Line 27

3/2	3/7	2/0	2/0	2/0	2/0	3/1	3/2	2/0		27		12	
2/0	2/0	2/0	2/0	2/0	2/0								
2/12	2/0	2/0	3/12	2/0	2/0	4/12	2/0	2/0		,	<	L	
2/0	2/0	2/0	6/12	2/0	2/0	7/12	2/0	2/0			l	|	
2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0					
11/12	2/0	2/0	12/12	2/0	2/0	2/0	2/0	2/0	2/0	¼	_		
14/12	2/0	2/0	15/12	0/13	0/10					Þ	þ	[CR]	[LF]

Line 28

3/2	3/8	2/0	2/0	2/0	2/0	3/1	3/3	2/0		28 13
2/0	2/0	2/0	2/0	2/0	2/0					
2/13	2/0	2/0	3/13	2/0	2/0	4/13	2/0	2/0		- = M
5/13	2/0	2/0	6/13	2/0	2/0	2/0	2/0	2/0		] m
2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0		
11/13	2/0	2/0	12/13	2/0	2/0	2/0	2/0	2/0	2/0	½ ˝
14/13	2/0	2/0	15/13	0/13	0/10					Ŧ ŧ [CR] [LF]

Line 29

3/2	3/9	2/0	2/0	2/0	2/0	3/1	3/4	2/0		29 14
2/0	2/0	2/0	2/0	2/0	2/0					
2/14	2/0	2/0	3/14	2/0	2/0	4/14	2/0	2/0		. > N
2/0	2/0	2/0	6/14	2/0	2/0	2/0	2/0	2/0		n
2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0		
11/14	2/0	2/0	12/14	2/0	2/0	2/0	2/0	2/0	2/0	¾ ˛
14/14	2/0	2/0	15/14	0/13	0/10					Ŋ ŋ [CR] [LF]

Line 30

3/3	3/0	2/0	2/0	2/0	2/0	3/1	3/5	2/0		30 15
2/0	2/0	2/0	2/0	2/0	2/0					
2/15	2/0	2/0	3/15	2/0	2/0	4/15	2/0	2/0		/ ? O
5/15	2/0	2/0	6/15	2/0	2/0	2/0	2/0	2/0		_ o
2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0		
11/15	2/0	2/0	12/15	2/0	2/0	2/0	2/0	2/0	2/0	¿ ˇ
14/15	0/13	0/10								ŉ [CR] [LF]

Line 31

3/3	3/1	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	31
2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	
2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	
2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	
9/11	3/2	2/0	4/12							[SVS(2)]
2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	
2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	
2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	
3/3	3/1	0/13	0/10							31 [CR] [LF]

Line 32

3/3	3/2	2/0	2/0	2/0	2/0	4/8	6/5	7/2		32 Her
6/5	2/0	7/4	6/8	6/5	2/0	6/12	6/9	6/14		e the lin
6/5	2/0	7/3	7/0	6/1	6/3	6/9	6/14	6/7		e spacing
2/0	6/9	7/3	2/0	7/3	6/5	7/4	2/0	7/4		is set t
6/15	2/0	2/7	3/2	2/7	2/0	5/11	5/3	5/6		o '2' [SV
5/3	2/8	3/2	2/9	5/13	2/14	0/13	0/10			S(2)]. [CR] [LF]

Line 33

3/3	3/3	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	33
2/0	2/0	1/10	0/13	0/10						ʕ [CR] [LF]

Line 34

3/3	3/4	2/0	2/0	2/0	2/0	2/0	2/0			34
9/11	3/4	6/13								[SGR(4)]
4/6	6/15	7/2	6/13	6/1	7/4	2/0	4/5	6/6	6/6	Format Eff
6/5	6/3	7/4	6/15	7/2	2/0	5/4	6/5	7/3	7/4	error Test
7/3	9/11	6/13	2/0	2/0	2/0	2/0	2/0			s [SGR]
9/11	3/4	6/13								[SGR(4)]
5/11	5/3	4/7	5/2	2/8	3/4	2/9	5/13			[SGR(4)]
9/11	3/0	6/13	2/0	2/0	2/0	2/0				[SGR(0)]
0/13	0/10									[CR] [LF]

Line 35 [5x[BS]] XX [CR]

0/8	0/8	0/8	0/8	0/8	5/8	5/8	0/13	35
3/3	3/5	2/0	2/0	2/0	2/0	2/0	2/0	_n_o_n_s
12/12	6/14	12/12	6/15	12/12	6/14	12/12	7/3	_p_a_c_i
12/12	7/0	12/12	6/1	12/12	6/3	12/12	6/9	_n_g_ _u
12/12	6/14	12/12	6/7	12/12	2/0	12/12	7/5	_n_d_e_r
12/12	6/14	12/12	6/4	12/12	6/5	12/12	7/2	_l_i_n_e
12/12	6/12	12/12	6/9	12/12	6/14	12/12	6/5	[CR] [LF]
0/13	0/10							

Line 36

3/3	3/6	2/0	2/0	2/0	2/0	2/0	2/0	36
4/5	8/11	6/9	8/12	3/13	4/13			E [PLD] i [PLU]=M
8/11	6/9							[PLD] i
8/12	6/3	8/12	3/2	8/11				[PLU] c [PLU] 2 [PLD
2/0	2/0	2/0	2/0	2/0	2/0	2/0		
12/12	4/5	12/12	8/11	6/9	8/12	12/12	3/13	_E_ [PLD] i [PLU] _=
12/12	4/13	12/12	8/11	6/9	8/12	12/12	6/3	_M_ [PLD] i [PLU] _c
12/12	8/12	3/2	8/11					_ [PLU] 2 [PLD]
2/0	2/0	2/0	2/0	2/0	2/0			
12/12	4/5	8/11	12/12	6/9	8/12	12/12	3/13	_E [PLD] _i [PLU] _=
12/12	4/13	8/11	12/12	6/9	8/12	12/12	6/3	_M [PLD] _i [PLU] _c
8/12	12/12	3/2	8/11					[PLU] _2 [PLD]
0/13	0/10							[CR] [LF]

Line 37

3/3	3/7	2/0	2/0	2/0	2/0	2/0	2/0	37
9/11	3/4	6/13						[SGR(4)]
4/5	8/11	6/9	8/12	3/13	4/13			E [PLD] i [PLU] = M
8/11	6/9							[PLD] i
8/12	6/3	8/12	3/2	8/11				[PLU] c [PLU] 2 [PLD
9/11	3/0	6/13						[SGR(0)]
2/0	2/0	2/0	2/0	2/0	2/0	2/0		
9/11	3/4	6/13	4/5	9/11	3/0	6/13		[SGR(4)] E [SGR(0)]
8/11								[PLD]
9/11	3/4	6/13	6/9	9/11	3/0	6/13		[SGR(4)] i [SGR(0)]
8/12								[PLU]
9/11	3/4	6/13	3/13	4/13	9/11	3/0	6/13	[SGR(4)] = M [SGR(0)
8/11								[PLD]
9/11	3/4	6/13	6/9	8/12				[SGR(4)] i [PLU]

Line 37 (cont.)

9/11	3/0	6/13								[SGR(0)]
9/11	3/4	6/13	6/3	9/11	3/0	6/13				[SGR(4)] c [SGR(0)
8/12										[PLU]
9/11	3/4	6/13	3/2	8/11						[SGR(4)] 2 [PLD]
9/11	3/0	6/13	2/0	2/0	2/0	2/0	2/0	2/0		[SGR(0)]
5/8	0/10									X [LF]

Line 38

3/3	3/8	0/13	0/10	38 [CR] [LF]

Line 39

3/3	3/9	2/0	2/0	2/0	2/0	4/8	6/5	7/2	6/5	39 Here
2/0	7/4	6/8	6/5	2/0	6/12	6/9	6/14	6/5	2/0	the line
7/3	7/0	6/1	6/3	6/9	6/14	6/7	2/0	6/9	7/3	spacing is
2/0	7/3	6/5	7/4	2/0	7/4	6/15	2/0	2/7	3/1	set to '1'
2/7	2/0	5/11	5/3	5/6	5/3	5/13	2/14			[SVS]
9/11	2/0	4/12	2/0	2/0						[SVS]
0/13	0/10									[CR] [LF]

Line 40

3/4	3/0	0/13	0/10

Line 41

3/4	3/1	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/0	4134567890
3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/0	1234567890
3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/0	1234567890
3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/0	1234567890
3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/0	1234567890
3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/0	1234567890
8/11	9/11	3/4	6/13							[PLD] [SGR(4)]
3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/0	1234567890
8/12	9/11	3/0	6/13							[PLU] [SGR(0)]
3/1	3/2									12

<u>NOTE</u> – This is the end of the test text.

ISBN 92-61-03611-2