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CCITT

THE INTERNATIONAL
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SERIES T: TERMINAL EQUIPMENT AND PROTOCOLS
FOR TELEMATIC SERVICES

PROCEDURES FOR DOCUMENT FACSIMILE TRANSMISSION IN THE GENERAL SWITCHED TELEPHONE NETWORK

Reedition of CCITT Recommendation T.30 published in the Blue Book, Fascicle VII.3 (1988)

NOTES

1   CCITT Recommendation T.30 was published in Fascicle VII.3 of the *Blue Book*. This file is an extract from the *Blue Book*. While the presentation and layout of the text might be slightly different from the *Blue Book* version, the contents of the file are identical to the *Blue Book* version and copyright conditions remain unchanged (see below).

2   In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Recommendation T.30

<h1 style="text-align:center">PROCEDURES FOR DOCUMENT FACSIMILE TRANSMISSION
IN THE GENERAL SWITCHED TELEPHONE NETWORK[1]</h1>

(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		Calling station *transmits to* called station	1-T
	Manual operation at called station		Calling station *receives from* called station	1-R
2	*Manual* operation at calling station and		Calling station *transmits to* called station	2-T
	Manual operation at called station		Calling station *receives from* called station	2-R
3	*Automatic* operation at calling station and		Calling station *transmits to* called station	3-T
	Automatic operation at called station		Calling station *receives from* called station	3-R
4	*Automatic* operation at calling station and		Calling station *transmits to* called station	4-T
	Automatic operation at called station		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.

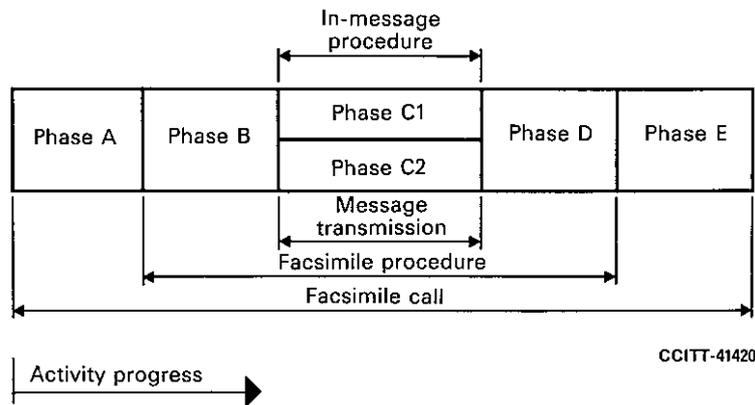## 2.2   *Time sequence of a facsimile call* (see Figure 1/T.30)

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.

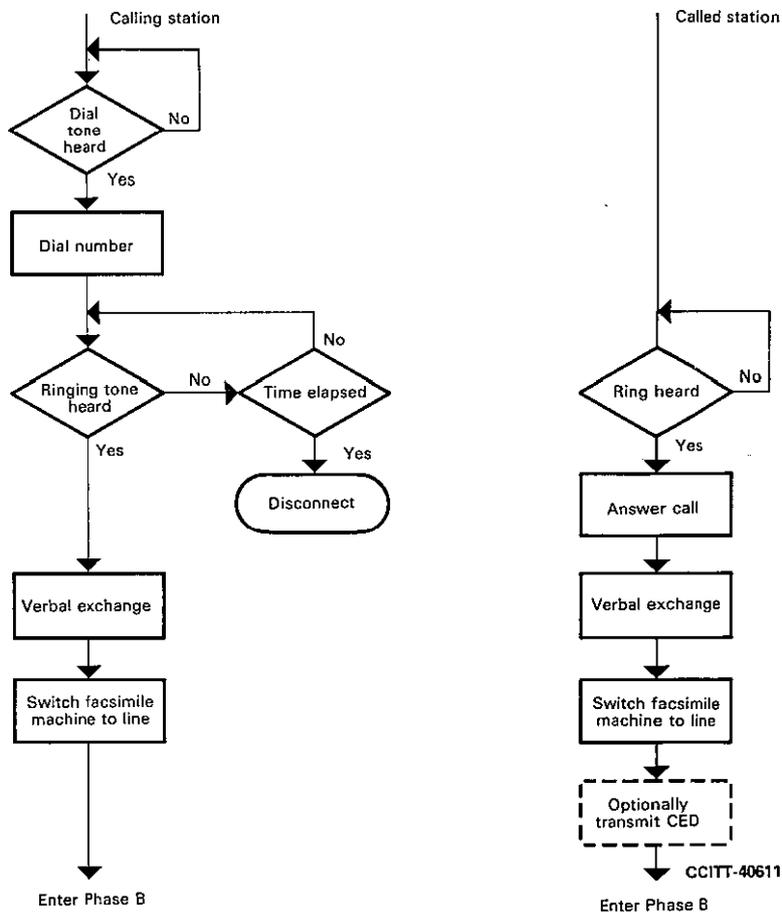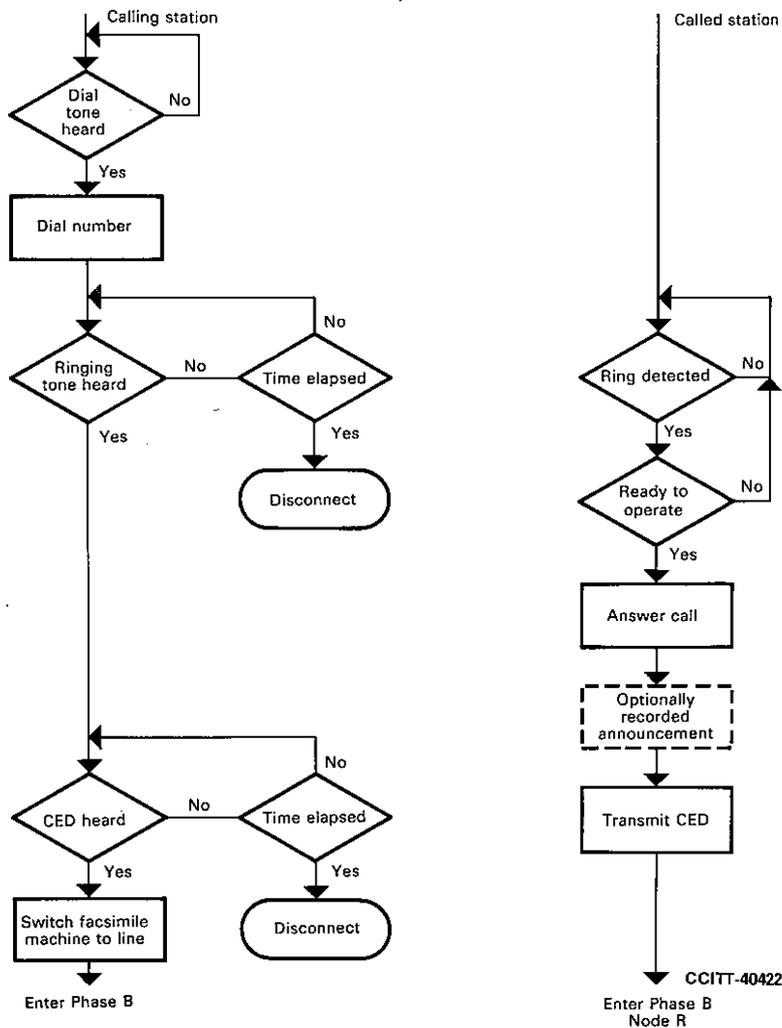| Call event No.	Calling station	Called station
1	Operator hears dial tone and dials desired number	
2	Operator hears ringing tone	Equipment detects ring and answers the call
3		Optionally, a recorded verbal announcement may be transmitted
4	Operator hears CED and facsimile machine is switched to line	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.

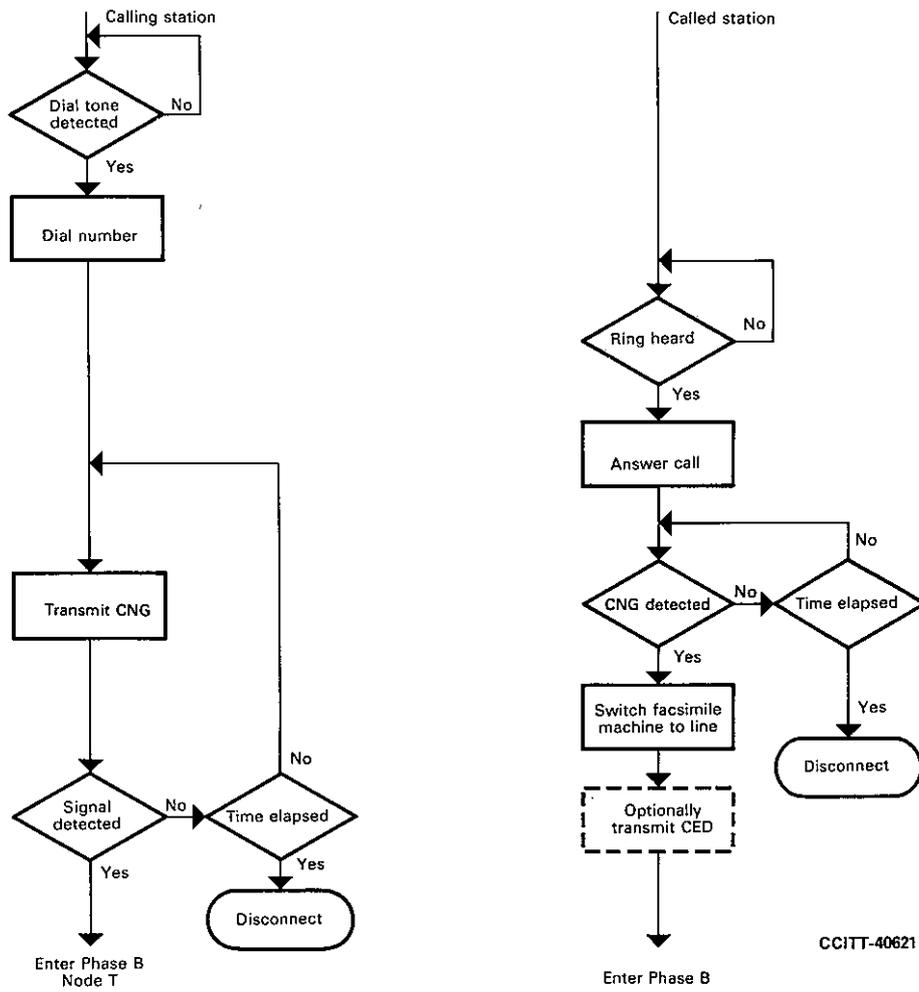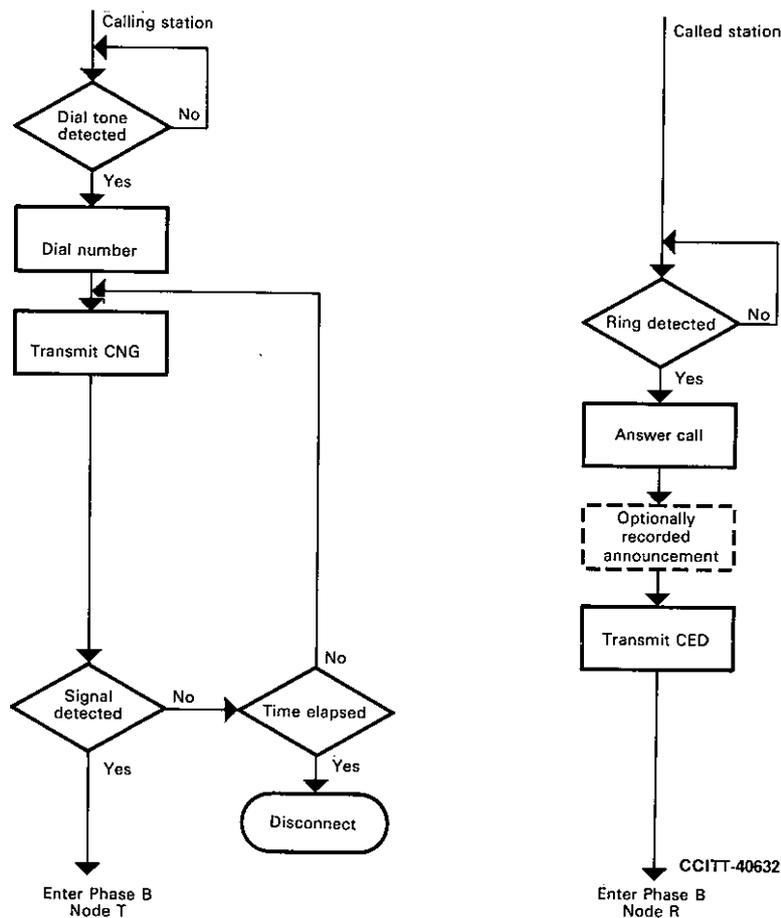| Call event No.	Calling station	Called station
1	Equipment detects dial tone and dials desired number (see Note). To clearly indicate to a normal telephone user that he is inadvertently connected, CNG will be transmitted to line during the time that signals are attempted to be detected. *Note* – An 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.

Called station procedure
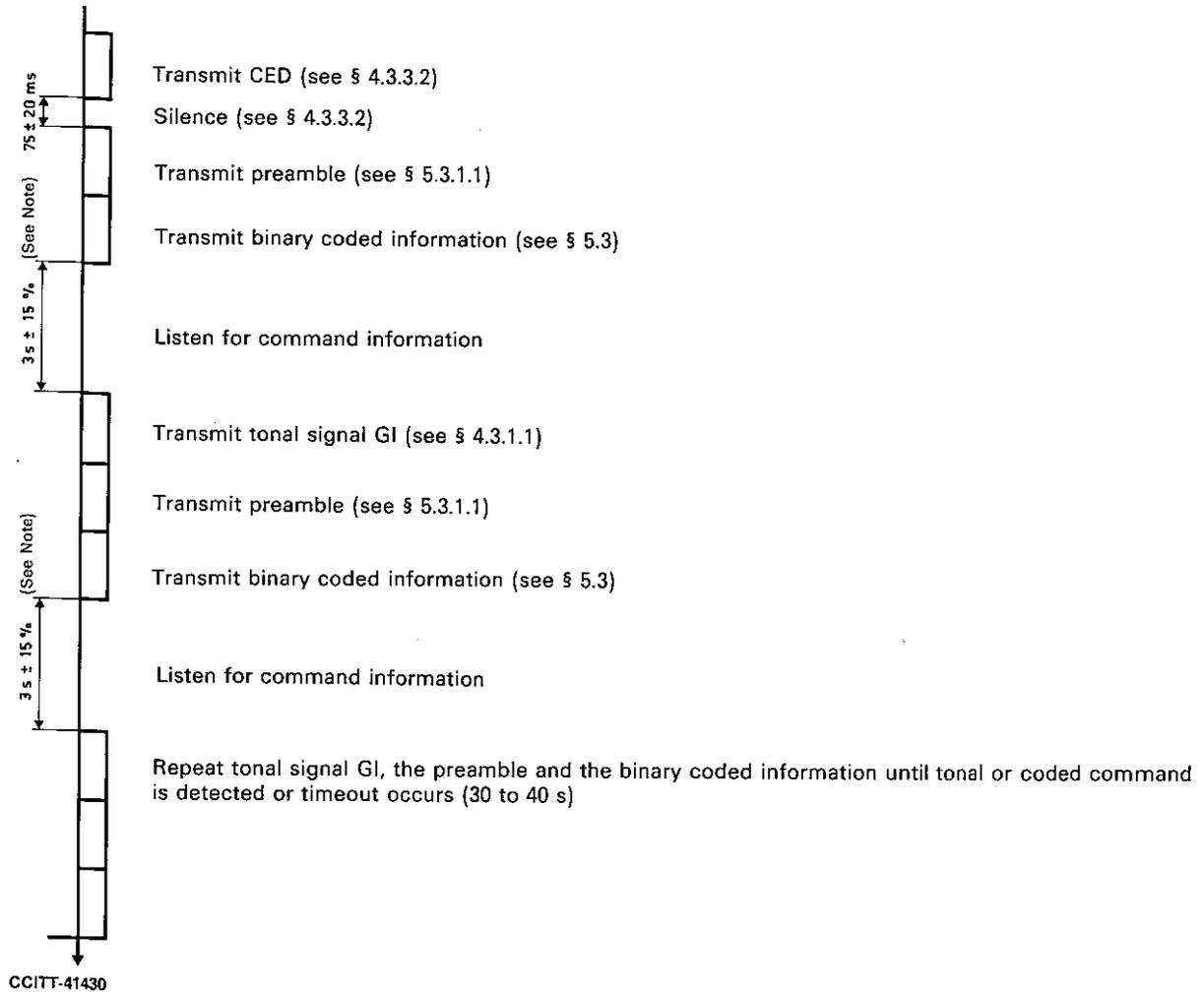
Transmit CED (see § 4.3.3.2)

Silence (see § 4.3.3.2)

Transmit preamble (see § 5.3.1.1)

Transmit binary coded information (see § 5.3)

Listen for command information

Transmit tonal signal GI (see § 4.3.1.1)

Transmit preamble (see § 5.3.1.1)

Transmit binary coded information (see § 5.3)

Listen for command information

Repeat tonal signal GI, the preamble and the binary coded information until tonal or coded command is detected or timeout occurs (30 to 40 s)

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Note – For manual receivers using the binary coded procedure, this delay should be 4.5 s ± 15%.

FIGURE 6/T.30

Binary-tonal identification signal
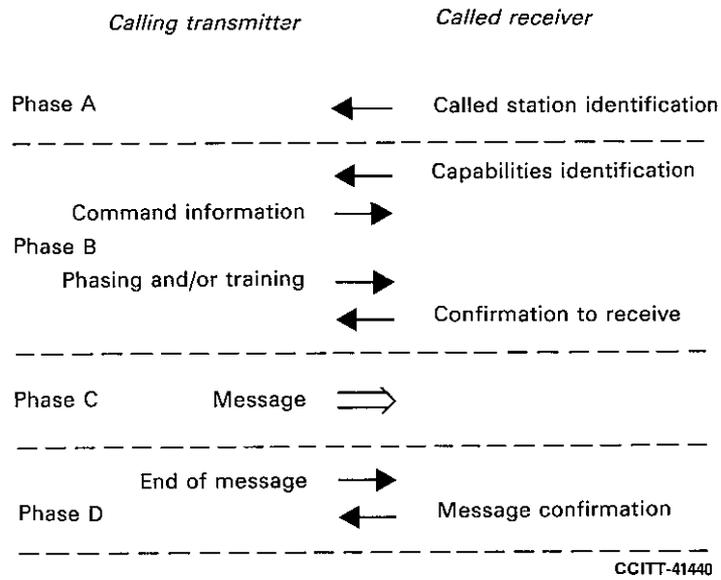
FIGURE 7/T.30

Calling station is transmitting

The condition where the calling station is to receive documents is shown in Figure 8/T.30. The simple tonal systems do not provide this capability.
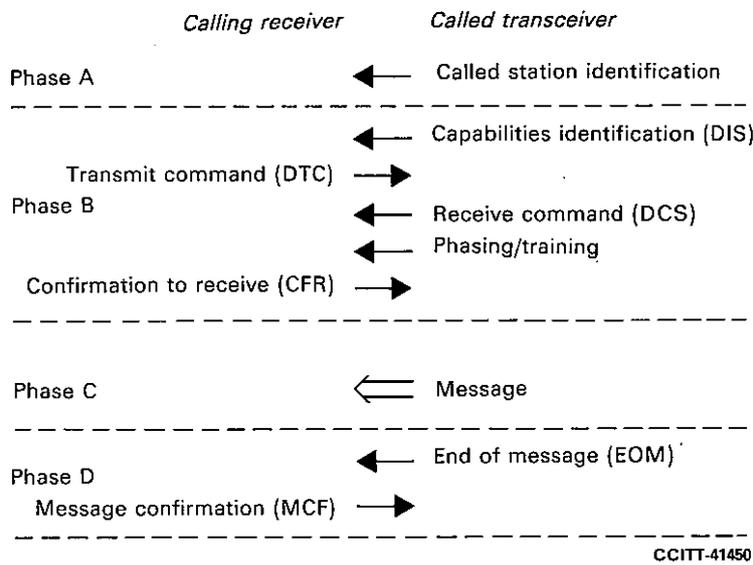

FIGURE 8/T.30

Calling station is receiving

3.3 *Phase E – Call release*

Call release occurs after the last post-message signal of the procedure or under certain conditions, e.g.:

3.3.1 *Time out*

When a signal as specified by the facsimile procedure is not received within the specified time-out period, the apparatus may signal to the operator (if one is in attendance) or disconnect the telephone connection. The appropriate time-out periods are specified in §§ 4 and 5 below.

3.3.2 *Procedural interrupt*

The facsimile procedure may be interrupted by sending a procedural interrupt signal, by notifying the attending operator or by disconnecting the connection. The signal is defined in §§ 4 and 5 below.

3.3.3 *Command*

In the case where binary coded procedures are utilized, the call may be immediately terminated by the binary coded system commands, as specified in § 5 below.

4   Tonal signalling for facsimile procedure

This signalling system covers operating methods 1-T and 2-T and has to be implemented for apparatus operating according to Recommendations T.2 and T.3.

4.1   *Description*

Phases B and C

Transmitter	Receiver
	1. Transmit GI
2. GI detected	
3. Select appropriate group	
4. Transmit GC	
5. Transmit phasing	
	6. Detect GC and phasing Select group and phase
	7. Transmit CFR
8. Detect CFR	
9. Transmit message	

Phase D

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

Multi-document transmitter	Single-document receiver
1. Transmit EOM	
	2. Detect EOM
	3. Transmit MCF
	4. Switch back to telephone Operator loads paper
5. Detect MCF and prepare for next document	
6. When ready to transmit, transmit CNG (optional)	
	7. Operator hears CNG and switches machine to line
	8. Transmit GI
9. Detect GI	
10. Transmit GC Continue phases B and C	

Multi-document transmitter to multi-document receiver and single document facsimile apparatus operate accordingly.

Note – It is acknowledged that there are existing equipments in the field that may not conform in all aspects to this Recommendation. Therefore, the decision may be made to go to a mode of operation other than specified herein. The diagram of Appendix I describes, as an example, one of these conditions. Other methods may be possible as long as they do not interfere with the recommended operation.

4.2   *Flow diagram* (Figure 9/T.30)
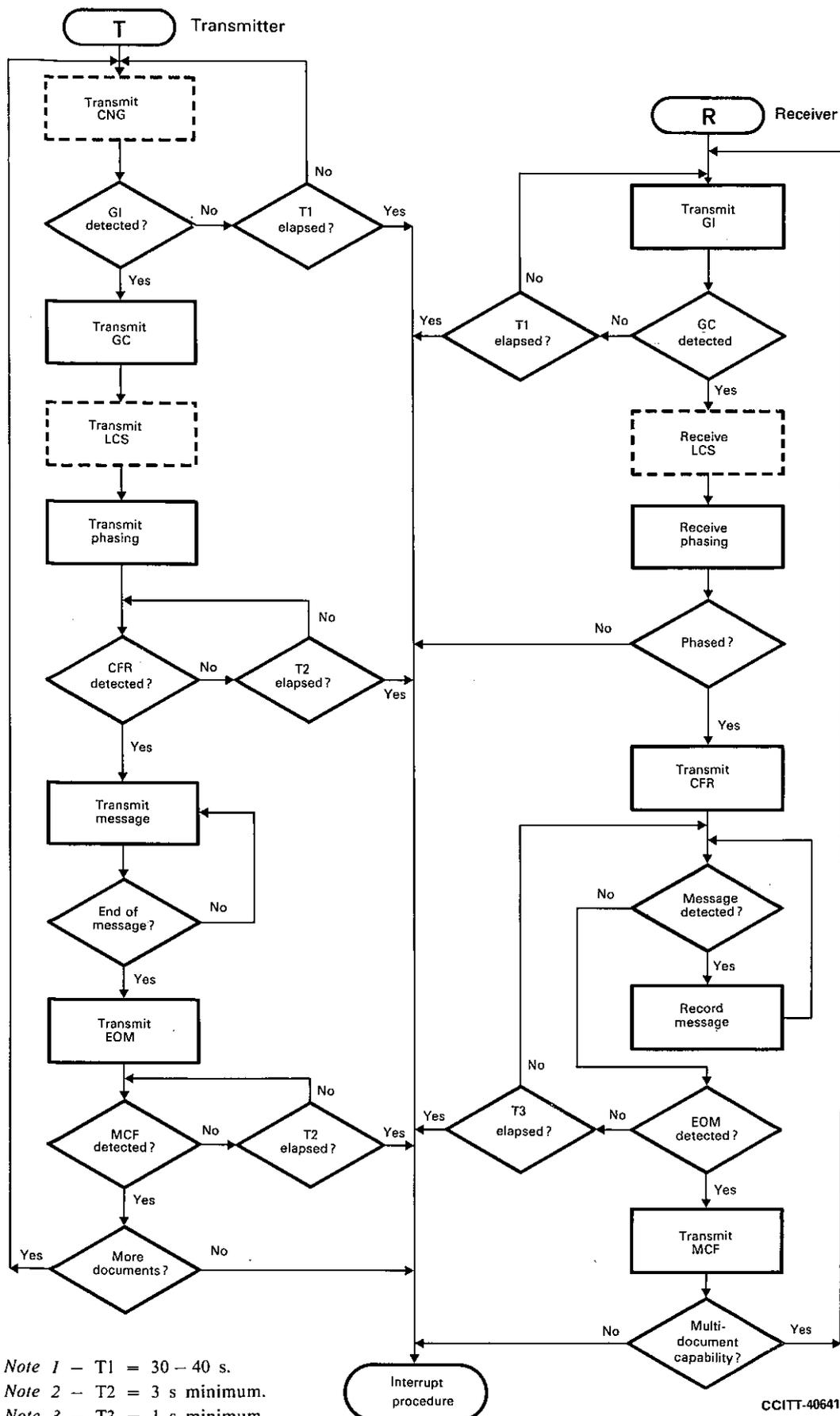
Note *1* — T1 = 30 – 40 s.
Note *2* — T2 = 3 s minimum.
Note *3* — T3 = 1 s minimum.
Note *4* — Broken boxes indicate signals not used in all methods.

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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.
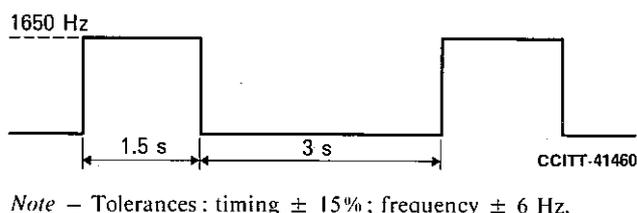
FIGURE 10/T.30

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.
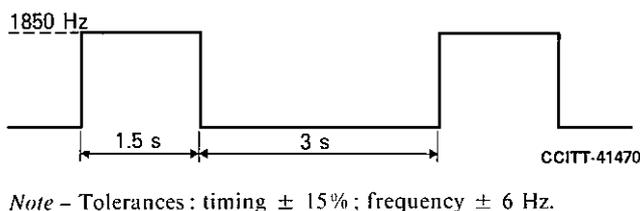
FIGURE 11/T.30

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)
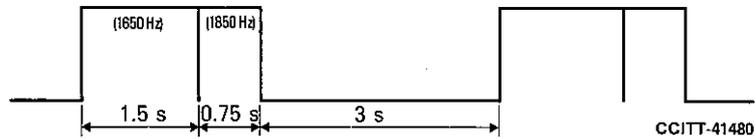
Note — Tolerances: timing ± 15%; frequency ± 6 Hz.

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)
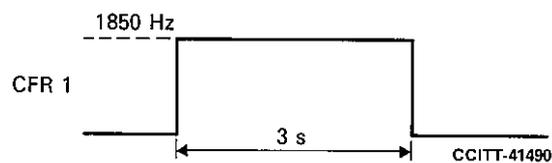
Note — Tolerances: timing ± 15%; frequency ± 6 Hz.

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)
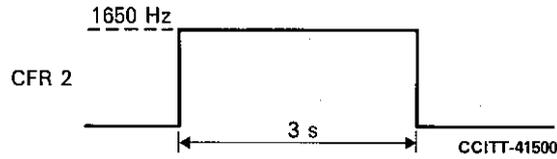
Note — Tolerances: timing ± 15%; frequency ± 6 Hz.

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)
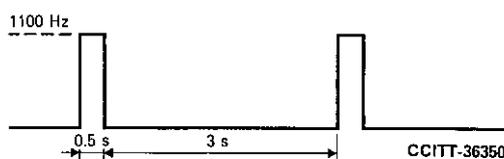
1100 Hz, ON for 0.5 second, OFF for 3 seconds.

Note – Tolerances: timing ± 15%; frequency 1100 Hz ± 38 Hz.

FIGURE 15/T.30

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 $\pm$ 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 $\pm$ 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 $\pm$ 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.

T0804030-89

Receiving station

R

Transmit
{NSF} {CSI} DIS
{{INSC} {CIG} DTC}

Phase B
Pre-message
procedures

Identify capabilities

Command
appropriate mode

Check phasing/training

Phase C
Message
transmission

RES-PONSE REC? — Yes / No

GC REC? — No / Yes → Go to tonal procedures

3 Tries? — No / Yes → Go to non-specified procedures Note 1

T1 elapsed? — No / Yes → C

F

COM-MAND REC? — No / Yes

T2 elapsed? — Yes / No

EDM? — No / Yes → R

LOCAL INT? — No → B / Yes → F

DTC? — Yes → D / No

DIS? — Yes → A / No

DCS? — No / Yes

MSG CARRIER REC? — Yes / No → F

Receive phasing/training TCF

Phase/TCF OK? — No / Yes

Respond CFR

Respond FTT Note 2

F

Receive training Note 2

Receive facsimile message

EOM/RTC? — No / Yes → F

MSG CARRIER REC? — Yes / No → F

III

T0804040-89

Transmitting station

Timers

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

T0804010-89

Receiving station

T0804020-89

Response received?

Enter

NO

T4
delayed?

NO

Flag
?

YES

YES

②

Received
a frame
?

NO

NO

YES

Signal
gone
?

NO

3s
delayed
?

YES

FCS
error
?

NO

NO

①

NO

3s
delayed
?

NO

Signal
gone
?

YES

CRP
?

NO

200 ms
delay
?

YES

②

YES

YES

YES

①

YES

DCN
?

YES

③

Transmit
DCN

③

NO

Disconnect
the line

200 ms
delay
?

NO

Optional
response
?

YES

Process
optional
response

②

YES

NO

Return «No»

Return «Yes»

CCITT-40650

T4 = 4.5s ± 15%, for manual units
T4 = 3.0s ± 15%, for automatic units
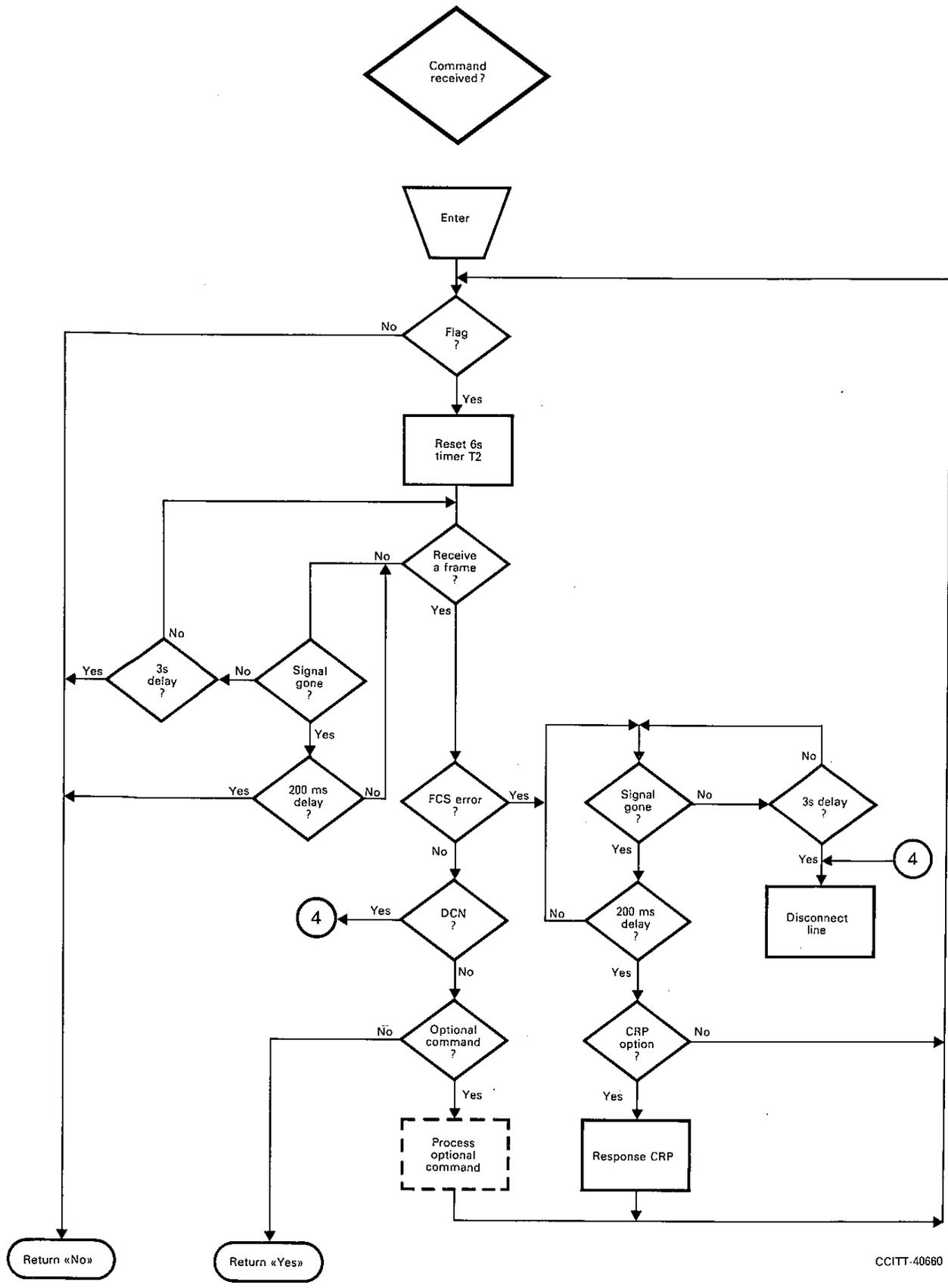
CCITT-40660

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

CCITT-36451
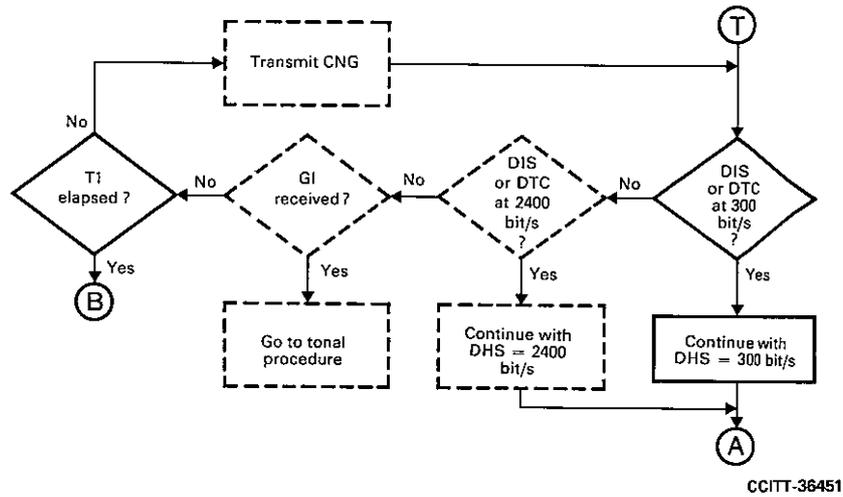
Note − DHS = Digital handshaking speed   Dotted lines = optional

Right-hand side of beginning of phase B of the flow diagram

CCITT-36462
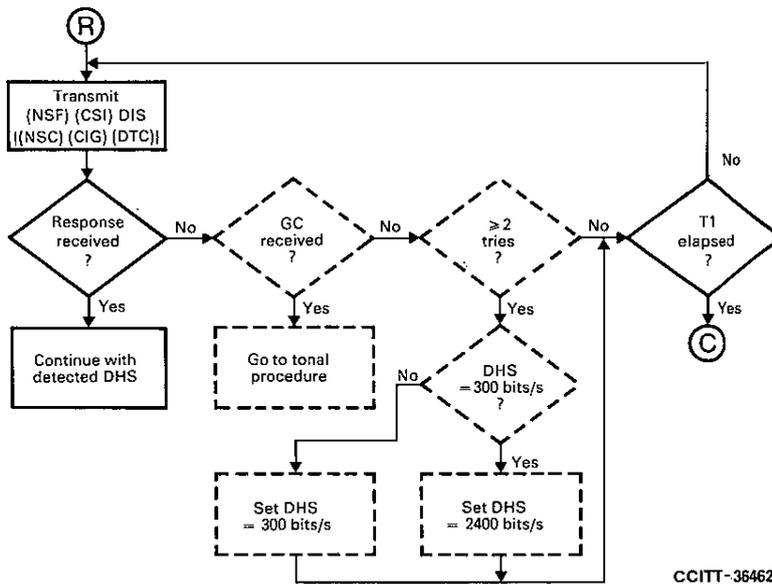
Note − The station listens to a response at 300 bits/s (2400 bit/s) after transmitting a command at 300 bit/s (2400 bit/s) and continues with the detected DHS.

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).
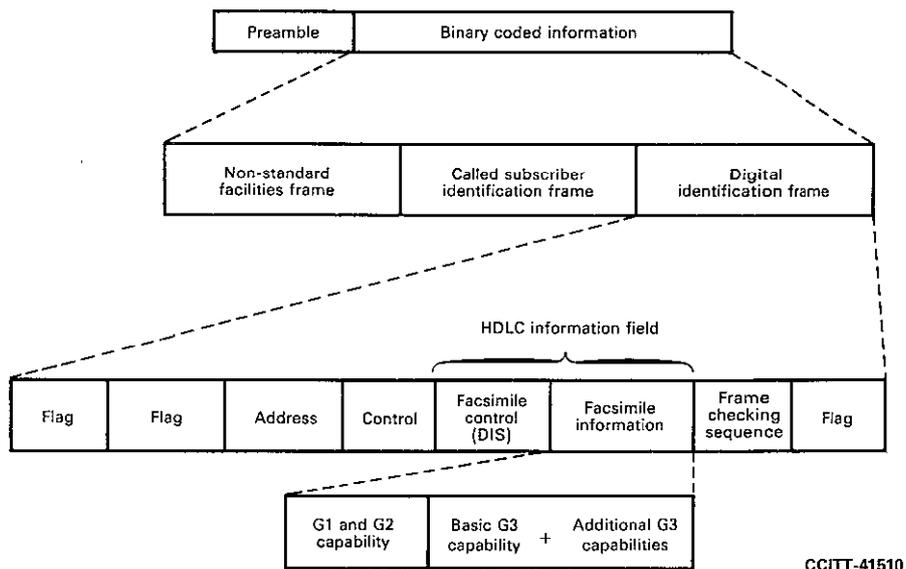
FIGURE 16/T.30

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.

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

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

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 x16 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 ($x15$ 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.

transmit left to right
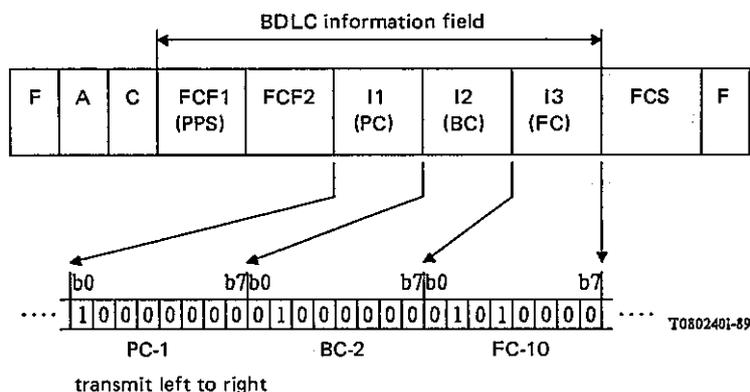
FCF1: Facsimile Control Field 1; Extention signal for error correction (PPS).
FCF2: Facsimile Control Field 2; Post message command (NULL, MPS, EOM, EOP and PR1-Q)
I1(PC): Information field 1; Page counter (8 bits); modulo 256)
I2(BC): Information field 2; Block counter (8 bits; modulo 256)
I3(FC): Information 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.
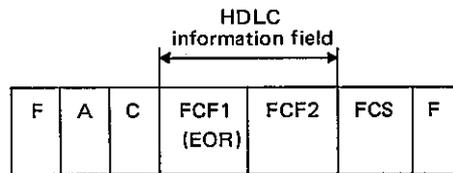
FCF1: Facsimile Control Field 1; Extention signal for error correction (EOR)
FCF2: Facsimile Control Field 2; Post message command (NULL, MPS, EOM, EOP and PR1-Q)

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
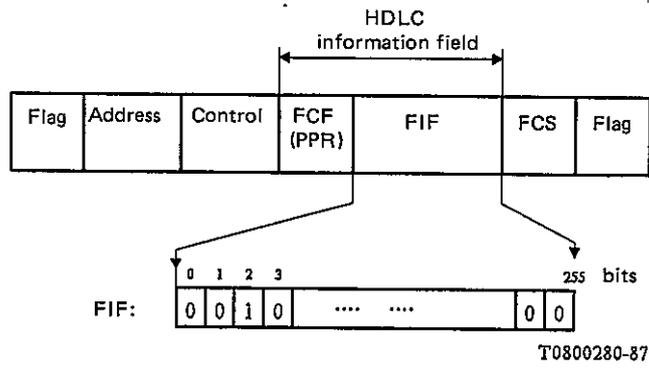
FIGURE A-3/T.30
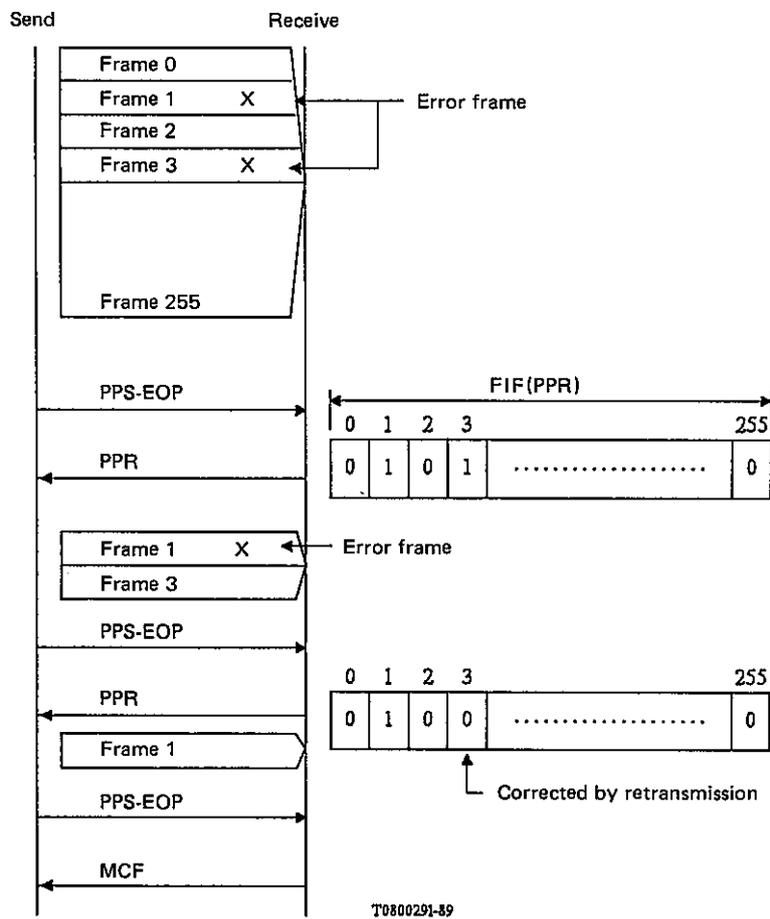
FIGURE A-4/T.30
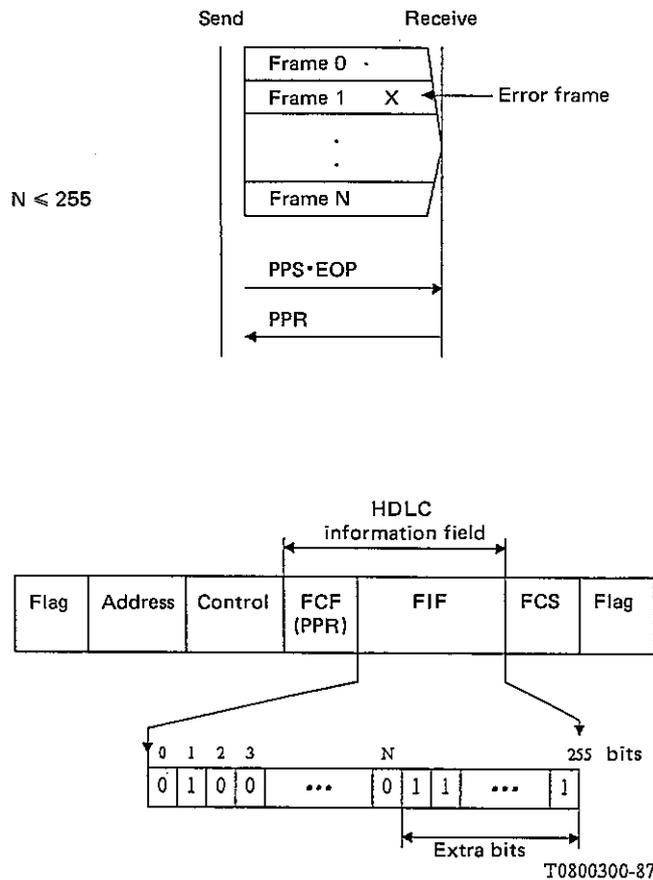
FIGURE A-5/T.30

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.
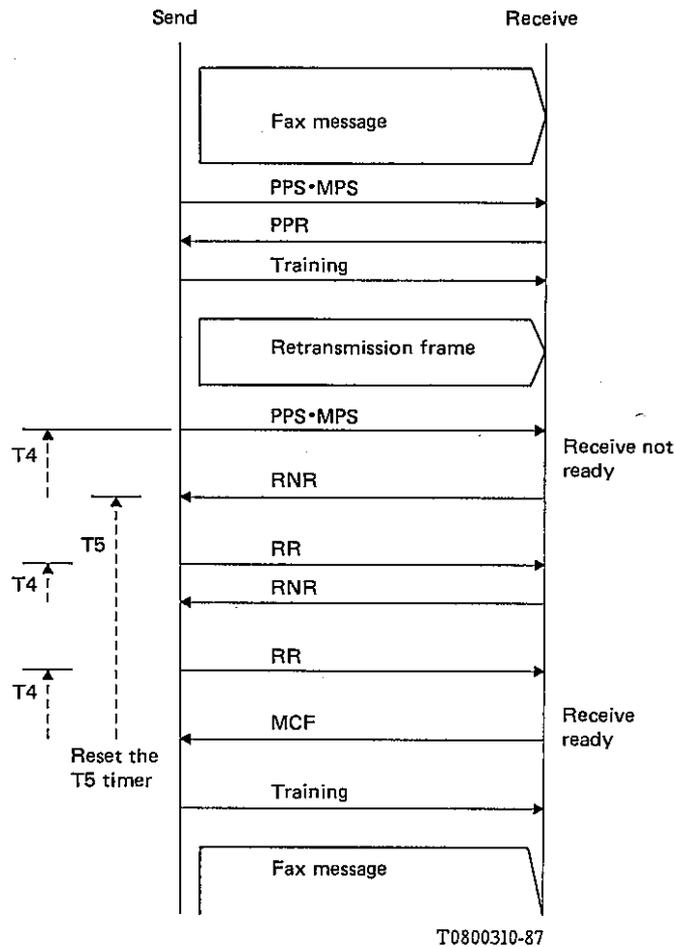
FIGURE A-6/T.30

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.

Transmitting station

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

Receiving station

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

Phase B
Pre-message
procedures

Identify capabilities

Command
appropriate mode

Check phasing/training

Phase C
Message
transmission

See the following page
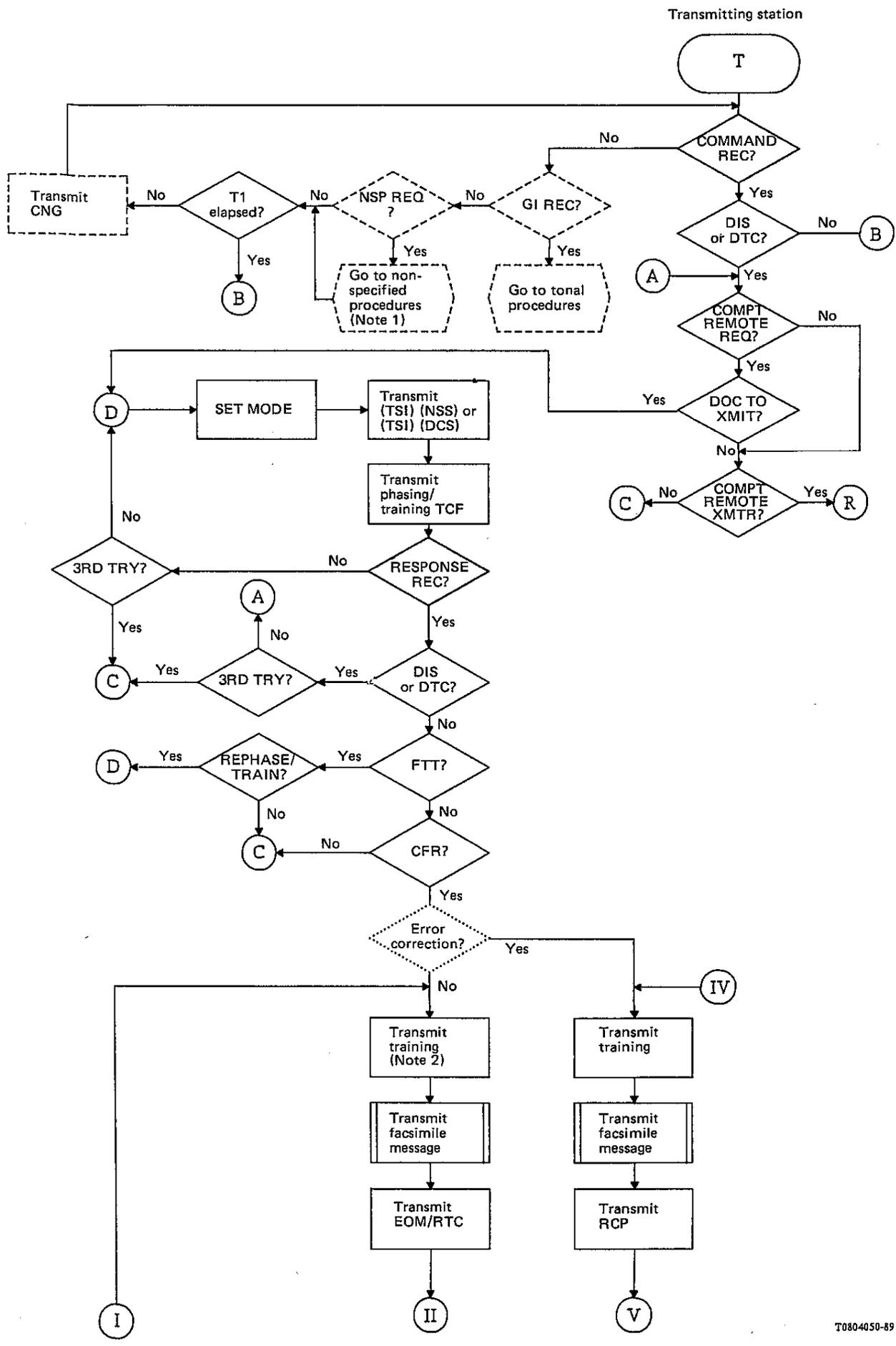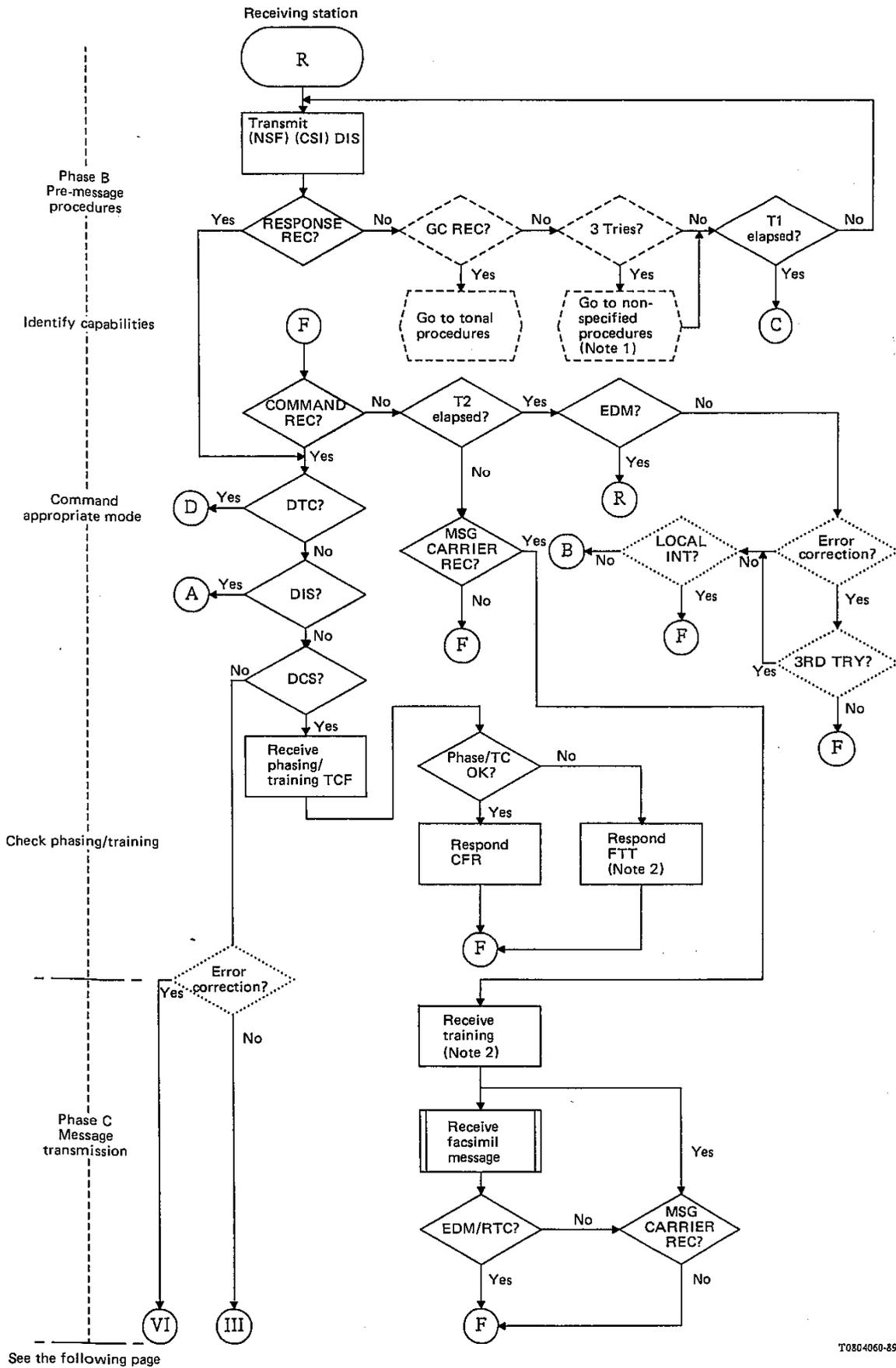
Note — The last command, except RR, was one of EON, PPS•EOM or EOR•EOM?

T0804060-89

Transmitting station

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

Timers

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

T0804010-89

Receiving station

III

Yes ← PRI-Q?

No

**Phase D
Post-message
procedures**

Alert
operator

LINE
REQ?

Yes

No

3RD
PRI·Q?

Yes

No

F

Yes → MPS?

No

Yes → EOP?

No

EOM? → No → B

Yes

LOCAL
INT? → Yes

No

COPY
QUALITY
OK? → No

Yes

REPHASE/
TRAIN? → Yes

No

Transmit
PIN or PIP

Phone
to line

OK to
continue?

No → B

Yes

Go to
beginning
of phase B

Respond
MCF

Respond
RTP

Respond
RTN

F

No → COPY
QUALITY
OK?

Yes

Transmit
PIN

Transmit
PIP

F

B
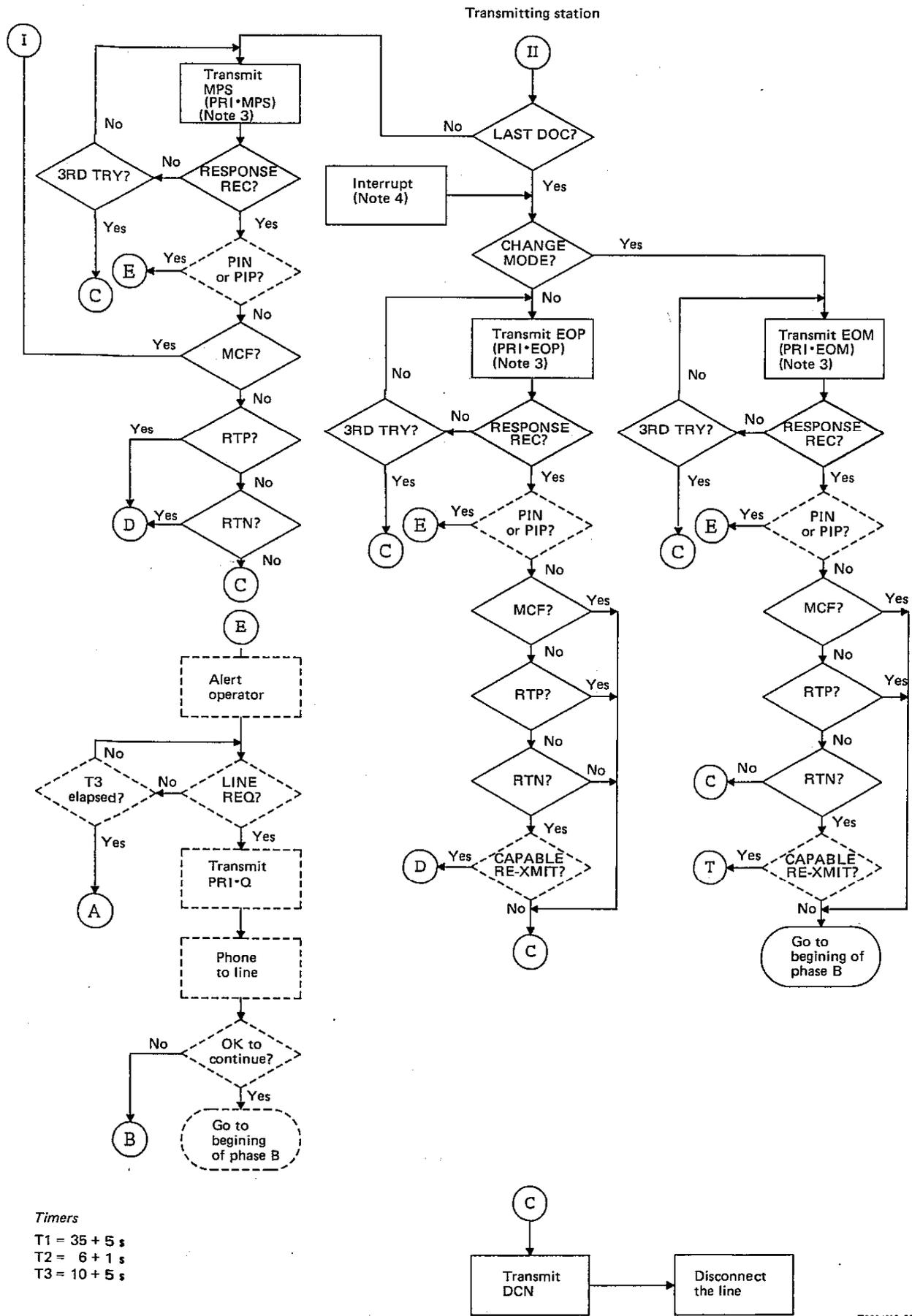
Disconnect
the line
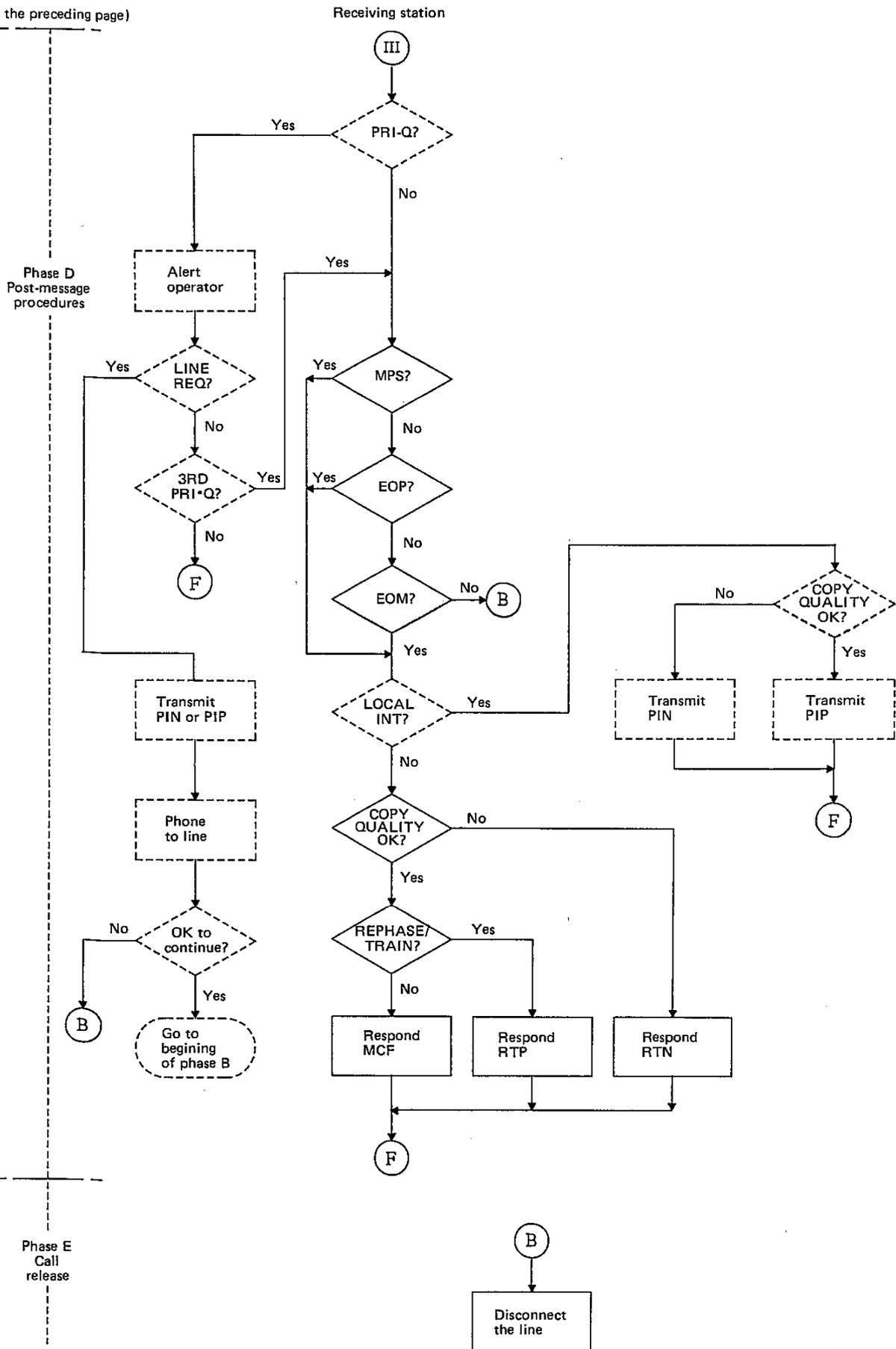
T0804020-89

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

Transmitting station

FIGURE A-8/T.30
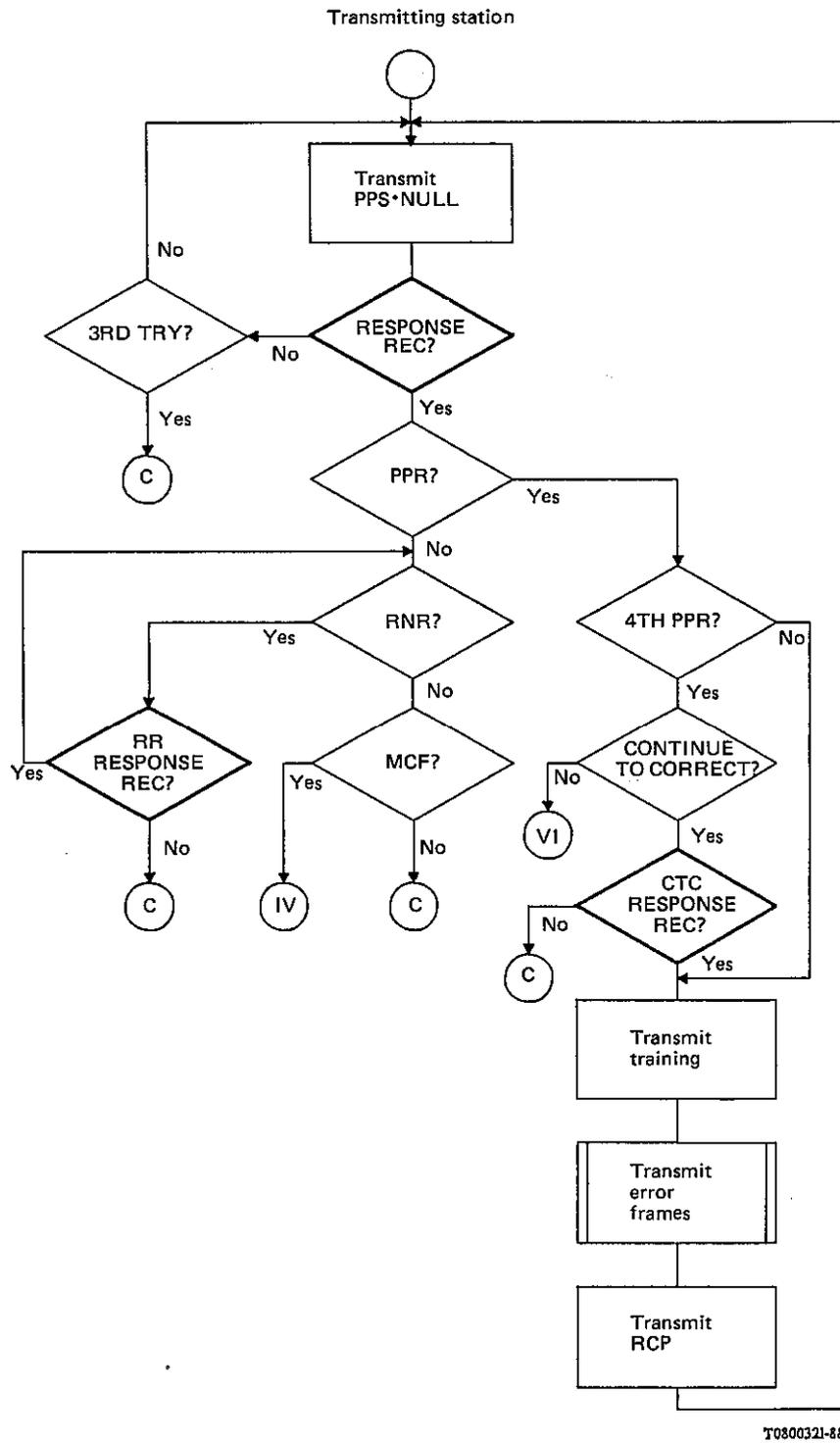
FIGURE A-9/T.30

Transmitting station
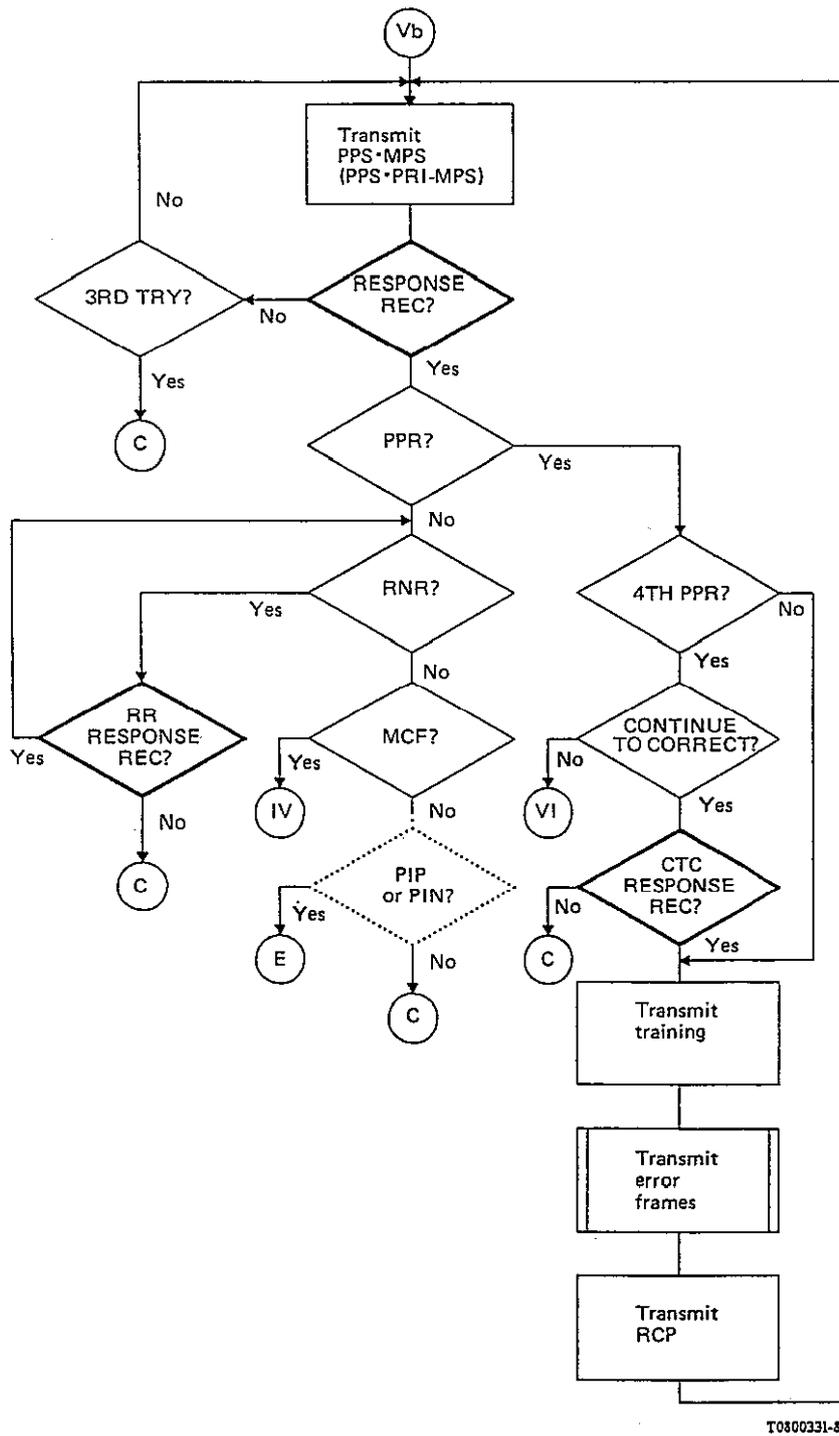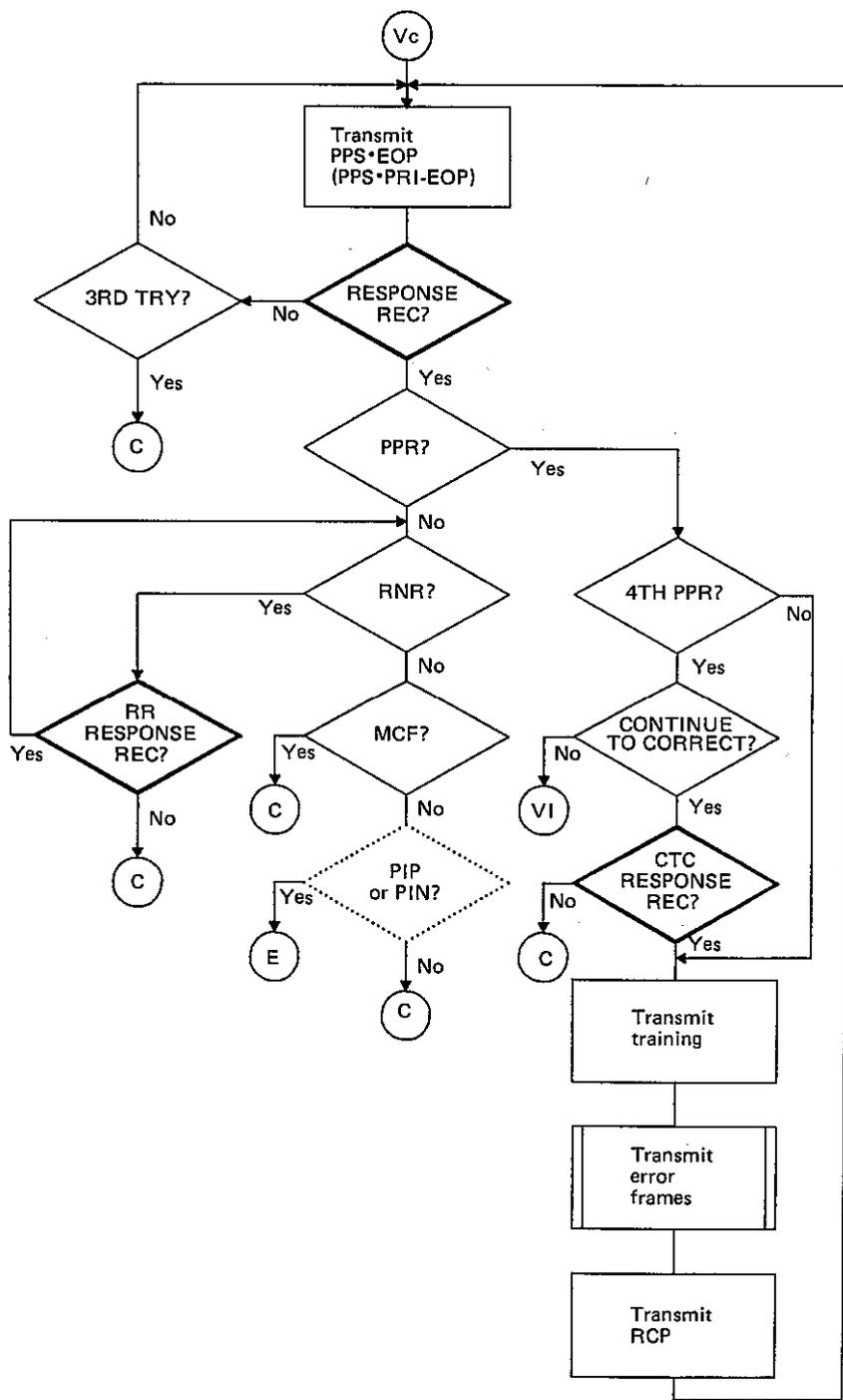
FIGURE A-10/T.30

FIGURE A-11/T.30

FIGURE A-12/T.30

T0800360-87

FIGURE A-13/T.30

FIGURE A-14/T.30

FIGURE A-15/T.30

Transmitting station

T0800391-88
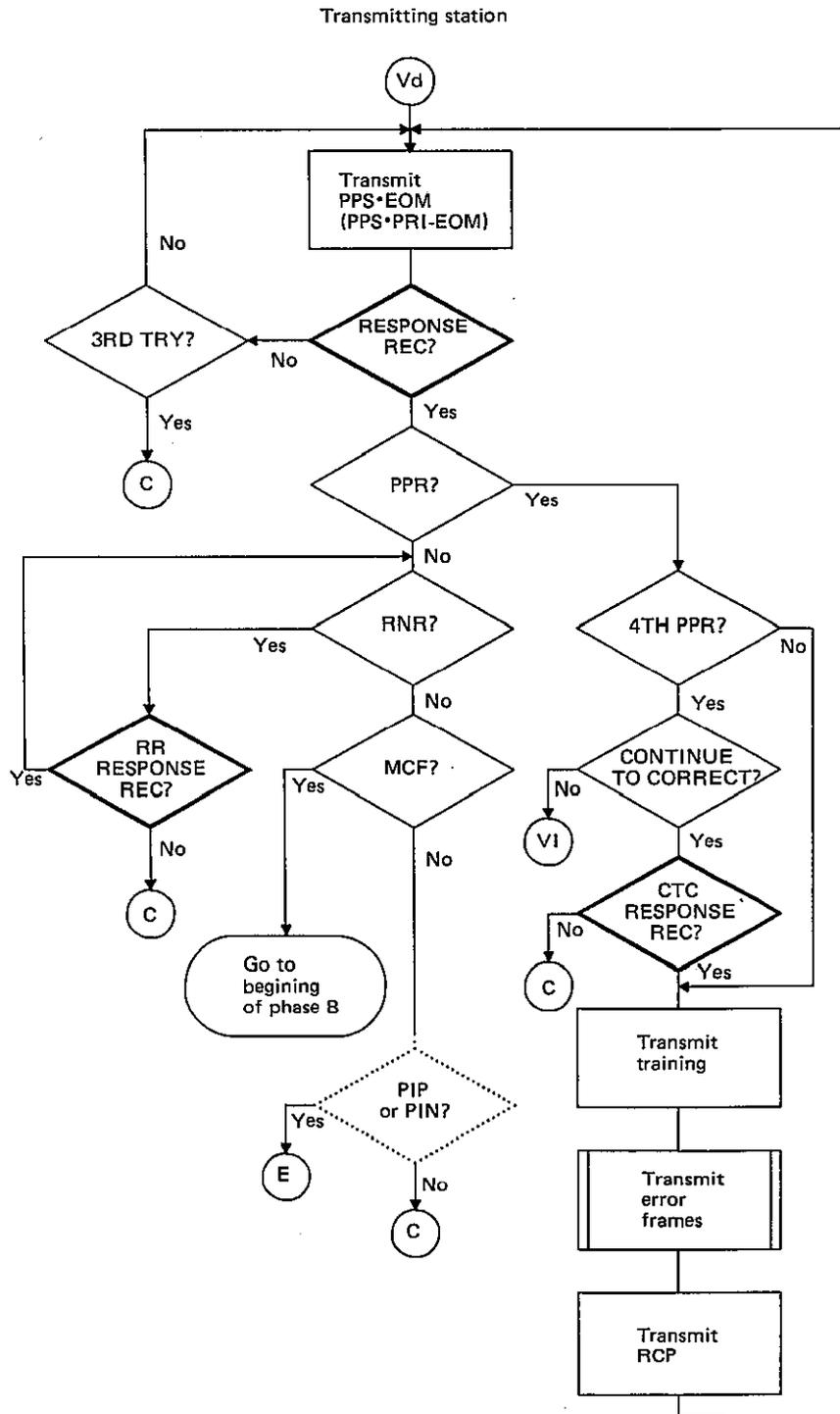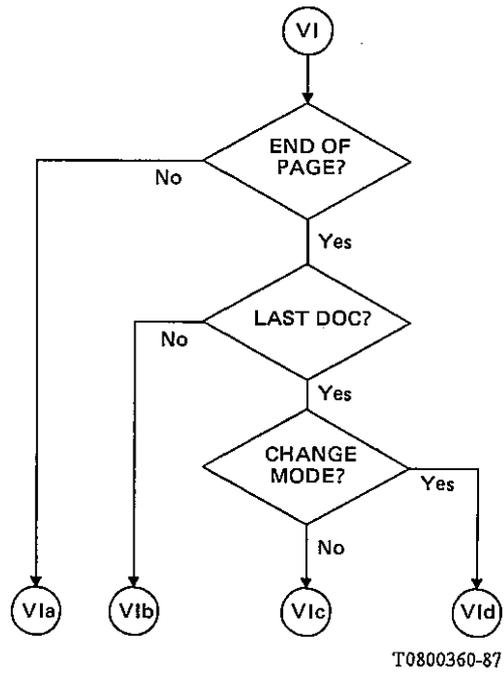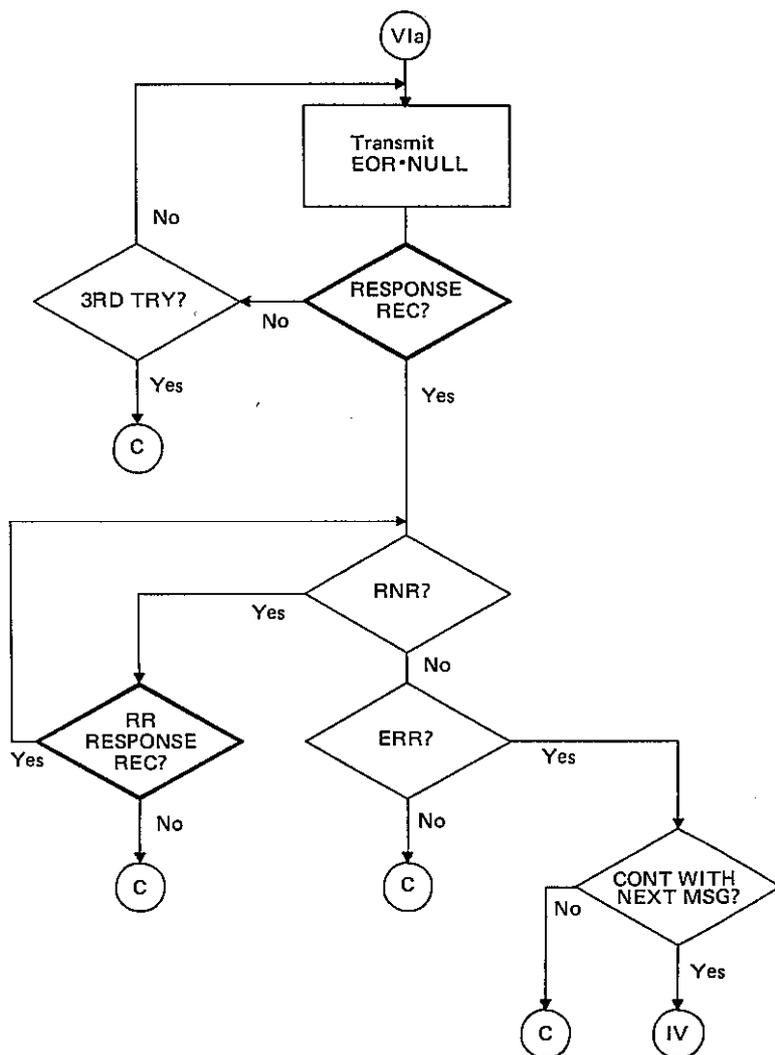
FIGURE A-16/T.30

Transmitting station
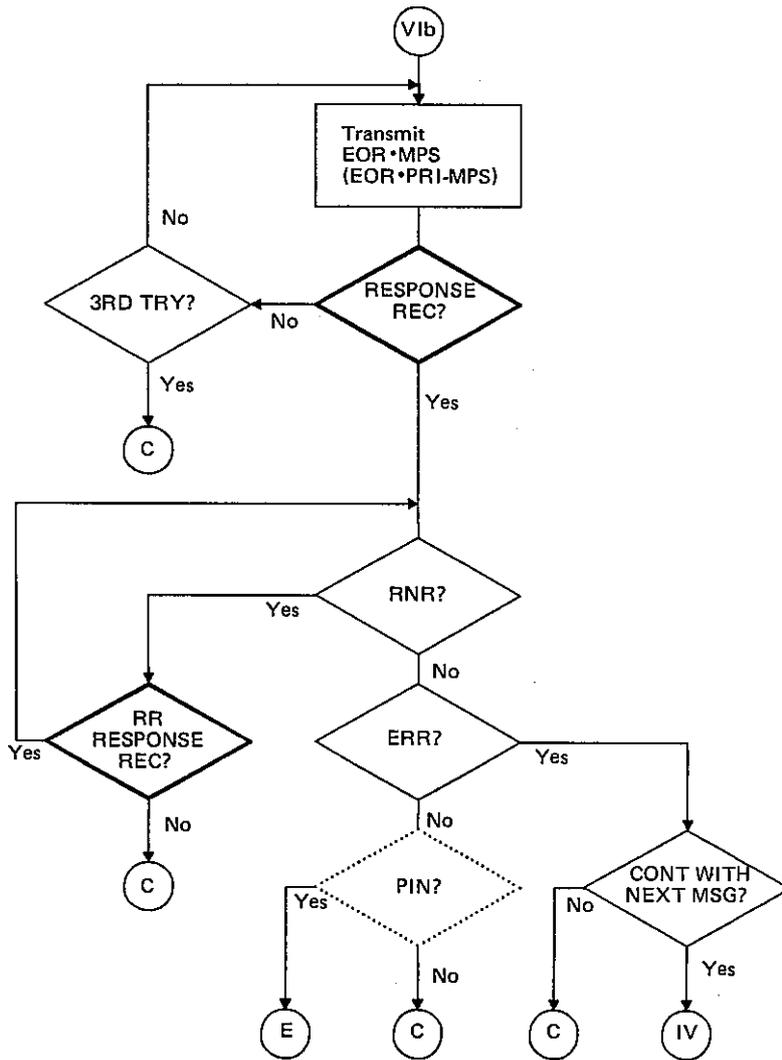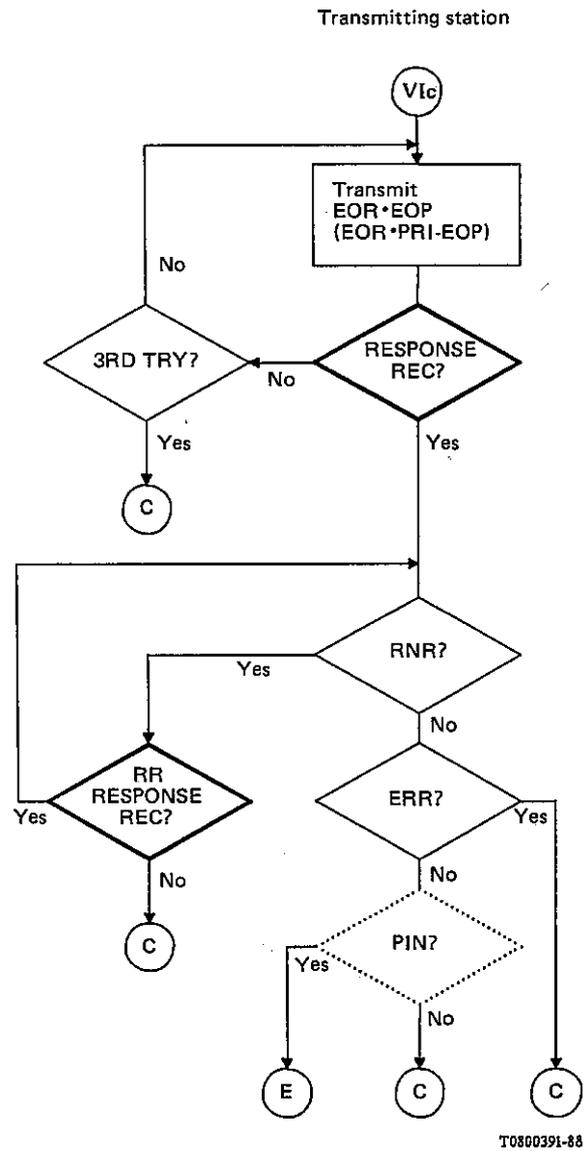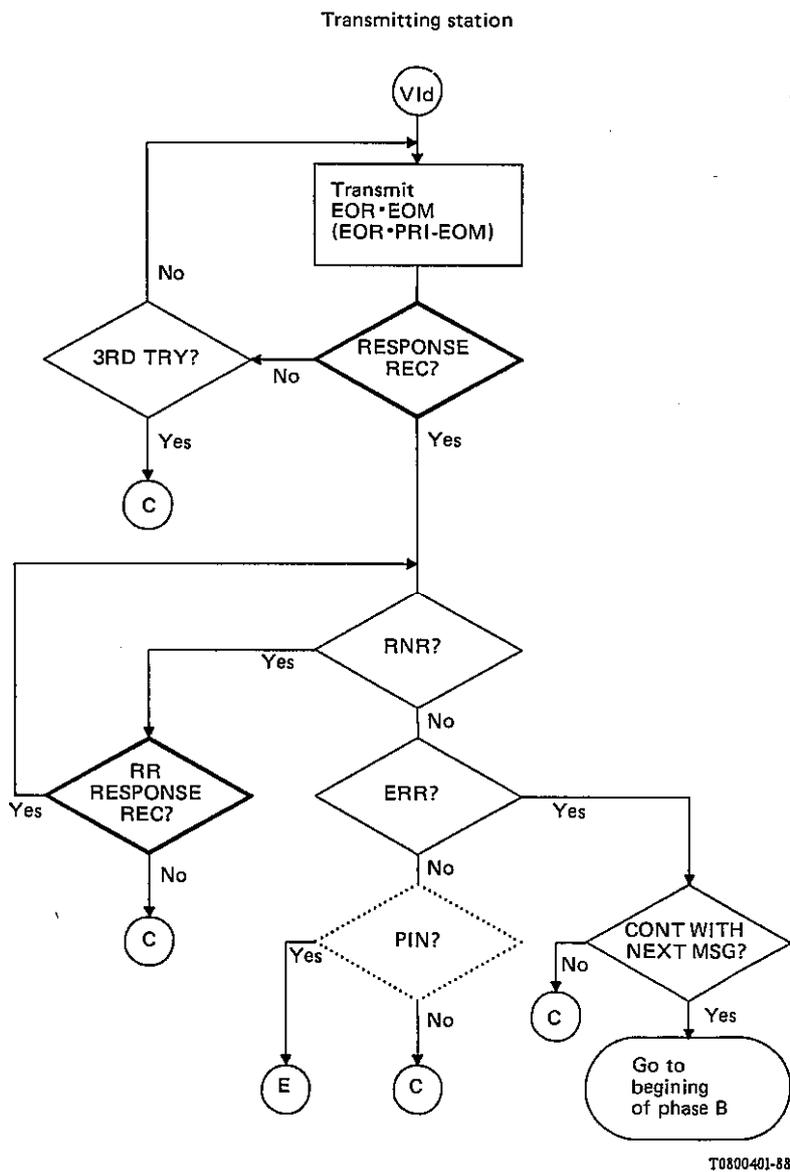
FIGURE A-17/T.30
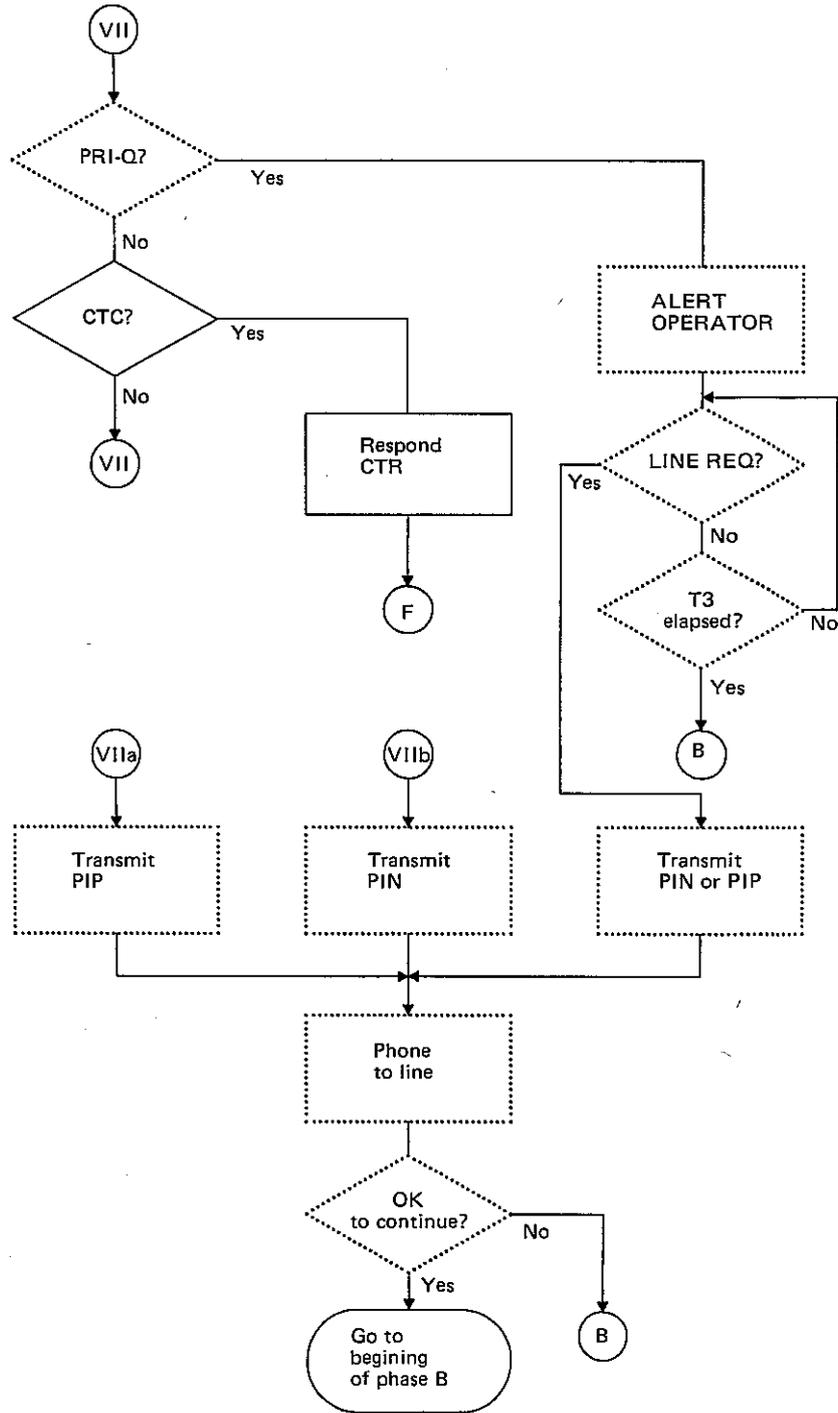
FIGURE A-18/T.30
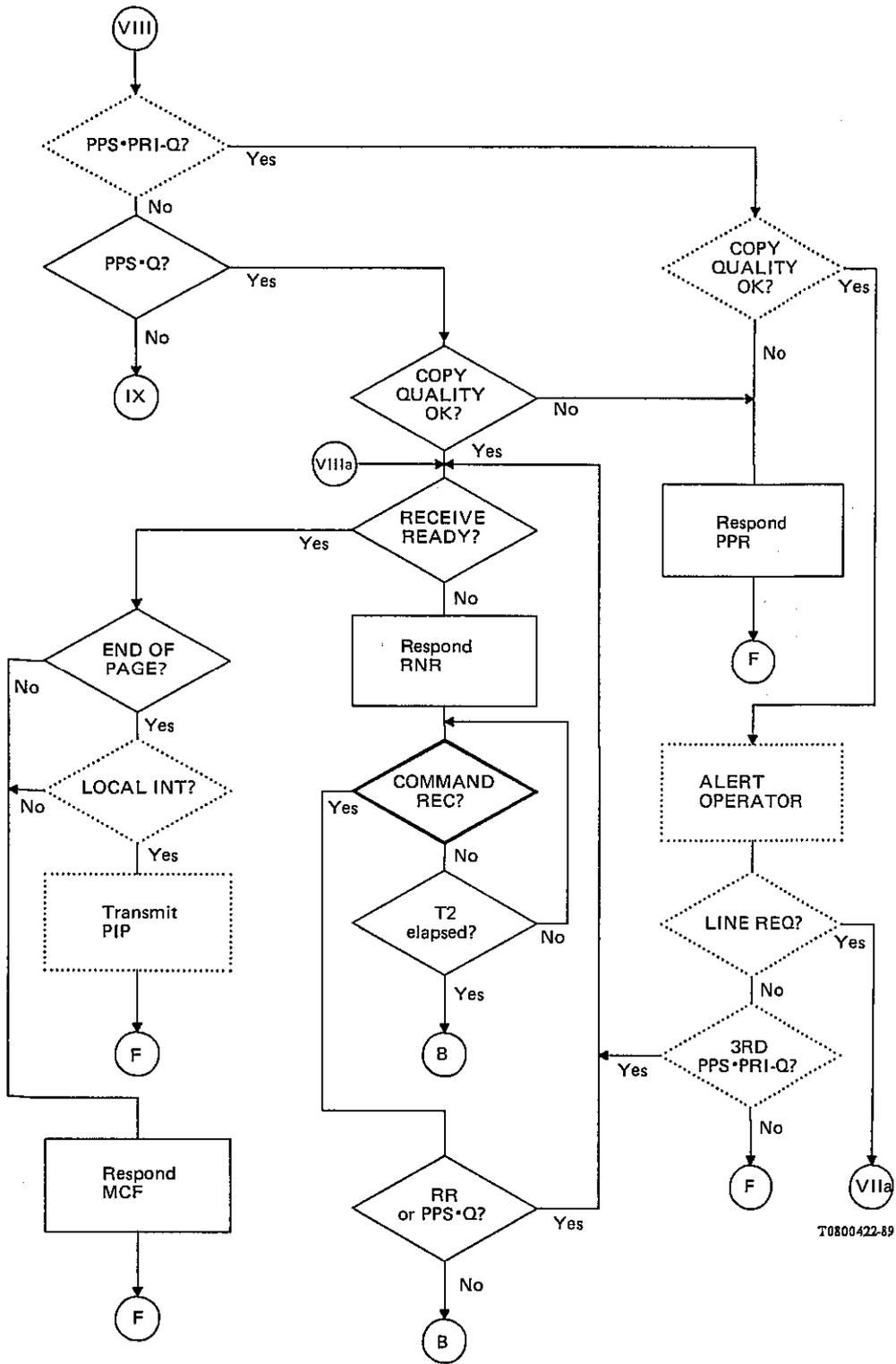
FIGURE A-19/T.30

Receiving station
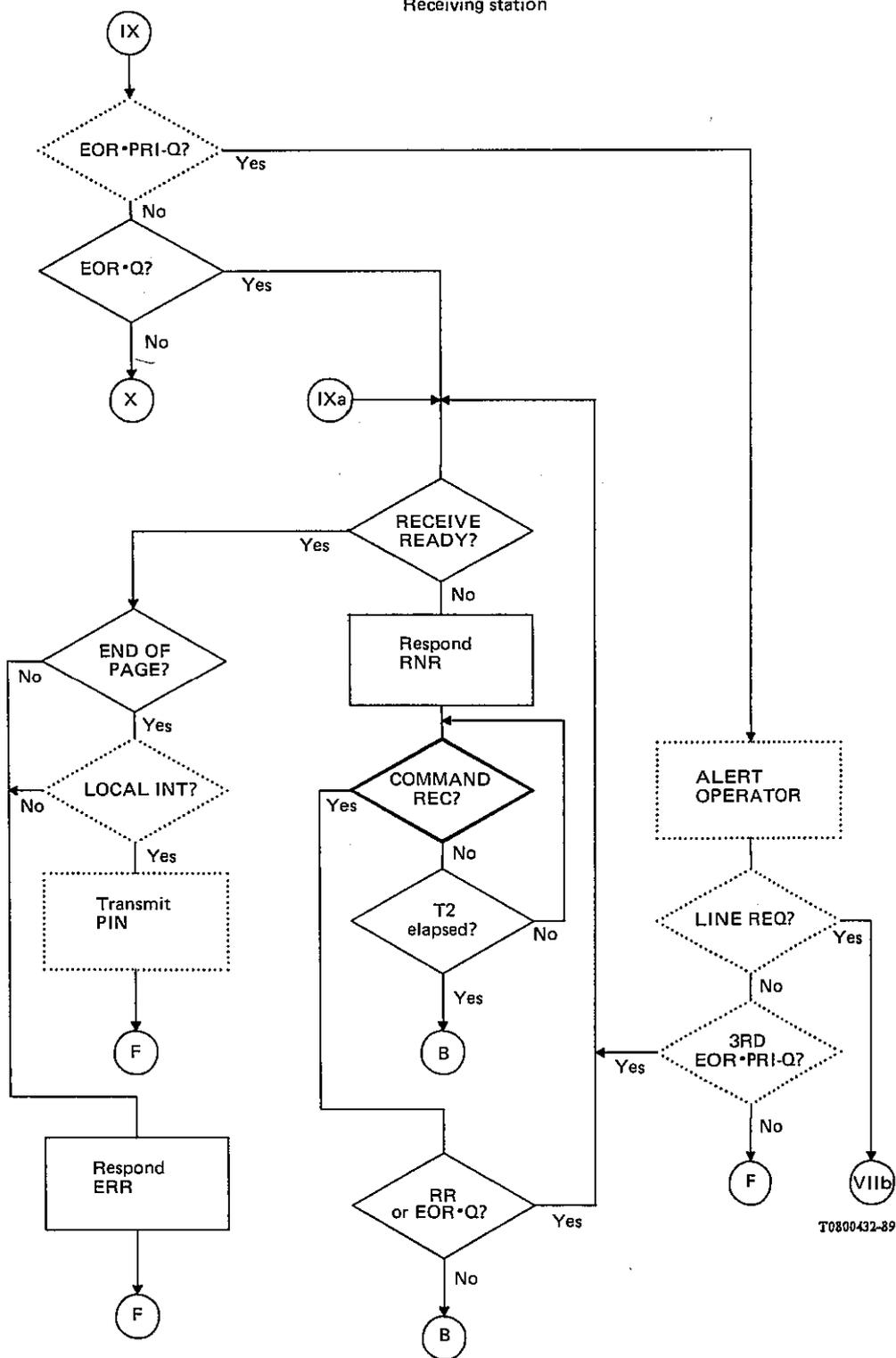
FIGURE A-20/T.30

Receiving station
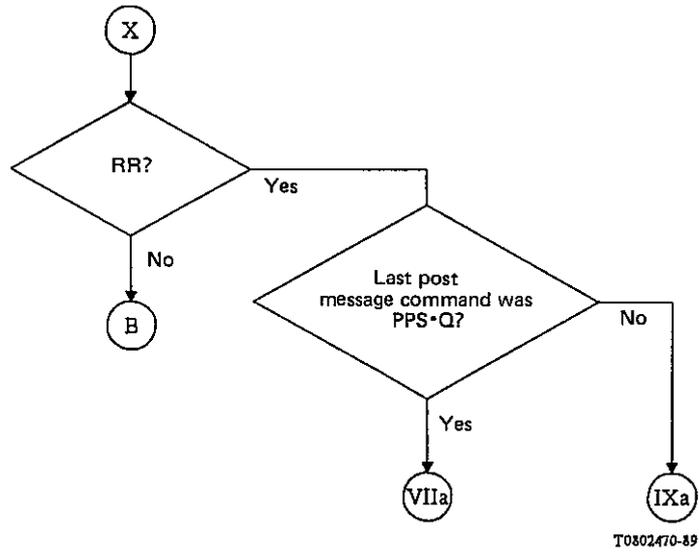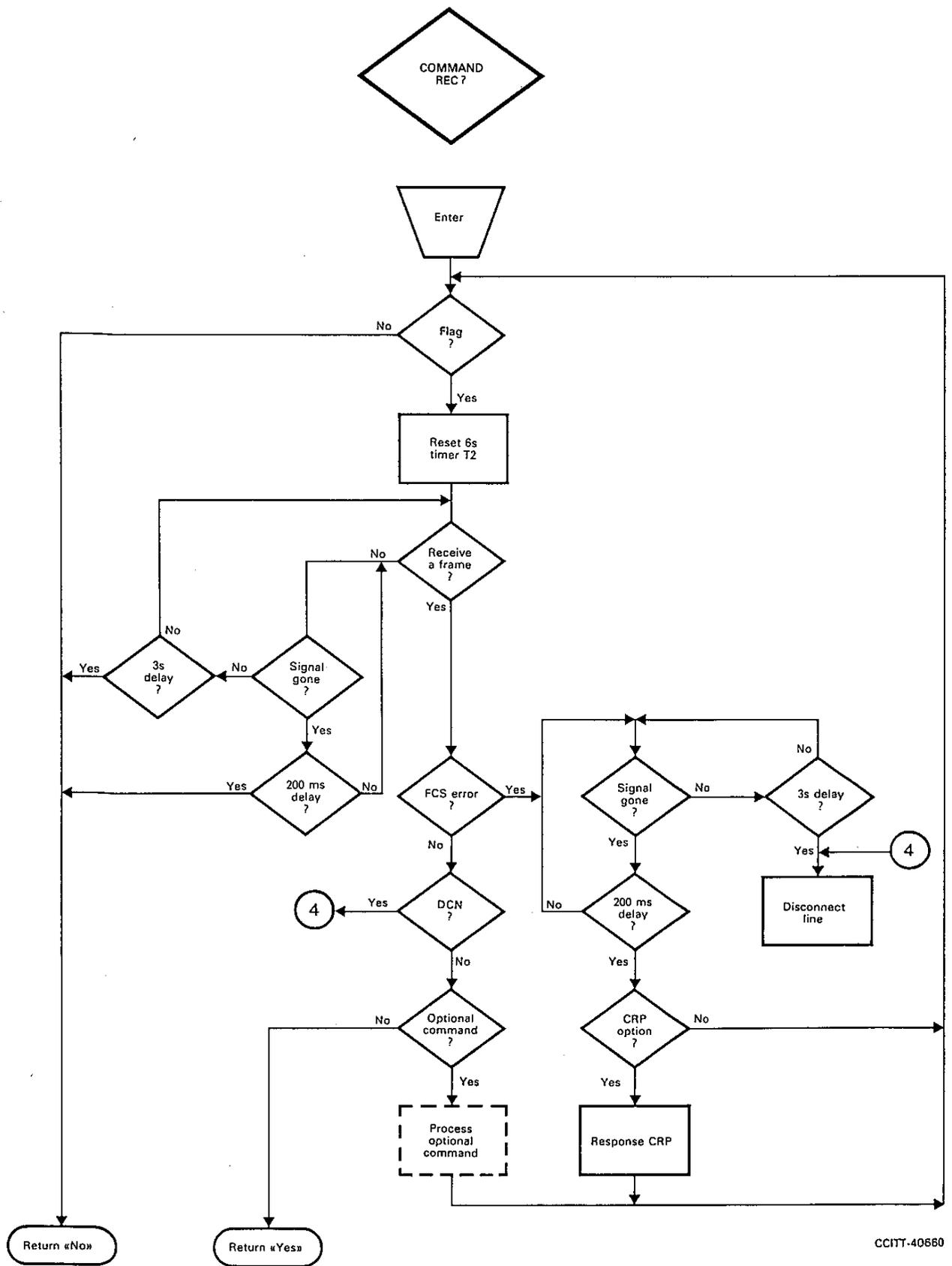
FIGURE A-21/T.30

FIGURE A-22/T.30

FIGURE A-23/T.30

T4 = 4.5s ± 15%, for manual units
T4 = 3.0s ± 15%, for automatic units
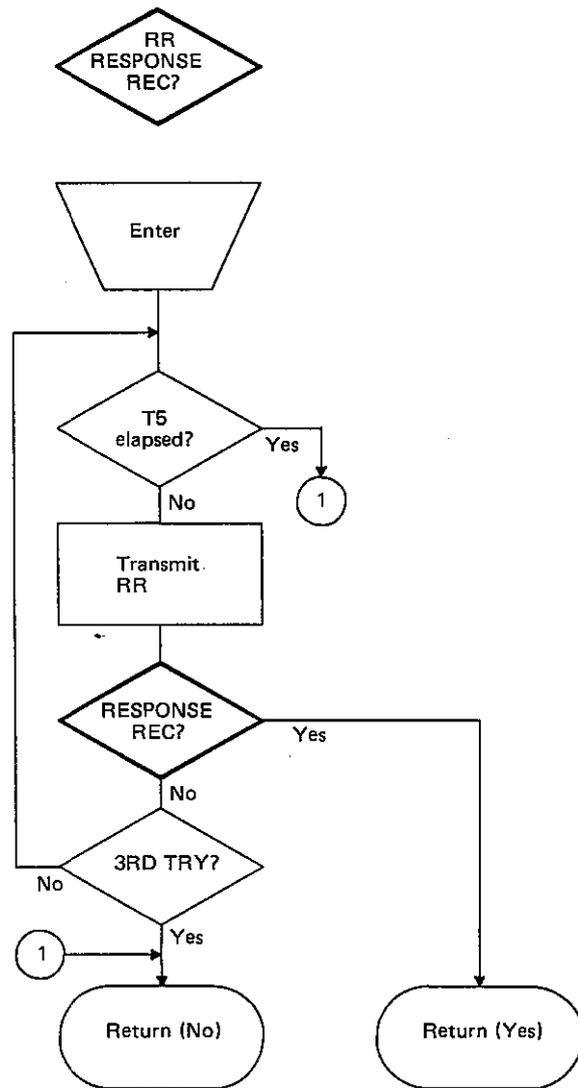
FIGURE A-24/T.30

T5 = 60 s ± 5 s
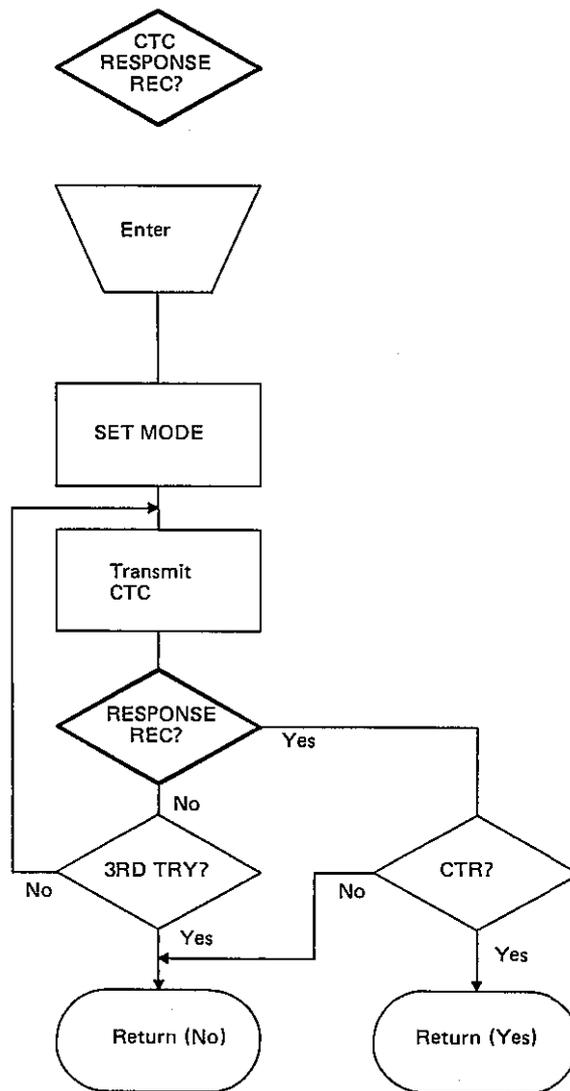
FIGURE A-25/T.30

A.7.1   *Flow diagram key*

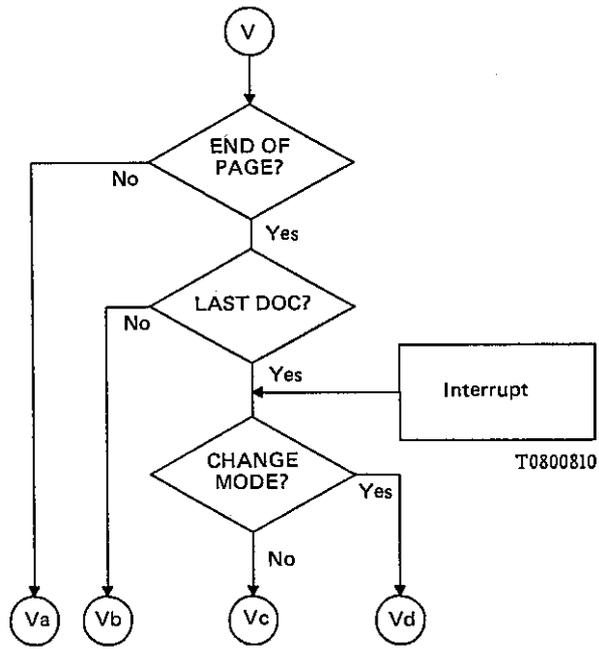|	
COMMAND REC	The "command received" subroutine searches for an error-free standard command. The decision diamonds in the flow diagram refer to the most recent standard command received (e.g., EOM, MPS, etc.).
COMPT REMOTE REC	The FIF associated with the DIS has indicated a "compatible remote receiver".
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.

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).

Calling unit   Called unit

CNG →

← CED

← (NSF) (CSI) DIS

(TSI) DCS →

Training, TCF →

← CFR

Training, FAX MSG →

PPS·NULL (0,0) →

← MCF

Training, FAX MSG →

PPS·MPS (0,1) →

← MCF

Training, FAX MSG →

PPS·NULL (1,0) →

← MCF

Training, FAX MSG →

PPS·EOP (1,1) →

← MCF

DCN →

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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.

Calling unit   Called unit

CNG ────────────────────────►
◄──────────────────────── CED
◄──────────────────────── (CSI) DIS
(TSI) DCS ────────────────────────►
Training, TCF ─ ─ ─ ─ ─ ─ ─►
◄──────────────────────── CFR
Training, FAX MSG ─ ─ ─ ─ ─►(error)
PPS·NULL (0,0) ────────────────────────►
◄──────────────────────── PPR
Training, FAX MSG (retransmit) ─ ─ ─►
PPS·NULL (0,0) ────────────────────────►
◄──────────────────────── MCF
Training, FAX MSG ─ ─ ─ ─ ─►
PPS·EOP (0,1) ────────────────────────►
◄──────────────────────── MCF
DCN ────────────────────────►

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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.

Calling unit
Called unit

CNG
CED
(NSF) (CSI) DIS
(TSI) DCS
Training, TCF
CFR
Training, FAX MSG (error)
PPS-MPS (0,0)
PPR
Training, FAX MSG (retransmit) (error)
PPS-MPS (0,0)
PPR
Training, FAX MSG (retransmit)
PPS-MPS (0,0)
MCF
Training, FAX MSG (error)
PPS-EOP (1,0)
PPR
Training, FAX MSG (retransmit)
PPS-EOP (1,0)
MCF
DCN

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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.

Calling unit   Called unit

CNG →
CED ←
(NSF) (CSI) DIS ←
(TSI) DCS →
Training, TCF →
CFR ←
Training, FAX MSG → (error)
PPS·NULL (0,0) →
PPR ←
Training, FAX MSG (retransmit) → (error)
PPS·NULL (0,0) →
PPR ←
Training, FAX MSG (retransmit) → (error)
PPS·NULL (0,0) →
PPR ←
Training, FAX MSG (retransmit) → (error)
PPS·NULL (0,0) →
PPR ←
CTC →
CTR ←
Training, FAX MSG (retransmit) →
PPS·NULL (0,0) →
MCF ←

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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).

Calling unit → CNG → Called unit
CED
(NSF) (CSI) DIS
(TSI) DCS
Training, TCF
CFR
Training, FAX MSG → (error)
PPS-NULL (0,0)
PPR
Training, FAX MSG (retransmit)
PPS-NULL (0,0) → MEMORY BUSY occurred
RNR
RR
T5
RNR
RR
Reset T5 timer
MCF
Training, FAX MSG
PPS-NULL (0,1)
MCF

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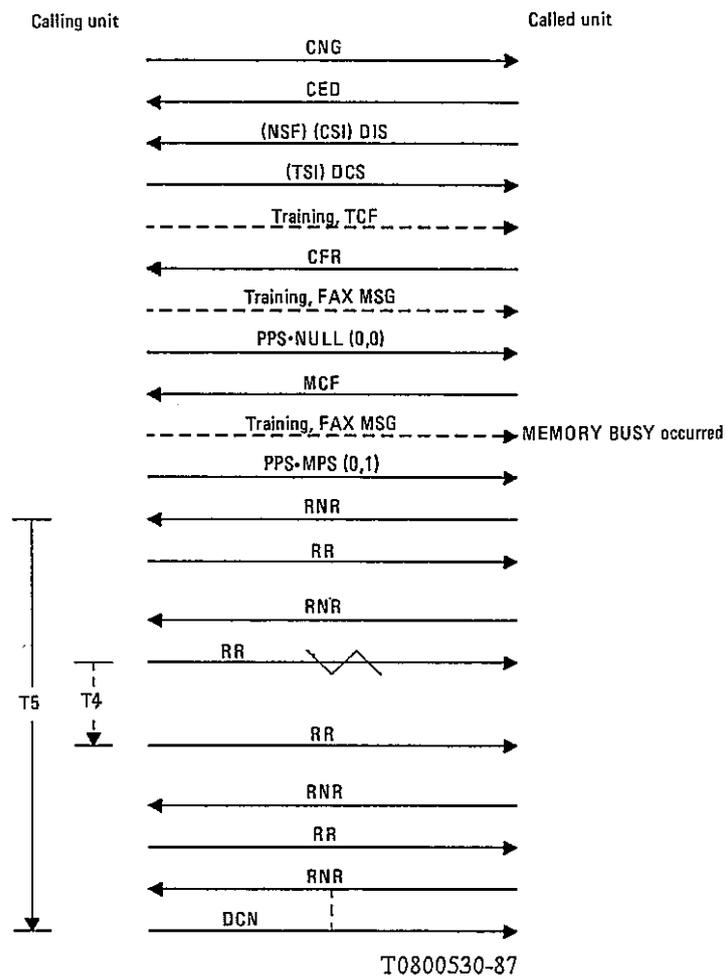
FIGURE A-26/T.30 (Sheet 8 of 13)

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.

Calling unit   Called unit

CNG ⟶

⟵ CED

⟵ (NSF) (CSI) DIS

(TSI) DCS ⟶

Training, TCF ⟶

⟵ CFR

Training, FAX MSG ⟶ (error)

PPS·NULL (0,0) ⟶

⟵ PPR

Training, FAX MSG (retransmit) ⟶ (error)

PPS·NULL (0,0) ⟶

⟵ PPR

Training, FAX MSG (retransmit) ⟶ (error)

PPS·NULL (0,0) ⟶

⟵ PPR

Training, FAX MSG (retransmit) ⟶ (error)

PPS·NULL (0,0) ⟶

⟵ PPR

EOR·NULL ⟶

⟵ ERR

Training, FAX MSG ⟶

PPS·NULL (0,1) ⟶

⟵ MCF

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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).

```
Calling unit                                              Called unit

                          CNG
───────────────────────────────────────────────────▶

                          CED
◀───────────────────────────────────────────────────

                     (NSF) (CSI) DIS
◀───────────────────────────────────────────────────

                      (TSI) DCS
───────────────────────────────────────────────────▶

                    Training, TCF
─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ▶

                          CFR
◀───────────────────────────────────────────────────

                  Training, FAX MSG
─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ▶  (error)

                   PPS·NULL (0,0)
───────────────────────────────────────────────────▶

                          PPR
◀───────────────────────────────────────────────────

              Training, FAX MSG (retransmit)
─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ▶  (error)

                   PPS·NULL (0,0)
───────────────────────────────────────────────────▶

                          PPR
◀───────────────────────────────────────────────────

              Training, FAX MSG (retransmit)
─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ▶  (error)

                   PPS·NULL (0,0)
───────────────────────────────────────────────────▶

                          PPR
◀───────────────────────────────────────────────────

              Training, FAX MSG (retransmit)
─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ▶  (error)

                   PPS·NULL (0,0)
───────────────────────────────────────────────────▶

                          PPR
◀───────────────────────────────────────────────────

                      EOR·MPS
───────────────────────────────────────────────────▶

                          ERR
◀───────────────────────────────────────────────────

                  Training, FAX MSG
─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ▶

                   PPS·NULL (1,0)
───────────────────────────────────────────────────▶

                          MCF
◀───────────────────────────────────────────────────

                              T0800570-87
```
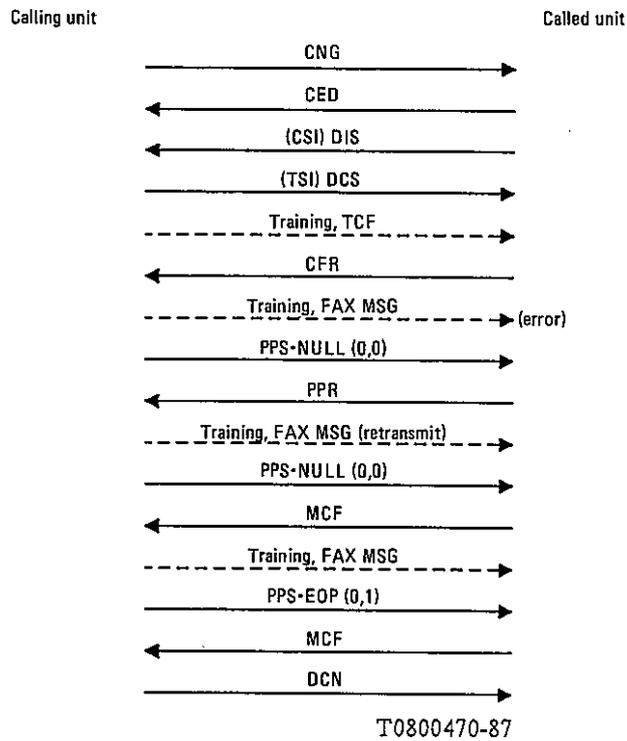
FIGURE A-26/T.30 (Sheet 12 of 13)

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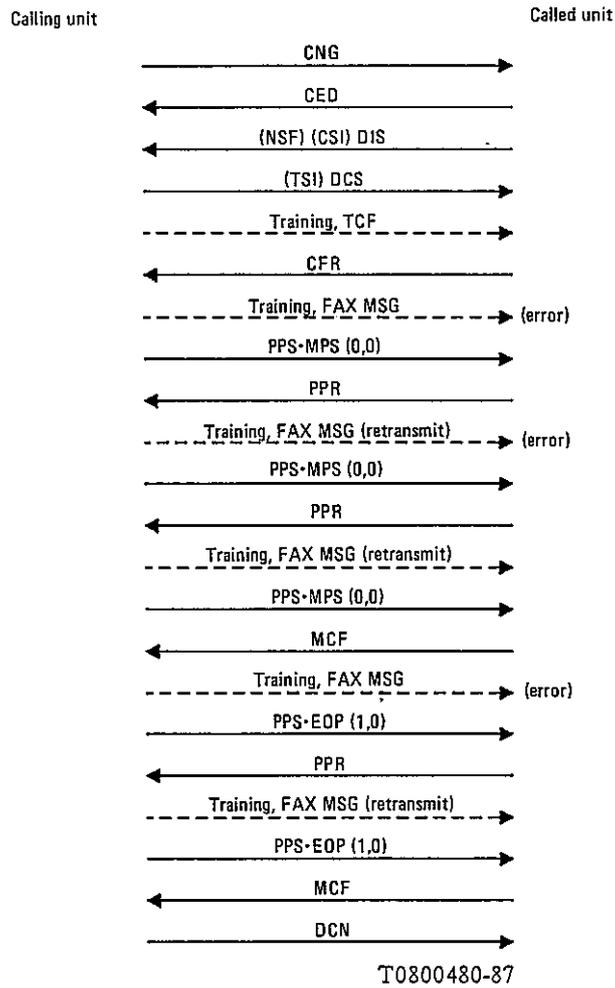an answer unit: example of EOR (first page not satis-
factorily received.

Called unit

```
                          CNG
        ──────────────────────────────────────▶
                          CED
        ◀──────────────────────────────────────
                    (NSF) (CSI) DIS
        ◀──────────────────────────────────────
                     (TSI) DCS
        ──────────────────────────────────────▶
                   Training, TCF
        ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ▶
                          CFR
        ◀──────────────────────────────────────
                 Training, FAX MSG
        ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ▶
                  PPS-NULL (0,0)
        ──────────────────────────────────────▶
                          MCF
        ◀──────────────────────────────────────
             Training, FAX MSG
        ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ▶
                  PPS-MPS (0,1)
        ──────────────────────────────────────▶
                          PPR
        ◀──────────────────────────────────────
           Training, FAX MSG (retransmit)
        ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ▶
                  PPS-MPS (0,1)
        ──────────────────────────────────────▶
                          MCF
        ◀──────────────────────────────────────
                          ¦
                          ¦
                          ¦
                  Training, FAX MSG
        ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ▶
                  PPS-MPS (1,0)
        ──────────────────────────────────────▶
                          MCF
        ◀──────────────────────────────────────
             Training, FAX MSG
        ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ▶
                  PPS-EOP (2,0)
        ──────────────────────────────────────▶
                          PPR
        ◀──────────────────────────────────────
           Training, FAX MSG (retransmit)
        ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ▶
                  PPS-EOP (2,0)
        ──────────────────────────────────────▶
                          MCF
        ◀──────────────────────────────────────
                          ¦
                          ¦        T0800580-87
                          ¦
```

When either all the frames or flag sequences in FAX MSG are destroyed, the receiver can detect the FAX MSG which was lost by checking Block Counter.

When either all the frames or flag sequences in FAX MSG are destroyed, the receiver can detect the FAX MSG which was lost by checking Page Counter.
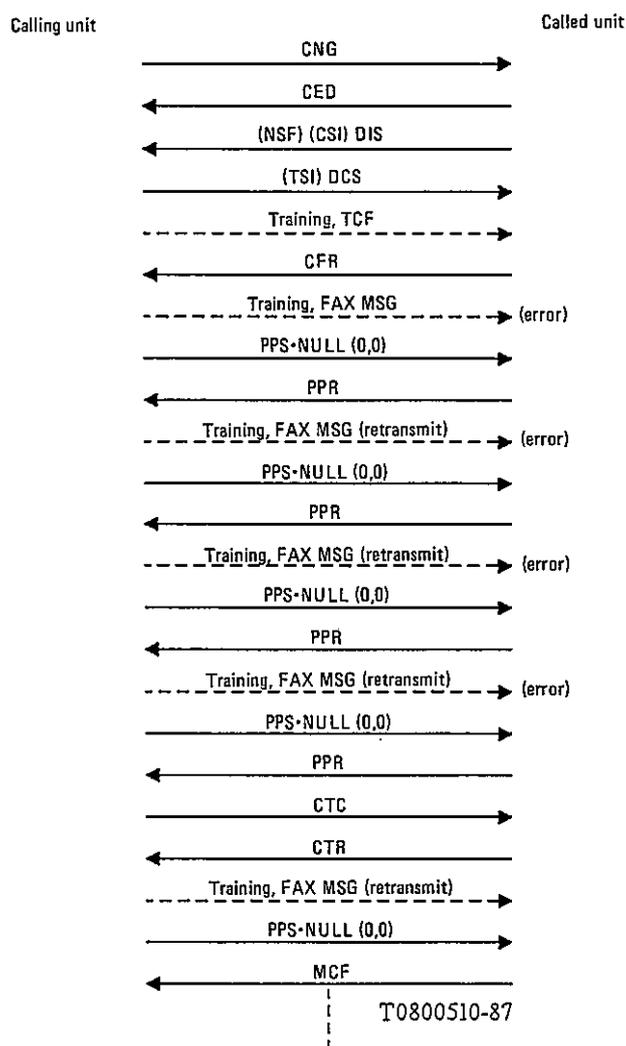
FIGURE A-26/T.30 (Sheet 13 of 13)

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.
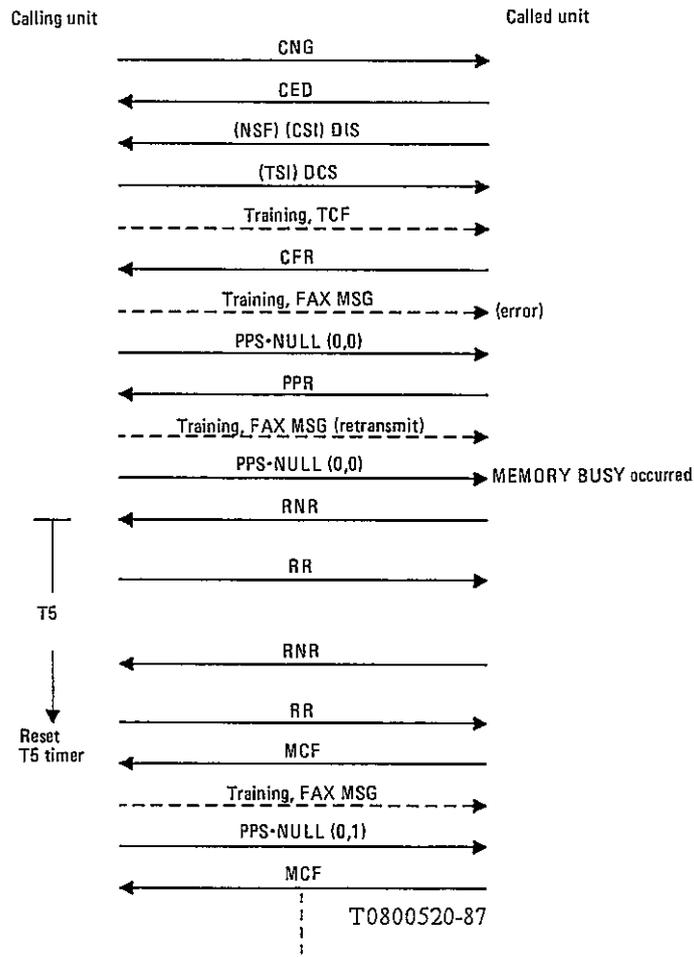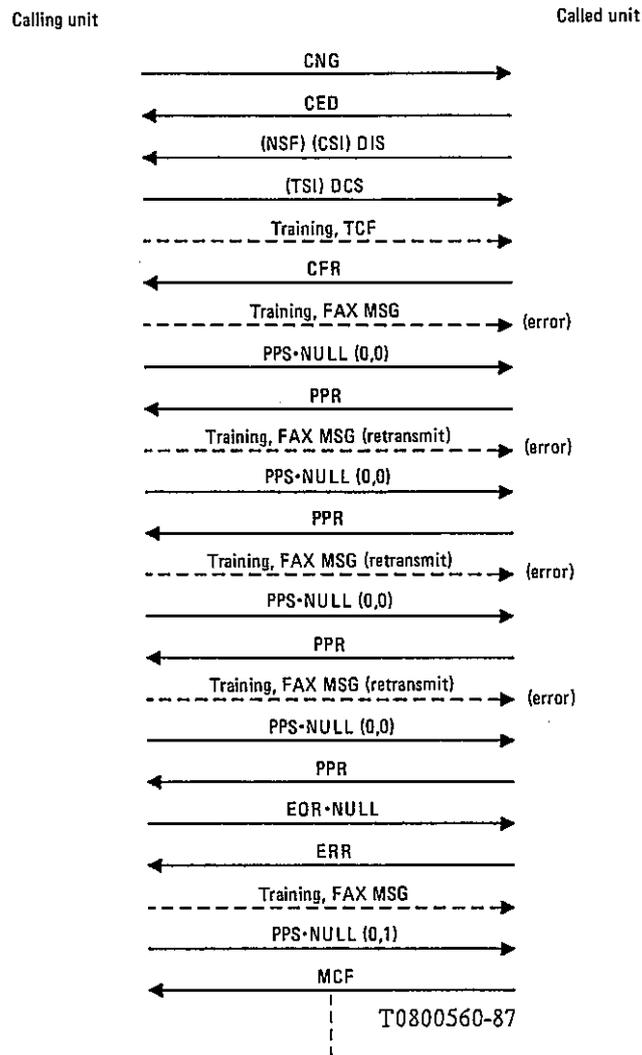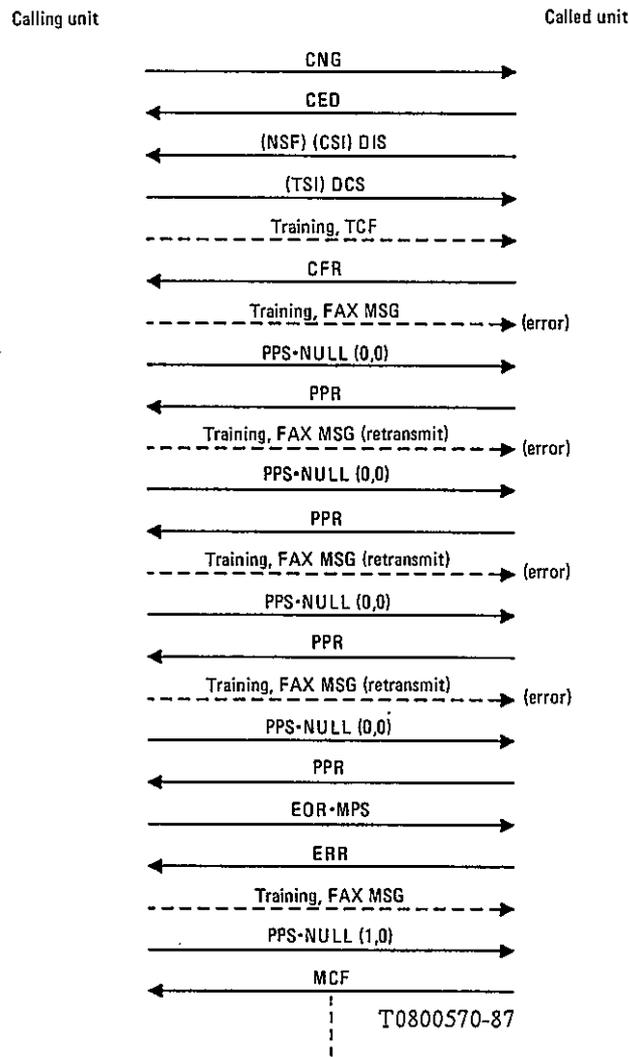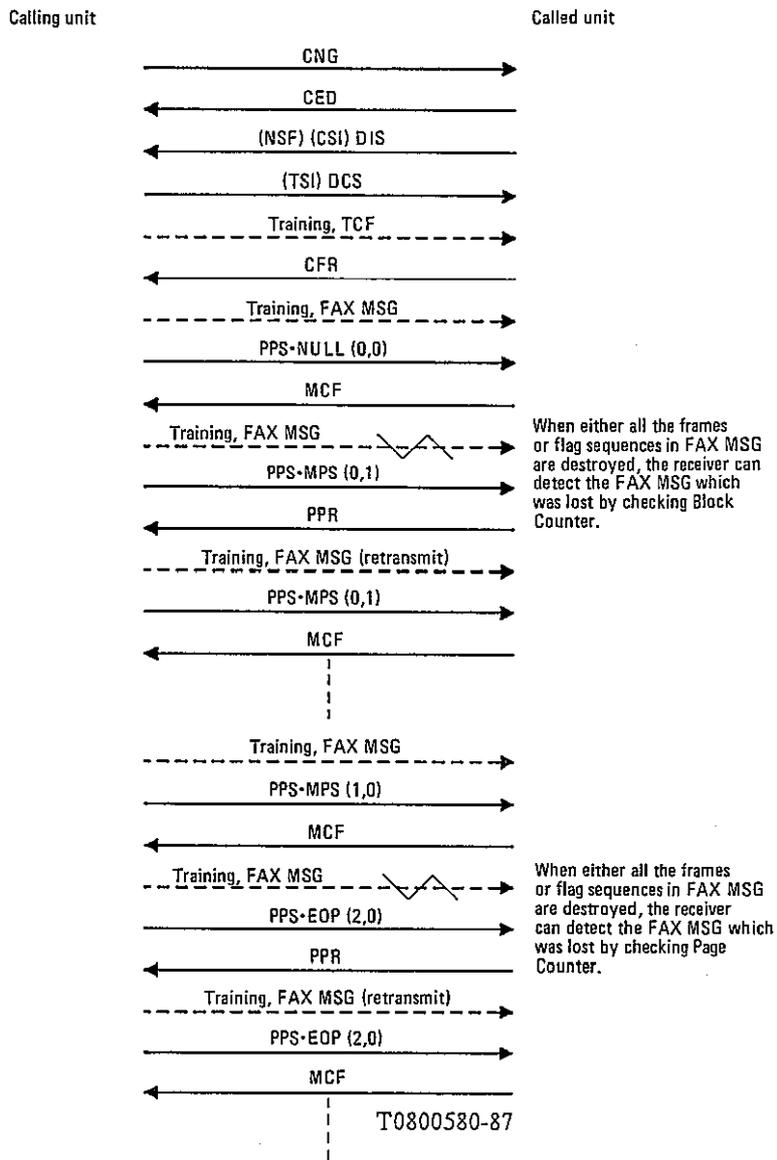
APPENDIX I

(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.
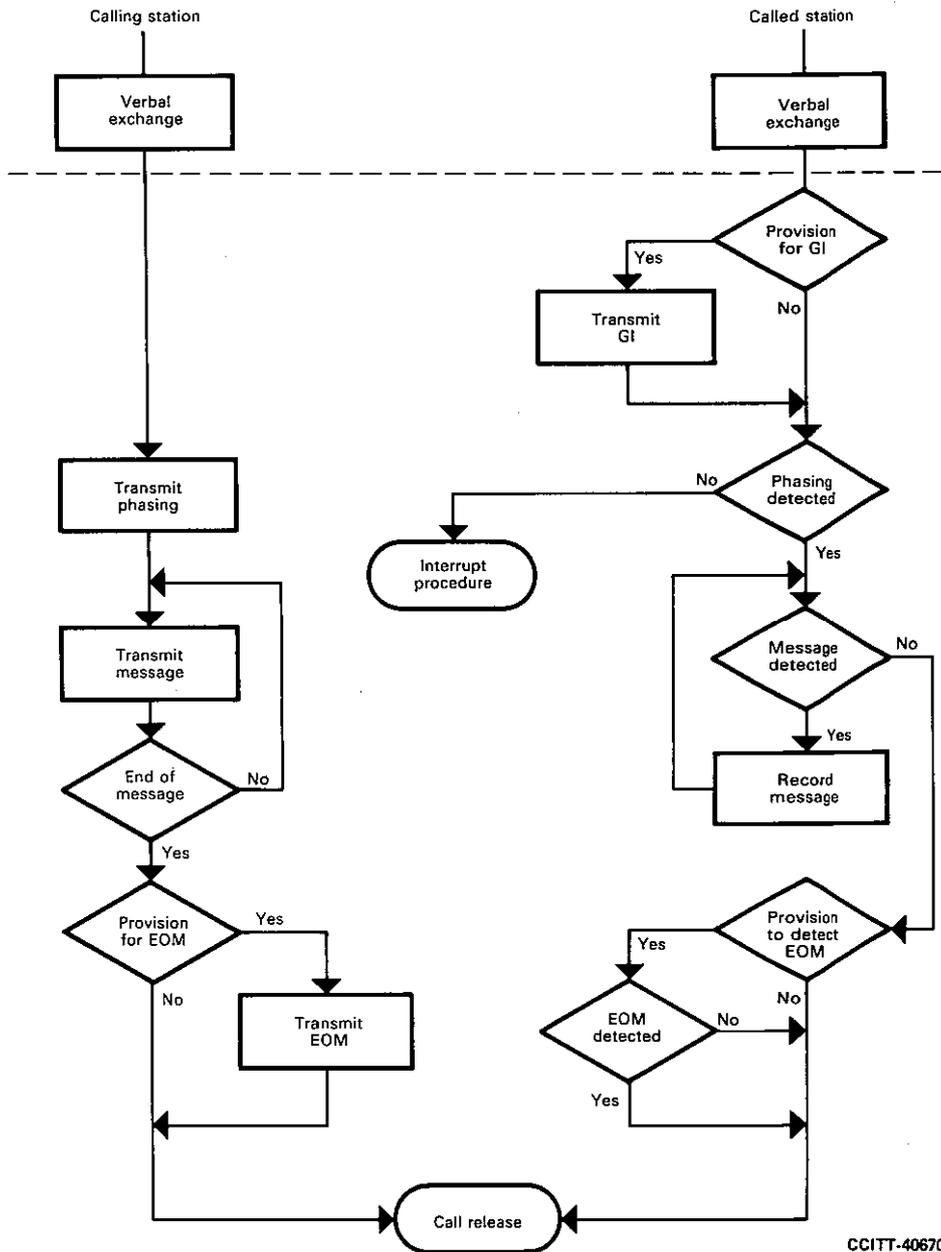

FIGURE I-1/T.30

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	5.3.6.1.6, 1)
		1100 Hz	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	4.3.1.3
		1650 or 1850 Hz	
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)

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)*

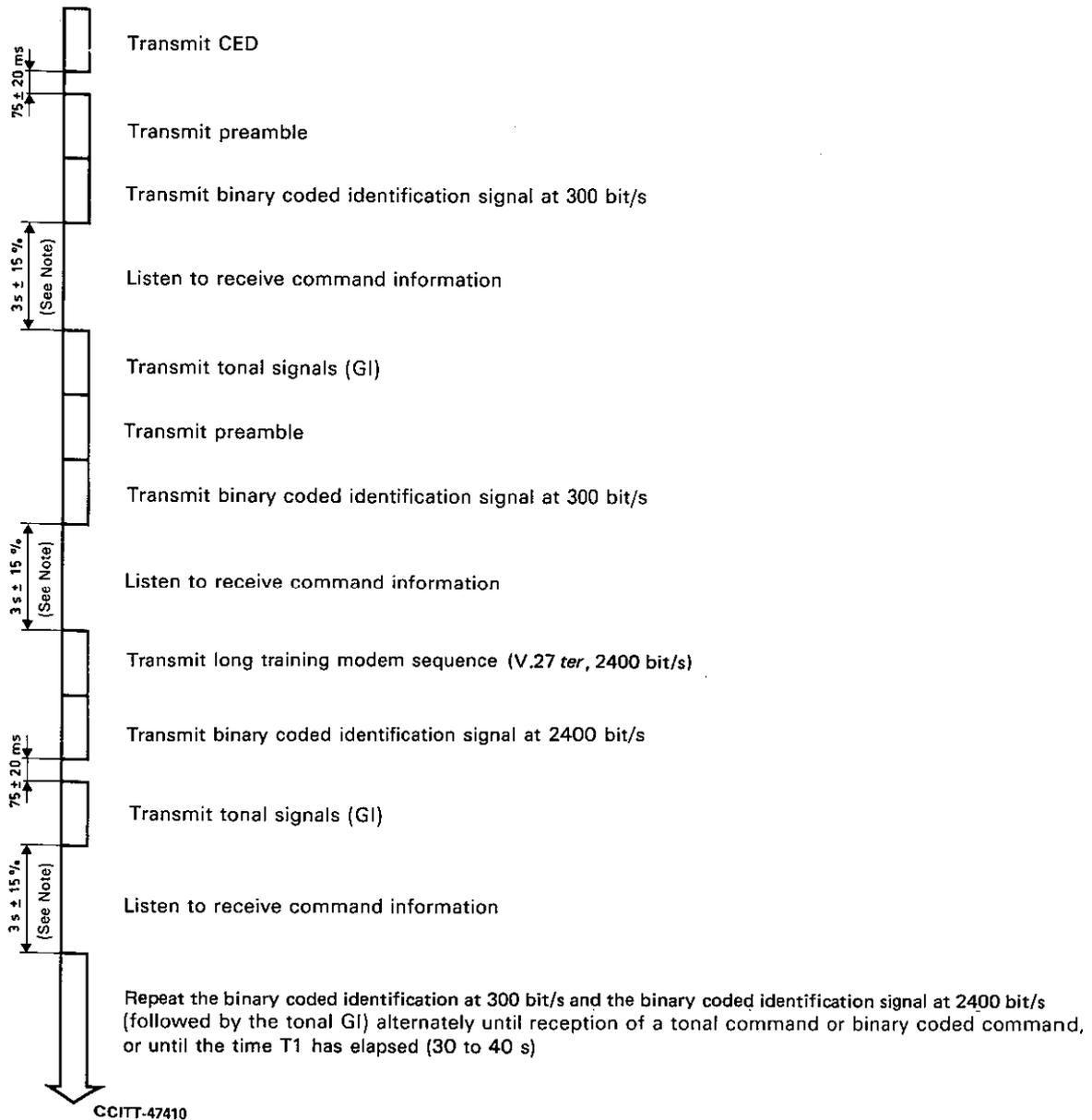| Commands	Comments	Appropriate responses
(RR)	Ask for the status of the receiver: from the transmitter to the receiver.	(RNR) (ERR) MCF PIP PIN (CRP)
DCN	Phase E command	None

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

**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.

Transmit CED

75 ± 20 ms

Transmit preamble

Transmit binary coded identification signal at 300 bit/s

3 s ± 15 % (See Note)

Listen to receive command information

Transmit tonal signals (GI)

Transmit preamble

Transmit binary coded identification signal at 300 bit/s

3 s ± 15 % (See Note)

Listen to receive command information

Transmit long training modem sequence (V.27 *ter*, 2400 bit/s)

Transmit binary coded identification signal at 2400 bit/s

75 ± 20 ms

Transmit tonal signals (GI)

3 s ± 15 % (See Note)

Listen to receive command information

Repeat the binary coded identification at 300 bit/s and the binary coded identification signal at 2400 bit/s (followed by the tonal GI) alternately until reception of a tonal command or binary coded command, or until the time T1 has elapsed (30 to 40 s)

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Note — For manual receivers using the binary coded procedure, this delay should be 4.5 s ± 15%.

FIGURE IV-1/T.30

Called station procedures (alternating method)

APPENDIX V

(to Recommendation T.30)

Signal sequence examples

The examples below are based on the flow diagrams and are for illustrative and instructional purpose only. They should not be interpreted as establishing or limiting the protocol. The exchange of the various commands and responses is limited only by the rules specified in this Recommendation. (See §§ 5.3 and 5.4).

The notations used in these diagrams are as follows:

– an arrowhead signifies the receiver of the signal;

– a solid line indicates transmission of the signal at the data rate of 300 bit/s;

– the dashed lines indicate transmission at the message data rate (Recommendations V.27 *ter*, 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.
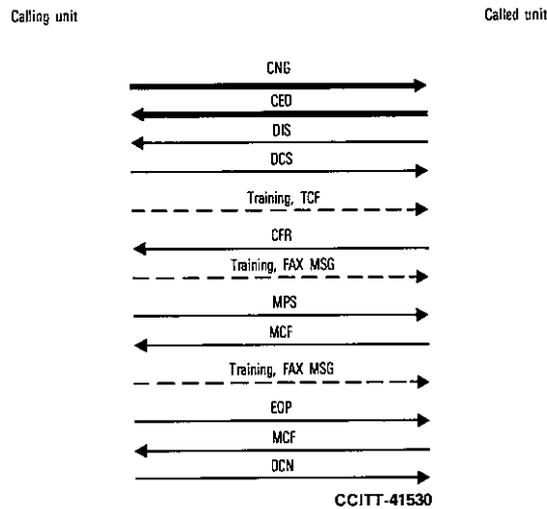

FIGURE V-1/T.30

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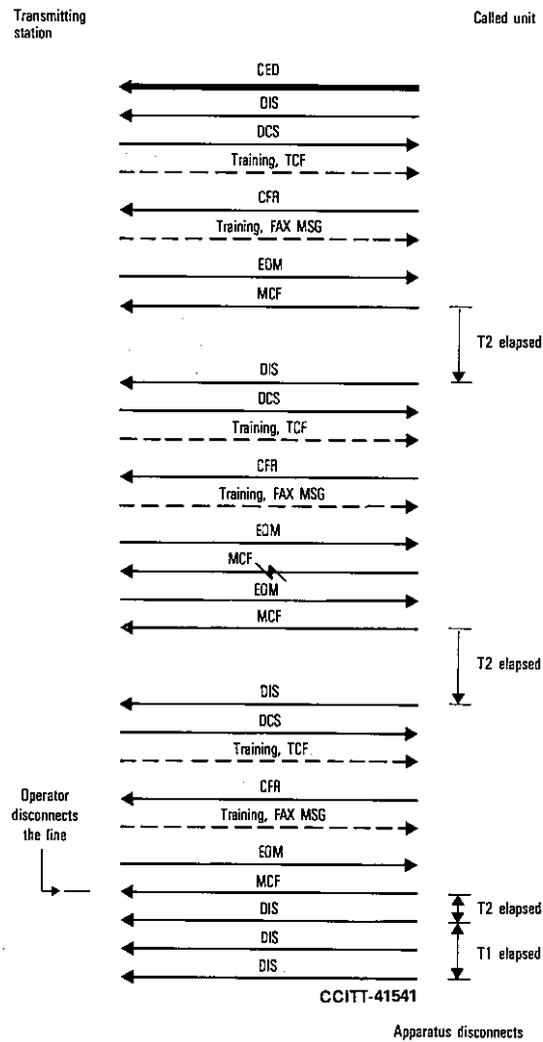
Transmitting station   Called unit

```
Transmitting                                    Called unit
station

              ◄──────── CED ────────
              ◄──────── DIS ────────
              ──────── DCS ────────►
              ─ ─ ─ Training, TCF ─ ─►
              ◄──────── CFR ────────
              ─ ─ ─ Training, FAX MSG ─ ─►
              ──────── EOM ────────►
              ◄──────── MCF ────────
                                            ┐
                                            │  T2 elapsed
                                            ↓
              ◄──────── DIS ────────
              ──────── DCS ────────►
              ─ ─ ─ Training, TCF ─ ─►
              ◄──────── CFR ────────
              ─ ─ ─ Training, FAX MSG ─ ─►
              ──────── EOM ────────►
              ◄──────── MCF ────────
              ──────── EOM ────────►
              ◄──────── MCF ────────
                                            ┐
                                            │  T2 elapsed
                                            ↓
              ◄──────── DIS ────────
              ──────── DCS ────────►
              ─ ─ ─ Training, TCF ─ ─►
              ◄──────── CFR ────────
Operator      ─ ─ ─ Training, FAX MSG ─ ─►
disconnects
the line      ──────── EOM ────────►
              ◄──────── MCF ────────
  ┐           ◄──────── DIS ────────    ↕ T2 elapsed
  └──►        ◄──────── DIS ────────
              ◄──────── DIS ────────    ↕ T1 elapsed

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                              Apparatus disconnects
```

FIGURE V-2/T.30

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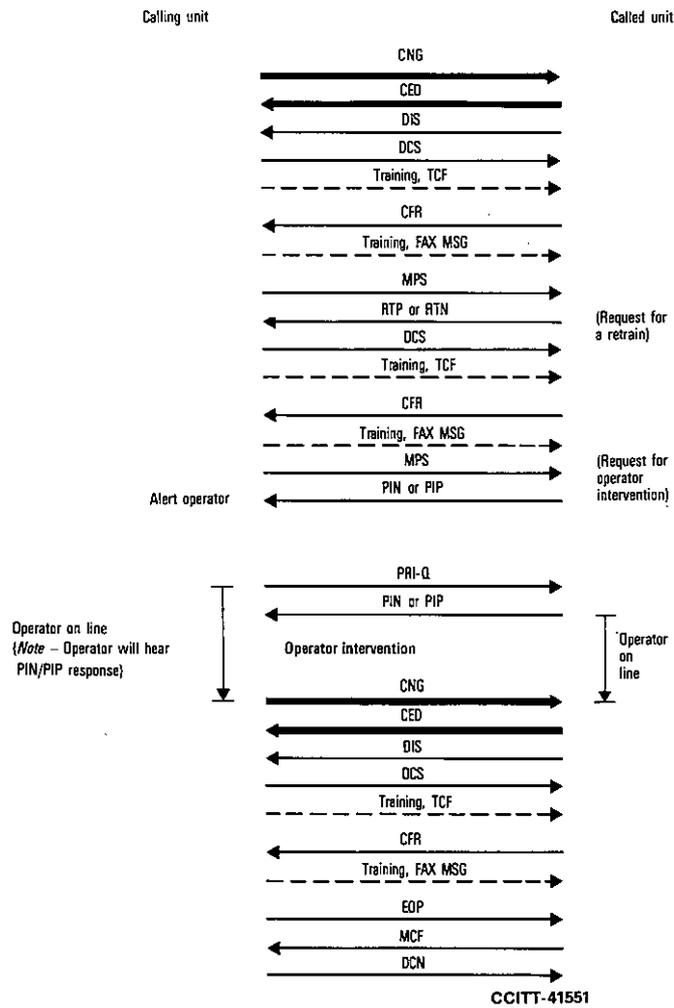an auto answer unit: example of EOM.

FIGURE V-3/T.30

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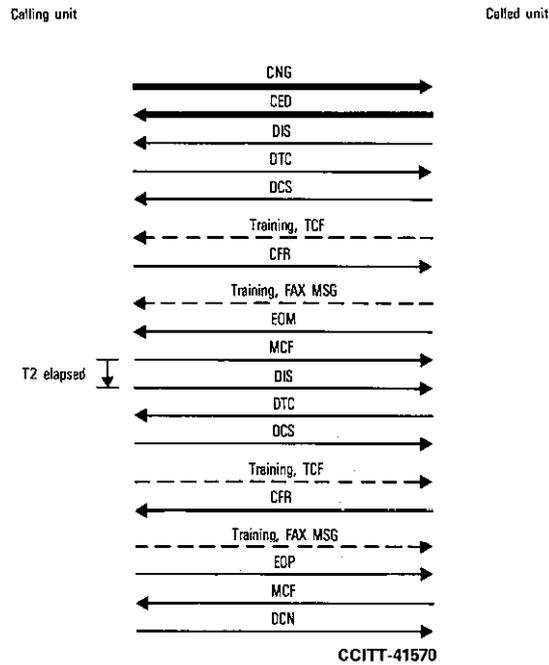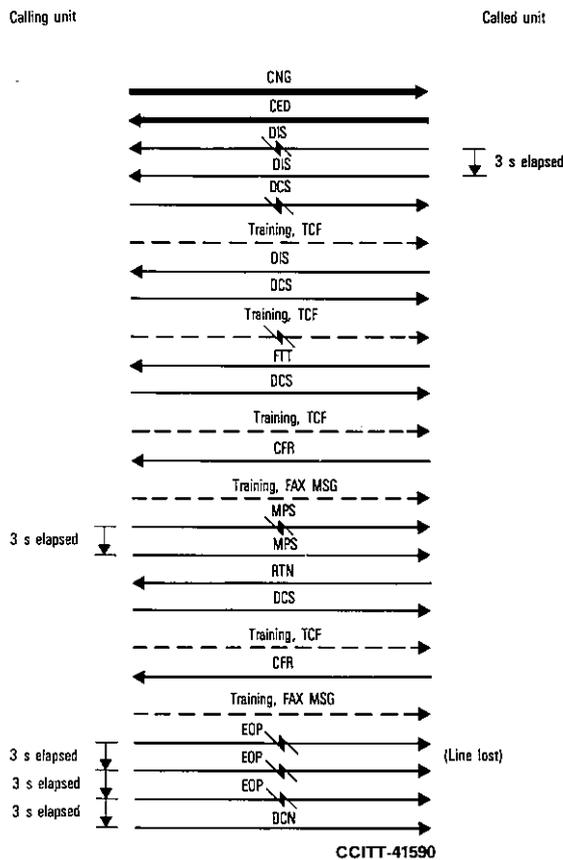auto answer unit: example of post-message responses.

FIGURE V-4/T.30

Example 4 – Manual transmitter wishing to transmit to an
auto answer unit: example of initial training failure and pro-
cedural interrups.

CNG

CED

DIS

DTC

DCS

Training, TCF

CFR

Training, FAX MSG

EOM

MCF

T2 elapsed ↧ DIS

DTC

DCS

Training, TCF

CFR

Training, FAX MSG

EOP

MCF

DCN

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FIGURE V-5/T.30

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

Calling unit   Called unit

CNG

CED

(NSF) (CSI) DIS

(NSC) (CIG) DTC

Compatible non-standard facilities?

No ↓   ↱ Yes

(TSI) DCS

Training, TCF

CFR

Training, FAX MSG

EOP

MCF

DCN

(NSS)

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Proceed with non-standard operation
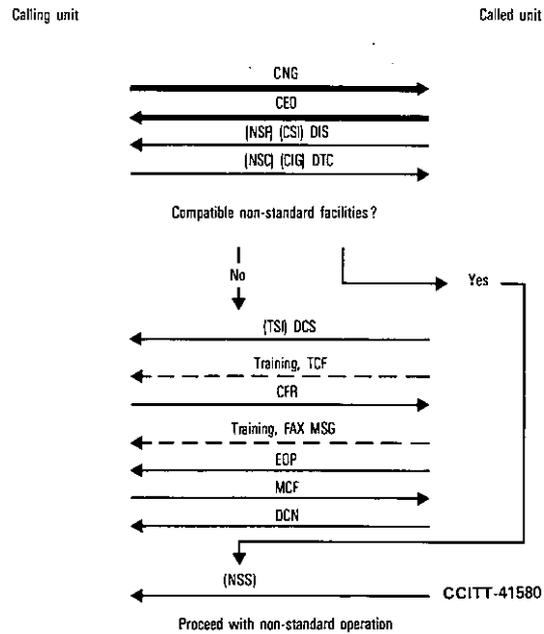
FIGURE V-6/T.30

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.
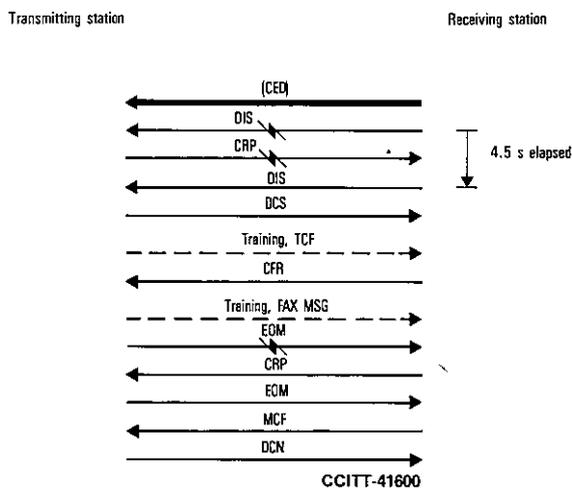
FIGURE V-8/T.30

Example 8 – Manual transmitter wishing to transmit to a manual receiver : example of error recovery technique using the optional CRP response.
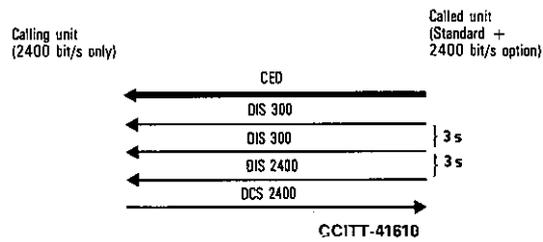
FIGURE V-9/T.30

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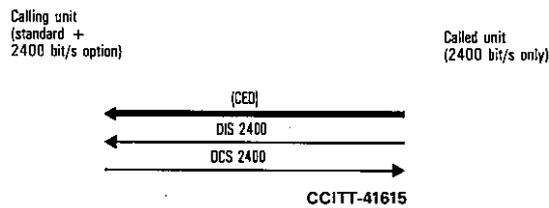

FIGURE V-10/T.30

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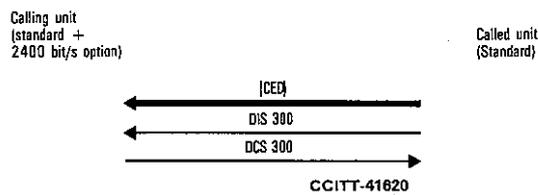

FIGURE V-11/T.30

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).
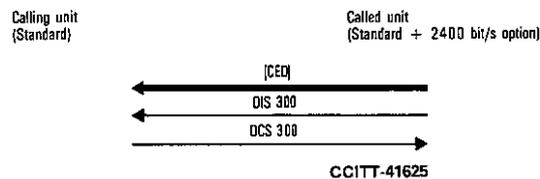

FIGURE V-12/T.30

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.

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