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**Recommendation T.30**

# PROCEDURES FOR DOCUMENT FACSIMILE TRANSMISSION IN THE GENERAL SWITCHED TELEPHONE NETWORK

*(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 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.

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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.

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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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.

**H.T. [T1.30]**
TABLE 1/T.30

| Method No.<br>Description of operating method<br>}<br>Direction of facsimile transmission<br>} | {<br><br>{<br><br>Overall designation | | |
|---|---|---|---|
| 1 | {<br><br>{<br><br>1-T<br>{<br><br>{<br><br>1-R | | |
| 2 | {<br><br>{<br><br>2-T<br>{<br><br>{<br><br>2-R | | |
| 3 | {<br><br>{<br><br>3-T<br>{<br><br>{<br><br>3-R | | |
| 4 | {<br><br>{<br><br>4-T<br>{<br><br>{<br><br>4-R | | |

*Note* — There may also be operating methods which will allow messages to be received by more than one station (multipoint connection).

**Table 1/T.30 [T1.30], p.**

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 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, p.**

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*

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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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.

**H.T. [T2.30]**

| Call event No. | Calling station | Called station |
|---|---|---|
| 1<br>Operator hears dial tone and dials desired number | { | |
| } | | |
| 2<br>Call rings and operator answers the call | Operator hears ringing tone | { |
| } | | |
| 3 | Verbal identification | Verbal identification |
| 4<br>Facsimile machine is switched to line | { | |
| } | { | |
| Facsimile machine is switched to line | | |
| } | | |
| 5<br>Begin facsimile procedure<br>(see §§ 4 and/or 5 of this Recommendation) | { | |
| } | { | |
| Begin facsimile procedure<br>(see §§ 4 and/or 5 of this Recommendation) | | |
| } | | |

**Table [T2.30], p.**

**Figure 2/T.30, p.**

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.

**H.T. [T3.30]**

| Call event No. | Calling station | Called station |
|---|---|---|
| 1<br>Operator hears dial tone and dials desired number<br>} | { | |
| 2<br>Equipment detects ring and answers the call<br>} | Operator hears ringing tone | { |
| 3<br>Optionally, a recorded verbal announcement may be transmitted<br>} | | { |
| 4<br>Operator hears CED and facsimile machine is switched to line<br>} | { | |
| 5<br>Begin facsimile procedure<br>(see §§ 4 and/or 5 of this Recommendation)<br>} | Transmit CED<br>{ | |
| Begin facsimile procedure<br>(see §§ 4 and/or 5 of this Recommendation)<br>} | { | |

**Table [T3.30], p.**

**Figure 3/T.30, p.**

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.

**H.T. [T4.30]**

| Call event No. | Calling station | Called station |
|---|---|---|
| 1<br>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.<br>*Note*<br>— An alternative procedure may be specified by Administrations.<br>} | { | |
| 2<br>Call rings and operator answers the call<br>} | | { |
| 3<br>Operator detects CNG and switches facsimile machine to line (optionally CED may be generated)<br>} | | { |
| 4<br>Begin facsimile procedure<br>(see § 5 of this Recommendation)<br>} | { | |
| Begin facsimile procedure<br>(see § 5 of this Recommendation)<br>} | { | |

**Table [T4.30], p.**

**FIGURE 4/T.30, p.**

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.

**H.T. [T5.30]**

| Call event No. | Calling station | Called station |
|---|---|---|
| 1<br>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.<br>*Note*<br>— An alternative procedure may be specified by Administrations. | { | |
| } | | |
| 2<br>Equipment detects ring and answers the call | | { |
| } | | |
| 3<br>Optionally, a recorded verbal announcement may be transmitted | | { |
| } | | |
| 4 | | Transmit CED |
| 5<br>Begin facsimile procedure<br>(see § 5 of this Recommendation) | { | |
| } | { | |
| Begin facsimile procedure<br>(see § 5 of this Recommendation) | | |
| } | | |

**Table [T5.30], p.**

**FIGURE 5/T.30, p.**

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 ± | 5% 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.

**Figure 6/T.30, p.**

**Figure 7/T.30, p.**

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, p.**

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*

**H.T. [T6.30]**

| 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 | |

**Table [T6.30], p.**

*Phase D*

**H.T. [T7.30]**

| { Single-document transmitter } | Multi-document receiver |
|---|---|
| 1. Transmit EOM | |
| | 2. Detect EOM |
| | 3. Transmit MCF |
| | { |
| 4. Prepare for next document | |
| } | |
| { | |
| 5. Detect MCF<br>Switch back to telephone<br>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 | |

**TABLEAU ETAPE D, (R´ecup.), [T7.30], p.**

**H.T. [T8.30]**

| Multi-document transmitter | Single-document receiver |
|---|---|
| 1. Transmit EOM | |
| | 2. Detect EOM |
| | 3. Transmit MCF |
| | { |
| 4. Switch back to telephone<br>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 | |

**TABLEAU ETAPE D, (R´ecup.), [T8.30], p.**

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)

**FIGURE 9/T.30, p.**

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 ± | 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)

**FIGURE 10/T.30, p.**

*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)

**FIGURE 11/T.30, p.**

*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)

**FIGURE 12/T.30, p.**

*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)

**FIGURE 13/T.30, p.**

*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)

**FIGURE 14/T.30, p.**

*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 ± | 5%; frequency ± | 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 ± | 5%; frequency ± | 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)

**FIGURE 15/T.30, p.**

*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 ± | .01% utilizing the characteristics of the Recommendation V.21 channel No. 2 modulation system. (For the tolerances, see § 3 of Recommendation V.21.) Signal generators should have a distortion not exceeding 1% and the control signal receivers should accept signals with a distortion not exceeding 40%.

*Note 1* — For Group 3 machines, the transmission of training , TCF, and all in-message signals, shall be at the data rate of the high-speed message channel.

*Note 2* — It is acknowledged that existing equipments may not conform in all aspects to this Recommendation. Other methods may be possible as long as they do not interfere with the recommended operation.

*Note 3* — Transmission of signals utilizing the modulation system of Recommendation V.21 channel No. 2 should be followed by a delay of 75 ± 20 milliseconds before the signalling, utilizing a different modulation system commences, (e.g. the delay between DCS and the Recommendation V.27 | fIter or V.29 training sequence ).

*Note 4* — The transmission of signalling utilizing the modulation systems of Recommendation V.27 | fIter or Recommendation V.29 should be followed by a delay of 75 ± 20 milliseconds before the signalling, utilizing a different modulation system, commences (e.g. the delay between RTC and MPS).

5.1 *Description*

*Phases B, C and D*

*Case 1* : Calling station wishes to transmit (see Figure 7/T.30).

**H.T. [T9.30]**

| 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). | |
| } | |

**TABLE [T9.30], p.**

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

**H.T. [T10.30]**

| 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.<br>Transmit training/phasing<br>} | |
| 9. Training/phasing | |
| 10. Transmit CFR | |
| | 11. Detect CFR |
| | 12. Transmit message |
| 13. Receive message | |
| | { |
| 14.<br>At end of message send either:<br>a)<br>EOM or<br>b)<br>EOP or<br>c)<br>MPS or<br>d)<br>PRI-Q or<br>e)<br>PPS×NULL or<br>f)<br>PPS×MPS or<br>g)<br>PPS×EOM or<br>h)<br>PPS×EOP or<br>i)<br>PPS×PRI-Q<br>} | |
| { | |
| 15.<br>Detect EOM, EOP, MPS, PRI-Q, PPS×NULL, PPS×MPS, PPS×EOM, PPS×EOP and PPS×PRI-Q<br>} | |
| { | |
| 16.<br>Transmit of the confirmation signals of postmessage responses (see § 5.3.6.1.7)<br>*Note*<br>— Binary coded signals must be preceded by a preamble (see § 5.3.1 below).<br>} | |

**Table [T10.30], p.**

5.2 *Flow diagrams* | see also Appendix IV)

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

**FIGURE MEP FIGURE EN REGARD PAGE PAIRE ET IMPAIRE, p. 26**

**FIGURE MEP FIGURE EN REGARD PAGE PAIRE ET IMPAIRE, p. 27**

**FIGURE MEP FIGURE EN REGARD PAGE PAIRE ET IMPAIRE, p. 28**

**FIGURE MEP FIGURE EN REGARD PAGE PAIRE ET IMPAIRE, p. 29**

**FIGURE CCITT 40660, p. 30**

**FIGURE CCITT 40650, p. 31**

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*

**FIGURE CCITT 36451, p.**

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

**FIGURE CCITT 36462, p.511**

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 –v’10p’ 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 –v’10p’ 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 –v’10p’ The transmitting station is ‘‘capable of retransmitting’’ a document which was not received with acceptable quality.

MSG CARRIER

REC –v’10p’ 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 –v’10p’ 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 –v’10p’ 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 –v’10p’ The HDLC frame received contained one of the listed ‘‘optional responses’’.

OPTIONAL

COMMAND –v’10p’ 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, p.**

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.

**H.T. [1T11.30]**
TABLE 2/T.30

| Bit No. | DIS/DTC | DCS |
|---|---|---|
| 1<br>Transmitter — T.2 operation | { | |
| } | | |
| 2 | Receiver — T.2 operation | Receiver — T.2 operation |
| 3 | T.2 IOC = 176 | T.2 IOC = 176 |
| 4<br>Transmitter — T.3 operation | { | |
| } | | |
| 5 | Receiver — T.3 operation | Receiver — T.3 operation |
| 6<br>Reserved for future T.3 operation features | { | |
| } | | |
| 7<br>Reserved for future T.3 operation features | { | |
| } | | |
| 8<br>Reserved for future T.3 operation features | { | |
| } | | |
| 9<br>Transmitter — T.4 operation | { | |
| } | | |
| 10 | Receiver — T.4 operation | Receiver — T.4 operation |
| 11, 12 | Data signalling rate | Data signalling rate |
| (0,0)<br>V.27 ter<br>fallback mode | { | |
| } | { | |
| 2400 bit/s V.27 ter | | |
| } | | |
| (0,1)<br>4800 bit/s V.27 ter | V.27 ter | { |
| } | | |
| (1,0) | V.29 | 9600 bit/s V.29 |
| (1,1) | V.27 ter and V.29 | 7200 bit/s V.29 |
| 13<br>Reserved for new modulation system | { | |
| } | | |
| 14<br>Reserved for new modulation system | { | |
| } | | |
| 15<br>Vertical resolution = 7.7 line/mm | { | |
| } | { | |
| Vertical resolution = 7.7 line/mm | | |
| } | | |
| 16<br>Two-dimensional coding capability | { | |
| } | Two-dimensional coding | |
| 17, 18 | Recording width capabilities | Recording width |
| (0,0)<br>1728 picture elements along scan line length of 215 mm ± 1 % | { | |
| } | { | |
| 1728 picture elements along scan line length of 215 mm ± 1 % | | |
| } | | |
| (0,1)<br>1728 picture elements along scan line length of 215 mm ± 1 % and | { | |

| | | |
|---|---|---|
| } | { | |
| 2432 picture elements along scan line length of 303 mm ± \| % | | |
| } | | |
| | { | |
| 2048 picture elements along scan line length of 255 mm ± \| % and | | |
| } | | |
| | { | |
| 2432 picture elements along scan line length of 303 mm ± \| % | | |
| } | | |
| (1,0) | { | |
| 1728 picture elements along scan line length of 215 mm ± \| % and | | |
| } | { | |
| 2048 picture elements along scan line length of 255 mm ± \| % | | |
| } | | |
| | { | |
| 2048 picture elements along scan line length of 255 mm ± \| % | | |
| } | | |
| (1,1) | Invalid (see Note 7) | Invalid |
| 19, 20<br>Maximum recording length capability | { | |
| } | Maximum recording length | |
| (0,0) | A4 (297 mm) | A4 (297 mm) |
| (0,1) | Unlimited | Unlimited |
| (1,0) | A4 (297 mm) and B4 (364 mm) | B4 (364 mm) |
| (1,1) | Invalid | Invalid |

**Tableau 2/T.30 [1T11.30], p. 35**

**H.T. [2T11.30]**
TABLE 2/T.30 *(cont.)*

| Bit No. | DIS/DTC | DCS |
|---|---|---|
| 21, 22, 23<br>Minimum scan line time capability at the receiver | { | |
| }<br>(0,0,0)<br>20 ms at 3.85 l/mm: T<br>7.7 T<br>3.85 | Minimum scan line time<br>{ | |
| }<br>(0,0,1)<br>40 ms at 3.85 l/mm: T<br>7.7 T<br>3.85 | 20 ms<br>{ | |
| }<br>(0,1,0)<br>10 ms at 3.85 l/mm: T<br>7.7 T<br>3.85 | 40 ms<br>{ | |
| }<br>(1,0,0)<br>5 ms at 3.85 l/mm: T<br>7.7 T<br>3.85 | 10 ms<br>{ | |
| }<br>(0,1,1)<br>10 ms at 3.85 l/mm: T<br>= 1/2 T<br>3.85 | 5 ms<br>{ | |
| }<br>(1,1,0)<br>20 ms at 3.85 l/mm: T<br>= 1/2 T<br>3.85 | {<br>7.7 | |
| }<br>(1,0,1)<br>40 ms at 3.85 l/mm: T<br>= 1/2 T<br>3.85 | {<br>7.7 | |
| }<br>(1,1,1)<br>0 ms at 3.85 l/mm: T<br>7.7 T<br>3.85 | {<br>7.7 | |
| } | 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<br>Frame size 0 = 256 octets<br>**Frame size**<br>1 = 64<br>octets<br>} | Set to ‘‘0’’ | { |
| 29 | Error limiting mode | Error limiting mode |
| 30<br>Reserved for G4 capability on PSTN<br>}<br>Reserved for G4 capability on PSTN<br>} | {<br><br>{ | |
| 31 | Unassigned | |
| 32 | Extend field | Extend field |
| 33<br>(0)<br>Recording width indicated by bits 17, 18<br>}<br>(1)<br>Recording width indicated by this field bit information<br>} | Validity of bits 17, 18<br>Bits 17, 18 are valid<br><br><br>Bits 17, 18 are invalid | Recording width<br>{<br><br><br>{ |
| 34<br>Recording width capability 1216 picture elements along scan line length of 151 mm ± | %<br>}<br>Middle 1216 elements of 1728 picture elements<br>} | {<br><br><br>{ | |
| 35<br>Recording width capability 864 picture elements along scan line length of 107 mm ± | %<br>}<br>Middle 864 elements of 1728 picture elements<br>} | {<br><br><br>{ | |
| 36<br>Recording width capability 1728 picture elements along scan line length of 151 mm ± | %<br>} | {<br><br><br>Invalid | |
| 37<br>Recording width capability 1728 picture elements along scan line length of 107 mm ± | %<br>} | {<br><br><br>Invalid | |
| 38<br>Reserved for future recording width capability<br>} | { | |
| 39<br>Reserved for future recording width capability<br>} | { | |
| 40 | Extend field | Extend field |

**Tableau 2/T.30 [2T11.30], p. 36**

**H.T. [3T11.30]**

*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 | fIter 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 $$id7.7 $$if and T $$id3.85 $$if 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 $$id7.7 $$if = 1/2 T $$id3.85 $$if 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.

**H.T. [T12.30]**

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

**Tableau 2/T.30 [3T11.30], p. 37**

**H.T. [T12.30]**

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

**Tableau 3/T.30 [T12.30], p. 38**

5.3.6.2.5 *CIG coding format*

The facsimile information field of the CIG signal shall be the international telephone number including the ‘‘+’’ character, telephone country code, area code and subscriber number. This field shall consist of 20 numeric digits coded as shown in Table 3/T.30. The least significant bit of the least significant digit shall be the first bit transmitted.

5.3.6.2.6 *TSI coding format*

The facsimile information field of the TSI signal shall be the international telephone number including the ‘‘+’’ character, telephone country code, area code and subscriber number. This field shall consist of 20 numeric digits coded as shown in Table 3/T.30. The least significant bit of the least significant digit shall be the first bit transmitted.

5.3.6.2.7 *Non-standard capabilities (NSF, NSC, NSS)*

When a non-standard capabilities FCF is utilized, it must be immediately followed by a FIF. This information field will consist of at least two octets. The first octet will contain a CCITT country code (see Note

below). Additional information could then be transmitted within the FIF field. This information is not specified and can be used to describe non-standard features, etc.

*Note* — The procedure for obtaining a registered CCITT code is given in Recommendation T.35.

5.3.7 *Frame checking sequences (FCS)*

The FCS shall be a 16 bit sequence. It shall be the 1s complement of the sum (modulo 2) of:

1) the remainder of $x^k(x^{15} + x^{14} + x^{13} + \ldots + x^2 + x + 1)$ divided (modulo 2) by the generator polynominal $x^{16} + x^{12} + x^5 + 1$, where $k$ is the number of bits in the frame existing between, but not including, the final bit of the opening flag and the first bit of the FCS, excluding bits inserted for transparency, and

2) the remainder after multiplication by $x^{16}$ and then division (modulo 2) by the generator polynominal $x^{16} + x^{12} + x^5 + 1$ of the content of the frame, existing between, but not including, the final bit of the opening flag and the first bit of the FCS, excluding bits inserted for transparency.

As a typical implementation, at the transmitter, the initial remainder of the division is preset to all 1s and is then modified by division by the generator polynominal (as described above) on the address, control and information fields; the 1s complement of the resulting remainder is transmitted as the 16-bit FCS sequence.

At the receiver, the initial remainder is preset to all 1s and the serial incoming protected bits and the FCS when divided by the generator polynominal will result in a remainder of 0001110100001111 ($x^{15}$ through $x^0$, respectively) in the absence of transmission errors.

The FCS shall be transmitted to the line commencing with the coefficient of the highest term.

5.4 *Binary coded signalling implementation requirements*

5.4.1 *Commands and responses*

Whereas § 5.2 defines a flow diagram to give an accurate example of the typical use of the binary coded procedures, these procedures are defined specifically in terms of the actions that occur on receipt of commands by the receiving station (see § 5.3).

A response must be sent, and only sent, upon detecting a valid command. Upon receiving a valid response, a new command must be issued within 3 seconds.

5.4.1.1 *Optional command and response frames*

If optional frames (e.g., NSF or NSF, CSI) are sent they must directly precede any mandatory command/response frame which is sent. In this case, bit 5 of the control field is 0 for the optional frames and is 1 only for the final frame (refer to § 5.3.5).

5.4.1.2 *Options within standard frames*

Certain optional portions of standard signals (e.g. the fifth bit of the PRI-Q signal) need not be utilized at either the transmitting unit or the receiving unit. However, the use of these optional portions of standard signals shall not cause erroneous operation.

5.4.2 *Line control procedures and error recovery*

Once the transmitting and receiving stations have been identified, all commands are initiated by the transmitting station and solicit an appropriate response from the receiving station (see Appendix III). Furthermore, the transmission of a response is permitted only when solicited by a valid command. If the transmitting station does not receive an appropriate valid response within 3 s ± 15%, it will repeat the command. After three unsuccessful attempts, the transmitting station will send the disconnect (DCN) command and terminate the call. A command or a response is not valid and should be discarded if:

i) any of the frames, optional or mandatory, have an FCS error;

ii) any single frame exceeds 3 s ± 15% (see Note below);

iii) the final frame does not have the control bit 5 set to a binary 1;

iv) the final frame is not a recognized standard command/response frame (see Appendix III).

The delay of 3 s before retransmission of the command can be shortened by the use of the optional command repeat (CRP) response. If the transmitting station receives a CRP response, it may immediately retransmit the most recent command.

During the initial pre-message procedure, neither station has a defined role (i.e., transmitter or receiver). Therefore, the station transmitting the DIS command will continue to retransmit it until, according to the procedures, each station has identified itself and the normal line control procedures may be followed.

*Note 1* — The implications of a maximum frame length of 3 s ± 15% are:

a) no transmitted frame should exceed 2.55 s (i.e., 3 s — 15%);

b) any frame which is received and is detected as greater than 3.45 s shall be discarded (i.e., 3 s + 15%);

c) a frame received which is between 2.55 and 3.45 s duration may be discarded.

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

5.4.3 *Timing considerations*

5.4.3.1 *Time-outs*

Time-out T1 defines the amount of time two stations will continue to attempt to identify each other. T1 is 35 ± 5 seconds, begins upon entering phase B, and is reset upon detecting a valid signal or when T1 times out.

Time-out T2 makes use of the tight control between commands and responses to detect the loss of command/response synchronization. T2 is 6 ± 1 seconds and begins when initiating a command search, (e.g. the 1st entrance into the ‘‘command received’’ subroutine, reference flow diagram in § 5.2). T2 is reset when an HDLC flag is received or when T2 times out.

Time-out T3 defines the amount of time a station will attempt to alert the local operator in response to a procedural interrupt. Failing to achieve operator intervention, the station will discontinue this attempt and shall issue other commands or responses. T3 is 10 ± 5 seconds, begins on the

first detection of a procedural interrupt command/response signal (i.e., PIN/PIP or PRI-Q), and is reset when T3 times out or when the operator initiates a line request.

Time-out T5 is defined for the optional T.4 error correction mode. Time-out T5 defines the amount of time waiting for clearance of the busy condition of the receiving station. T5 is 60 ± 5 seconds and begins on the first detection of the RNR response. T5 is reset when T5 times out or the MCF or PIP response is received or when the ERR or PIN response is received in the flow control

process after transmitting the EOR command. If the timer T5 has expired, the DCN command is transmitted for call release.