

**Recommendation T/CD 05-03 E (Innsbruck 1981)
concerning the specification of a CCITT Group 3 document facsimile terminal**

Recommendation proposed by Working Group T/WG 10 "Data Communications" (CD)

Text of the Recommendation adopted by the "Telecommunications" Commission:

"The Conference of European Post and Telecommunications Administrations,

Considering

- that CCITT Recommendation T.4 describes the standardization of Group 3 facsimile apparatus for document transmission;
- that CCITT Recommendation T.30 describes the procedures for document facsimile transmission in the General switched telephone network;
- that GT/CD has studied the harmonization of facsimile equipment under the auspices of Question CD7;
- that the procedures for certifying private Data terminal equipment (DTE) and Data circuit terminating equipment (DCE) for attachment to the Administrations' installations are outlined in Recommendation T/SF 13.

Recommends

that the attached specification for a CCITT Group 3 document facsimile machine as contained in Annex to this Recommendation should apply when such equipment is being considered for purchase by a CEPT Administration for use with its Telefax service."

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1. **GENERAL**

- 1.1. This specification details the performance and facility requirements to be provided by a document facsimile machine using digital redundancy reduction techniques which is capable of transmitting and receiving an ISO A4 size document on the General switched network (GSTN). The technical facilities and the procedural requirements have been selected from within the framework of CCITT Recommendations T.4 and T.30. The document facsimile machine is referred to throughout this specification as the "facsimile machine".
- 1.2. The specification covers, amongst others, the following aspects of the facsimile machine:
- the mechanical construction;
 - the technical facilities;
 - the operational requirements related to the construction and technical facilities;
 - the performance of the scanning, transmission, reception and document reproduction facilities;
 - the procedural requirements to cover both manual and automatic reception of single and multi-page documents.
- 1.3. The working life of the facsimile machine when correctly maintained shall be at least 5 years and the requirements of this specification shall be met over the whole of this period. Detailed requirements will be specified by the appropriate Administration.

2. **CONSTRUCTION**

2.1. **General**

The particular method of construction shall be determined by the manufacturer but shall conform to good engineering practice. Any special construction and stability requirements will be defined by the appropriate Administration.

2.2. **Dimensions**

The facsimile machine shall have dimensions suitable for use in a normal office environment and preferably shall be housed in a single enclosure and shall be readily transportable.

It is preferred that the facsimile machine shall be suitable for desk top mounting, but alternatively, it may be designed to be free standing.

2.3. **Weight**

The weight of the facsimile machine suitable for desk top mounting preferably should not exceed 25 kg. For a free standing machine, the weight preferably should not exceed 50 kg.

When appropriate, hand holds shall be provided located with respect to the centre of gravity of the facsimile machine so as to facilitate easy and safe lifting.

2.4. **Test points**

Adequate test points shall be provided to facilitate installation and maintenance testing e.g. at the input and output of the modem.

2.5. Component designation

All components shall be clearly identifiable from their circuit diagram. The designation may be included on the component (where sufficient space exists) or on the facsimile machine e.g. printed wiring boards. Wherever possible, components shall not obscure their designation.

2.6. Accessibility

All components and wiring shall be readily accessible for maintenance purposes.

3. TRANSMITTER

3.1. Document dimensions

The facsimile machine shall be capable of accepting and scanning documents with dimensions up to a minimum of 212 mm × 299 mm × 0.15 mm. It is preferred that the facsimile machine shall be capable of accepting and scanning documents whose thickness is greater than 0.15 mm.

It is preferred also that the facsimile machine shall be capable of accepting and scanning documents of length greater than 299 mm.

3.2. Scanning track

The message area should be scanned in the same direction in the transmitter and receiver. Viewing the message area in a vertical plane, the picture elements should be processed as if the scanning direction was from left to right with subsequent scans adjacent and below the previous scan.

The reference position of the document shall be such that the right hand edge lies between picture elements 1703 and 1728 of each scanned line.

3.2.1. The scanned line length shall be 215 mm \pm 1%.

3.2.2. There shall be 1728 picture elements along the scanned line.

3.2.3. The scanning density shall be nominally 3.85 lines per mm \pm 1%. It is preferred that an additional scanning density of 7.7 lines/mm \pm 1% should be provided. If scanning densities of 3.85 lines/mm and 7.7 lines/mm are both provided, the selection of the one used for message transmission shall be controlled by the operator at the transmitting station.

3.2.4. The document shall be positioned such that the first line to be coded and transmitted lies between 0 mm and 4 mm down the document from the top edge.

3.2.5. The minimum transmission times of the total scanning line shall be 20 ms and 40 ms.

3.2.6. The facsimile machine shall meet the full performance requirements as detailed in paragraph 5.8. when scanning documents which have been handwritten, drawn, typed or printed in black on material which is white. It is preferred that the facsimile machine shall meet the full performance requirements as detailed in paragraph 5.8. when scanning documents which have been handwritten, drawn, typed or printed in colours other than black on material which is white, off-white, buff or a pastel shade.

3.2.7. The performance of the facsimile machine shall not be adversely affected by the surface finish of the document being scanned.

3.2.8. *Optical sensitivity*

For black and white documents, the full dynamic range shall be achieved. A black and white document is defined as one which has a relative visual density of at least 1 between the background and the inscription. Provisionally, the method of measurement of visual density shall be as defined in ISO/DP 6273.2.

The scanning optics shall present shades of grey to the encoder as potentials representing black or white. Additional facilities may be included to simulate grey shades, these shall be under the control of the operator.

3.3. Document loading

Facilities shall be provided to enable the document to be transmitted to be correctly loaded into the scanning area. The document may be loaded into the scanning area by one of the following methods:

3.3.1. Feeding the document into a slot.

3.3.2. Laying the document on a plate or tray.

3.3.3. Placing the document in a stack feeder.

3.3.4. Alternative methods to those detailed above may be provided subject to the approval of the appropriate Administration.

3.4. **Document unloading**

- 3.4.1. The operator shall be able to retrieve the document easily after it has been scanned and in the event of mains failure.
- 3.4.2. If the loading or unloading of a document is automatic, a method of premature removal shall be provided.
- 3.4.3. The document to be transmitted shall not be damaged or smeared by the action of loading into or removal from the scanning area or by the scanning process.

4. **LINE SIGNAL REQUIREMENTS**

4.1. **Modulation system**

- 4.1.1. The modulation system shall be as detailed in CCITT Recommendation T.4.
- 4.1.2. *Spectral components transmitted to line*
The permitted line signal spectrum characteristics will be detailed by the appropriate Administration.
- 4.1.3. Facilities shall be provided to enable the output level of the facsimile machine to be adjusted. These facilities shall not be accessible to the operator. The range of adjustment will be detailed by the appropriate Administration.

4.2. **Coding scheme**

The one dimensional run length encoding scheme as detailed in CCITT Recommendation T.4 shall be provided. The two dimensional coding scheme detailed in Recommendation T.4 may be provided also.
Note: The use of 2 dimensional coding may be restricted by certain Administrations.

5. **RECEIVER**

- 5.1. The decoded picture elements shall be recorded as if the scanning direction was from left to right with subsequent recording lines adjacent to and below the previous line. The direction of recording refers to viewing the received copy in the vertical plane.
 - 5.1.1. The density of picture elements along the recorded line shall correspond to 1728 picture elements along a line length of 215 mm $\pm 1\%$.
 - 5.1.2. The width of the recording medium shall be 210 ± 2 mm.
 - 5.1.3. The position of the recording medium shall be such that the right hand edge lies between Picture elements 1703 and 1728 of each recorded line. The effective minimum recorded line length shall be 208 mm and shall include Picture element 1703. It is preferred that the effective minimum recorded line length shall be equal to the width of the recording medium.
 - 5.1.4. The recorded density shall be 3.85 lines per mm $\pm 1\%$. It is preferred that an additional recording density of 7.7 lines/mm $\pm 1\%$ should be provided.
 - 5.1.5. In the case of facsimile machines limited to A4 length received copies, the position of the recording medium shall be such that the first line to be recorded lies between 0 mm and 4 mm down the received copy from the top edge.
In the case of facsimile machines not limited to A4 length received copies, the complete message shall be reproduced irrespective of length.
 - 5.1.6. A receiving time of 20 ms for a total coded scan line at a recording density of 3.85 lines/mm shall be provided.

5.2. **Loading**

If the recording medium is usable on one side only, facilities shall be provided to ensure that the medium is loaded in the correct orientation.
Facilities shall be provided such that the medium on which the received copy is to be produced may be correctly loaded into the facsimile machine and automatically fed to the recording position by one of the following methods:

- 5.2.1. *Feeding from a continuous roll or stack feeder*
The loading operation shall be capable of being carried out by unskilled personnel using the minimum of controls.
- 5.2.2. Alternative arrangements to those detailed above may be provided, subject to the approval of the appropriate Administration.

5.3. **Received copy—Unloading**

Upon completion of the reception procedure, the received copy shall be automatically removed from the recording position.

Alternative methods may be provided, subject to the approval of the appropriate Administration.

The operator shall be able to retrieve the received copy easily after it has been removed from the recording position.

5.4. **Methods of recording**

Various methods of recording are acceptable, provided that the method used conforms to the following requirements:

- 5.4.1. The emission of fumes or particles that are toxic or could cause irritation or injury to operating and/or maintenance personnel is not permitted.
- 5.4.2. The generation of any form of residue, etc., the accumulation of which would cause misoperation of the equipment is not permitted unless appropriate facilities are provided to enable the residue to be removed from the facsimile machine.
- 5.4.3. The recording medium and the method of recording shall not utilise chemicals or materials which may be liable to cause deterioration of other documents with which the received copy may be filed or of the received copy itself. The recording medium shall not give rise to harmful effects on operating and/or maintenance personnel.

5.5. **Received copy marking**

- 5.5.1. The reception of a signal corresponding to “black” shall result in a dense and consistent marking of the recording medium, preferably black. The density of “black” shall be at least 0.6 relative to the recording medium.
 - 5.5.2. The reception of a signal corresponding to “white” shall result in no marking of the recording medium.
 - 5.5.3. The recording medium shall be white or a shade that will not inhibit or reduce legibility.
 - 5.5.4. The received copy marking shall be resistant to fading or damage by heat, light or abrasions experienced in normal office use.
 - 5.5.5. The recording of 8 lines/mm bar patterns shall have a visible modulation with a contrast of at least 30% (see ISO/DP 6273.2).
- 5.6. The received copy shall not be damaged or smeared by the action of removal from the recording position or by the recording process.

5.7. **Alarm facilities**

- 5.7.1. Facilities shall be provided to indicate to the operator when consumables need or will shortly need replenishment e.g. toner, ink.
- 5.7.2. Facilities shall also be provided to indicate to the operator when less than approximately 10% of the recording medium remains.

5.8. **Performance**

- 5.8.1. The performance requirements of the facsimile machine will be defined by the appropriate Administration. However, manufacturers should note that satisfactory performance is required over the large majority of national and international general switched telephone network connexions.
The performance of the facsimile machine will be evaluated using the CCITT Facsimile Test Charts detailed in CCITT Recommendation T.21.
The scanning and recording systems of the facsimile machine shall be such that the recorded copy of zone 3.6. of the CCITT Characterisation Test Chart shall contain distinct alternate lines at least for certain parts of this zone.
- 5.8.2. The receiver shall satisfy the specified performance requirements when the received carrier signal is subjected to a frequency drift of ± 7 Hz from the nominal value.
- 5.8.3. The performance requirements shall be met in full when the facsimile receiver is receiving from a transmitter which conforms to the requirements of this specification.

- 5.8.4. The receiver shall satisfy the specified performance requirements when the received signal is within the range -5 to -43 dBm. Administrations may specify that the performance requirements shall be met when the received signal level is below -43 dBm. No control of receiver sensitivity shall be provided for operator use.
- 5.8.5. The receiver shall provide the recording mechanism with the decoded run length signal, each picture element being either "black" or "white".

6. CONTROL PROCEDURES FOR MESSAGE TRANSMISSION AND RECEPTION

- 6.1. The facsimile machine shall follow the binary coded control procedures detailed in CCITT Recommendation T.30 and also those detailed in paragraphs 6.6. and 6.7. of this specification.
- 6.2. The data signalling rate for the binary coded control procedures shall be 300 bit/s as defined in CCITT Recommendation T.30.
- 6.3. For exact details of the formats of the signals specified in this section, please refer to CCITT Recommendation T.30.
- 6.4. The output levels of the signals detailed in this section shall not be higher than that set for the carrier signal.
- 6.5. If several compatible scanning line times and data signalling rates are available at the transmitter and the receiver, the shortest scan line time and the highest data signalling rate that can be supported by the telephone line shall be selected automatically by the facsimile machine.
If the operator has selected an unavailable scanning line density, the facsimile machine shall automatically revert to the standard scanning line density and transmit the document whilst operating an audible and visual alarm. The alarms shall operate for a period of 10-15 seconds or less if reset by the operator and the visual alarm shall indicate clearly that the document is being transmitted at a different scanning line density to that which was selected.
- 6.6. Facilities shall be provided to enable the operator to transmit the Disconnect (DCN) signal, the facsimile machine shall then follow the interrupt procedure detailed in paragraph 6.9.1.2.
- 6.7. **Calling station**
- 6.7.1. After switching from the telephone to the facsimile mode (see paragraph 8.3.) and unless the Calling tone signal (CNG) is transmitted, the facsimile machine shall emit no signal above -60 dBm until the Digital identification signal (DIS) or the Called subscriber identification (CSI) plus DIS are detected.
- 6.7.2. If the facsimile machine wishes to transmit then, after detection of the DIS or CSI+DIS signals and provided there is a compatible Group 3 receiver at the called station, it shall transmit the Transmitter station identification (TSI) signal and the Digital command signal (DCS) followed by the training sequence and the Training check (TCF) signal. If the called station does not have a compatible receiver, the facsimile machine shall follow the interrupt procedure detailed in paragraph 6.8.1.2.
- 6.7.3. If the facsimile machine wishes to receive then, after detection of the DIS or CSI+DIS signals, it shall transmit the Calling subscriber identification (CIG) and Digital transmit command (DTC) signals.
- 6.7.4. Whilst looking for a response to the TSI, DCS and TCF signals, the facsimile machine shall emit no signal above -60 dBm.
- 6.8. **Called station**
- 6.8.1. After switching from the telephone to the facsimile mode, the facsimile machine shall follow one of the procedures detailed below:
- 6.8.1.1. When being used in the automatic answering mode, the facsimile machine shall transmit the Called station identification (CED) signal followed by the CSI and DIS signals.
- 6.8.1.2. When being used in the manual answering mode, the facsimile machine shall transmit either the CSI and DIS signals or the CED signal followed by the CSI and DIS signals.
- 6.8.2. Whilst looking for a response to the above signals, the facsimile machine shall emit no signal above -60 dBm.

6.9. **Interrupt procedure**

6.9.1. *Transmitter*

6.9.1.1. If the facsimile machine satisfactorily completes the transmission procedure, it shall switch from the facsimile mode to the telephone mode (see paragraph 8.4.) and shall operate an audible alarm. If the telephone handset is off-hook, the audible alarm shall operate until reset by the operator. If the telephone handset is on-hook, the audible alarm shall operate for a short period not exceeding 1 second.

6.9.1.2. If the facsimile machine does not satisfactorily complete the transmission procedure, it shall switch from the facsimile mode to the telephone mode and also operate an audible and visual alarm. If the telephone handset is off-hook, the audible and visual alarms shall operate until reset by the operator. If the telephone handset is on-hook, the audible alarm shall operate for a period of 3 to 5 seconds and the visual alarm shall operate until reset by the operator. The visual alarm shall be clearly designated to indicate that the transmission procedure has not been completed satisfactorily.

6.9.2. *Receiver*

6.9.2.1. If the facsimile machine satisfactorily completes the reception procedure, it shall switch from the facsimile mode to the telephone mode and shall operate an audible alarm. If the telephone handset is off-hook, the audible alarm shall operate until reset by the operator. If the telephone handset is on-hook, the audible alarm shall operate for a short period not exceeding 1 second.

6.9.2.2. If the facsimile machine does not satisfactorily complete the reception procedure it shall switch from the facsimile mode to the telephone mode and shall operate an audible and visual alarm. If the telephone handset is off-hook, the audible and visual alarms shall operate until reset by the operator. If the telephone handset is on-hook, the audible alarm shall operate for a period of 3 to 5 seconds and the visual alarm shall operate until reset by the operator. The visual alarm shall be clearly designated to indicate that the reception procedure has not been completed satisfactorily.

6.9.3. The operation of the visual and/or audible alarms detailed in paragraphs 6.9.1.2. and 6.9.2.2. shall not inhibit the subsequent operations of the facsimile machine.

6.10. **Copy quality**

The received copy quality shall be deemed to be unacceptable if more than 10% of the detected lines are received in error. (This figure is provisional.)

7. **CONTROLS**

7.1. Controls shall be protected so as to minimise the possibility of accidental operation.

7.2. All controls shall be marked or marking provided adjacent to the appropriate control to indicate clearly the function. Where appropriate, the direction of operation shall also be marked.

7.3. A visual indication shall be provided to indicate that a control is operated.

8. **CONNEXION TO LINE**

8.1. When the facsimile machine is connected to line, a facsimile signal path shall be connected to the two wire presented line.

8.2. When the facsimile machine is not connected to line, a speech path shall be provided from a two wire presented telephone input to the two wire presented line. Details of the characteristics of this path will be specified by the appropriate Administration.

8.3. **Telephone to facsimile mode switching**

8.3.1. When being used as a transmitter, with mains power applied, the facsimile machine shall be switched from the telephone to the facsimile mode by the operation of a transmit control.

8.3.2. When being used as a receiver in the automatic answering mode with mains power applied, the facsimile machine shall be switched from the telephone to the facsimile mode automatically upon detection of an incoming call.

When being used as a receiver in the manual answering mode with mains power applied, the facsimile machine shall be switched from the telephone to the facsimile mode by the operation of a receive control.

8.3.3. When mains power is not applied, the facsimile machine shall remain in the telephone mode irrespective of the operation of any controls, etc.

8.4. **Facsimile to telephone mode switching**

- 8.4.1. When being used as a transmitter, the mains power applied, the facsimile machine shall be switched from the facsimile to the telephone mode by the following:
 - 8.4.1.1. Automatically when the facsimile call is complete.
 - 8.4.1.2. By the operation of a control (see paragraph 8.3.1.).
 - 8.4.1.3. By the interrupt procedure (see paragraph 6.9.1.).
 - 8.4.1.4. By suitable alternative methods subject to the approval of the appropriate Administration.
- 8.4.2. When being used as a receiver, with mains power applied, the facsimile machine shall be switched from the facsimile to the telephone mode by the following:
 - 8.4.2.1. Automatically when the facsimile call is complete.
 - 8.4.2.2. Operation of a control (see paragraph 8.3.2.).
 - 8.4.2.3. By the interrupt procedure (see paragraph 6.9.2.).
 - 8.4.2.4. By suitable alternative methods subject to the approval of the appropriate Administration.
- 8.4.3. The facsimile machine shall switch from the facsimile to the telephone mode immediately upon disconnection of the mains power.
- 8.5. It shall not be possible to operate the facsimile machine in the transmitting and receiving modes simultaneously on the same telephone line.

9. **AUTOMATIC AND MANUAL ANSWERING**

- 9.1. The facsimile machine shall have facilities to both automatically and manually answer incoming calls. In the automatic answering mode, if the facsimile machine is not capable of receiving and reproducing at least one A4 length message, it shall not answer an incoming call. If the facsimile machine is capable of receiving a message it shall, upon detection of the call, answer the call and automatically switch from the telephone to the facsimile mode.
- 9.2. Details of the characteristics of the ringing signals and requirements for ringing detector circuits will be detailed by the appropriate Administration.

10. **LOCAL TEST MODE**

- 10.1. Facilities shall be provided to enable the facsimile machine to be locally tested by the operator.
 - 10.1.1. When operating in this mode, the same circuitry shall be utilised as in normal transmission and reception, as far as this is practically possible.
 - 10.1.2. When the facsimile machine is operating in this mode, the telephone input shall be connected to the two wire presented line and it shall be possible to make and receive calls on the associated telephone.
- 10.2. Facilities may be provided to enable local copies to be made. It is not necessary to utilise the modulation and demodulation processes when providing these facilities. When the facsimile machine is operating in the local copy mode and is conditioned to automatically answer incoming calls, the receipt of an incoming call shall cause it to switch immediately from the local copy mode and answer the call.
When the facsimile machine is in the local copy mode and is conditioned to manually transmit or receive, the telephone input shall be connected to the two wire presented line and it shall be possible to make and receive calls on the associated telephone.

11. **ROUTINE MAINTENANCE**

Facilities shall be provided to indicate when routine maintenance is required. The frequency of routine maintenance will be detailed by the appropriate Administration.

12. **OPERATING AND STORAGE ENVIRONMENT**

These requirements will be detailed by the appropriate Administration.

13. **POWER SUPPLIES AND PROTECTION**

13.1. The operating power for the facsimile machine shall be derived from an integral a.c. mains power unit. Details of the characteristics of the a.c. mains supply will be specified by the appropriate Administration.

13.2. On the restoration of power following a supply failure, the sequence of restoration of the internal power supply rails shall be such that damage or misoperation of the facsimile machine shall not occur.

13.3. **Protection and radio interference**

These requirements will be detailed by the appropriate Administration.

14. **RELIABILITY AND COMPONENT SELECTION**

These requirements will be detailed by the appropriate Administration. However, manufacturers should note that the reliability shall be such that faults do not occur more than once every 5,000 A4 length messages sent or received or more than once every 12 months whichever is less.

15. **MISCELLANEOUS REQUIREMENTS**

15.1. **Acoustic noise**

These requirements will be detailed by the appropriate Administration. However, manufacturers should note that the acoustic noise level produced by the facsimile machine in any of its operating modes must be acceptable in a normal office environment.

15.2. **Documentation for installation and maintenance**

Details of the documentation required e.g. handbooks will be specified by the appropriate Administration.

15.3. **Telephone line interface**

Details of the telephone line characteristics and the requirements for the facsimile machine will be specified by the appropriate Administration.

15.4. **Additional modes of operation**

Manufacturers may provide additional modes of operation to those detailed in this specification and CCITT Recommendation T.4 by utilising the non-standard facilities commands and responses detailed in CCITT Recommendation T.30. However, if one of these optional modes is selected, then at the end of each complete transmission and reception procedure, the facsimile machine shall automatically return to the standard mode of operation detailed in this specification.

The provision and use of any optional modes shall not cause misoperation of facsimile machines which operate only in the "standard" mode as defined in this specification.

15.5. **Identification signals**

Facilities shall be provided to present to the operators the decoded CSI and CIG signals at the calling and called facsimile machines respectively. A minimum of the 12 least significant digits of the decoded signals shall be presented. Facilities shall be provided to enable the CSI, CIG and TSI codes to be set on installation and shall not be accessible to the operator.

It is preferred that the decoded TSI signal should be printed on the received copy.