



**E**UROPEAN  
**T**ELECOMMUNICATION  
**S**TANDARD

**ETS 300 242**

December 1992

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Source: ETSI TC-TE

Reference: T/TE 05-05

ICS: 33.020, 33.040.40

**Key words:** Group 3 facsimile

**Terminal Equipment (TE);  
Group 3 facsimile equipment**

**ETSI**

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## Foreword

This European Telecommunication Standard (ETS) has been produced by the Terminal Equipment (TE) Technical Committee of the European Telecommunications Standards Institute (ETSI).

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## 1 Scope

This European Telecommunication Standard (ETS) specifies the technical characteristics to be met by Group 3 facsimile equipment to enable reliable document interchange between compliant equipment.

The ETS does not contain the requirements for Public Switched Telephone Network (PSTN) access, Safety or Electromagnetic Compatibility.

All tests necessary to check conformance to this ETS are included in Annex B (normative), which is an integral part of this ETS.

## 2 Normative references

This ETS incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to, or revisions of any of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

- [1] ETS 300 001 (1992): "Attachments to Public Switched Telephone Network (PSTN); General technical requirements for equipment connected to an analogue subscriber interface in the PSTN".
- [2] CCITT Recommendation T.4: "Standardization of Group 3 facsimile apparatus for document transmission".
- [3] CCITT Recommendation T.30: "Procedures for document facsimile transmission in the general switched telephone network".
- [4] CCITT Recommendation T.21: "Standardized test charts for document facsimile transmission".

## 3 Definitions

For the purpose of this ETS, the definitions given in CCITT Recommendations T.4 [2], T.30 [3] and T.21 [4] apply along with the following:

**Group 3 facsimile terminal equipment:** this is referred to throughout this ETS as the "facsimile equipment".

**An extended configuration:** includes within its own domain at least two independently addressable sinks and/or two independently addressable sources of facsimile traffic to the public network. An implementation which is designed to be completely physically included within a personal computer is considered as an extended configuration.

## 4 Abbreviations

For the purpose of this ETS, the abbreviations given in CCITT Recommendations T.4 [2] and T.30 [3] apply along with the following:

EMC	ElectroMagnetic Compatibility
ETS	European Telecommunication Standard
ETSI	European Telecommunications Standards Institute
PSTN	Public Switched Telephone Network
SUT	System Under Test

## 5 General requirements

General requirements about the access to the PSTN are not contained in this ETS and reference should be made to ETS 300 001 [1].

Safety and electromagnetic compatibility (EMC) requirements of the country in which permission to connect the facsimile equipment is sought shall apply. The source of national information may be found in the CEPT Yearbook and Approval Information for Telecommunications Terminal Equipment.

## 6 Technical characteristics

### 6.1 General

The facsimile equipment shall comply with the requirements of CCITT Recommendation T.4 [2], paragraphs 1, 2, 3, 4, 5, 6, 7, 8 and CCITT Recommendation T.30 [3], paragraphs 1, 2, 3, 4.3.3.2, 4.3.3.3, 5, and additional requirements as described in this ETS.

NOTE: In Germany, in order to provide reliable document interchange between compliant equipment an improved input, sensitivity of - 46 dBm will be considered for a certain period of time.

The testing specification is given in Annex B.

Requirements for the scanner of the facsimile equipment based on test chart No. 3 of CCITT Recommendation T.21 [4], are contained in Annex A. This applies only if a physical scanner is implemented.

### 6.2 Features

**Basic feature:** a standardized feature which is mandatory for the certificate of conformity.

**Optional feature:** a standardized feature of facsimile equipment which may be used in a specified way to supplement the basic features and which incorporates compatibility between facsimile equipment. Optional features in this ETS are not mandatory but when implemented shall be implemented as described in this ETS for the certificate of conformity. The applicant shall state which optional features are to be certified.

**Special feature:** a non-standardized feature of facsimile equipment which can be used to supplement basic or optional features but which does not incorporate compatibility between facsimile equipment. A special feature shall not impair the compatibility of basic or optional features between facsimile equipment.

### 6.3 Transmitter

For equipment which is capable of sending only A5 and/or A6 size documents, the requirements for equipment capable of sending A4 size documents shall not be applied.

#### 6.3.1 Document dimensions

The facsimile equipment shall be capable of accepting and scanning documents with dimensions of at least 212 mm x 299 mm.



### 6.3.2 Scanning track

The density of picture elements along the scanned line shall correspond to 1 728 picture elements along a line length of  $215 \text{ mm} \pm 1 \%$ .

The basic scanned line length is  $215 \text{ mm} \pm 1 \%$ .

For implementations which use centre alignment of the document in the scanner, the reference position of the document shall be such that the centre of the document lies between picture elements 851 and 877 over the first 20 mm of the document.

For implementations which use right edge alignment of the document in the scanner, the reference position of the document shall be such that a point 10 mm from the right edge of the document lies between picture elements 1 623 and 1 648 over the first 20 mm of the document.

The applicant shall state which implementation has been used.

In addition to the basic scanning line length of 215 mm, other scanned line lengths may be implemented.

The basic scanning density shall be 3,85 lines per mm  $\pm 1 \%$ . In addition, the facsimile equipment may provide other scanning densities. The selection of the one used for message transmission shall be controlled by the transmitting station.

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.

### 6.4 Receiver

For equipment which is capable of receiving only A5 and/or A6 size documents, the requirements for equipment capable of receiving A4 size documents shall not be applied.

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.

The density of picture elements along the recorded line shall correspond to 1 728 picture elements along a line length of  $215 \text{ mm} \pm 1 \%$ .

The effective minimum recorded line length shall be 200 mm.

For implementations which use centre alignment in the printer, the reference position of the recording medium shall be such that the centre of the recording medium lies between picture elements 851 and 877 over the first 20 mm of the document.

For implementations which use right edge alignment in the printer, the reference position of the recording medium shall be such that a point 10 mm from the right edge of the recording medium lies between picture elements 1 623 and 1 648 over the first 20 mm of the document.

The applicant shall state which implementation has been used.

In the case of facsimile equipment 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.

### 6.5 Performance

The performance of the facsimile equipment shall be evaluated using the CCITT Facsimile Test Chart No. 3 detailed in CCITT Recommendation T.21 [4]. Performance tests of the facsimile equipment are described in Annex A of this ETS.

## 6.6 Control procedures for message transmission and reception

The facsimile equipment shall follow the binary coded control procedures detailed in CCITT Recommendation T.30 [3].

As a basic feature, the facsimile equipment should transmit the appropriate subscriber identification signal CSI/CIG/TSI (Called Subscriber Identification/Calling Subscriber Identification/Transmitting Subscriber Identification) according to CCITT Recommendation T.30 [3].

### Received image quality

The received image quality criteria, if adjustable, should not be accessible to the operator.

The receiver shall interpret the received image as badly received and send the corresponding (RTN or PIN) signal (ReTrain Negative or Procedural Interrupt Negative) during phase D of the facsimile procedure if more than 15 % of the detected lines are faulty.

The receiver shall interpret the received image as received with sufficient quality and send the corresponding (MCF, RTP, PIP) signal (Message ConFirmation, ReTrain Positive, Procedural Interrupt Positive) during phase D of the facsimile procedure if less than 5 % of the detected lines are faulty.

## 6.7 Facsimile switching

When power is not applied, the facsimile equipment shall remain disconnected from the telephone line, irrespective of the operation of any controls and of the status (e.g. ringing) of the line interface.

### 6.7.1 Automatic calling equipment

Automatic calling is not a mandatory feature.

### 6.7.2 Facsimile to telephone mode switching

The facsimile equipment shall disconnect itself from the telephone line:

- when the facsimile call is complete;
- when a timeout has expired as specified in CCITT Recommendation T.30 [3];
- upon disconnection of the power.

## 6.8 Automatic and manual answering

In the automatic answering mode, if provided, the facsimile equipment shall answer incoming calls only if at least one of the following conditions exists:

- the facsimile equipment is not in an alarm state due to the lack of consumables;
- the facsimile equipment is able to transmit a message according to operating modes 2-R or 4-R as per CCITT Recommendation T.30 [3].

If the facsimile equipment is capable of receiving or transmitting a message it shall, upon detection of the call, answer the call and automatically connect itself to the telephone line.

## 6.9 Miscellaneous requirements

### 6.9.1 Special features

Manufacturers may provide special features to those detailed in this specification and CCITT Recommendation T.4 [2] by utilizing the non-standard facilities commands and responses detailed in CCITT Recommendation T.30 [3].

### **6.9.2 Extended configurations**

In the case of an extended configuration the following applies:

#### **Activity log**

An activity log shall be provided which contains information regarding the results of communications.

The activity log shall be in non-volatile memory or shall be buffered.

**Annex A (normative): Requirements for the scanner of the facsimile equipment based on test chart No. 3 of CCITT Recommendation T.21**

Application of TEST CHART No. 3

Operational conditions for the test are as follows:

- standard operational conditions as indicated by the manufacturer;
- resolution of 3,85 lines/mm.

**Table A.1**

Interpretation of zones on original chart	Requirements on transmitted document
Zone 3.1 Band of alternating black and white lines, thickness 5 mm. Permits measurement of scanning distortion and adjustment of the black and white levels.	Zone 3.1 This zone shall be reproduced.
Zone 3.2 2 density level bands in complementary order. These scales permit measurement of the scanners' analogue response curves and definition of the white/black decision threshold level in digital transmission devices. The two bands, covering nearly the width of the page, are reversed for verification of the uniformity of the scanner's response over the entire length of the horizontal line. The densities, varying between 0,2 and 1,5, are indicated in the margin of each of the bands.	Zone 3.2 The grey gradation (level between 0,2 and 1,2) may be represented with black color. Levels 0,8; 1; 1,2 shall not be represented with white color.
Zone 3.3 Black band covering the entire page width. Permits adjustment of characteristic "black" signals through the entire sequence of the electronic devices.	Zone 3.3 This zone shall be reproduced.
Zone 3.4 - 3.5 Isolated black and white lines, variable thickness, 2 complementary bands. Using this group, it is possible to define the limits of resolution for isolated black and white lines. Line thicknesses are indicated in microns.	Zone 3.4 - 3.5 Black lines: at least the line with a thickness greater than 100 microns shall be reproduced. The whole black color shall be obtained for lines with thickness greater than 250 microns. White lines: it shall be possible to recognize the lines with a thickness greater than 200 microns. The lines shall be completely white for thickness greater than 350 microns.

(continued)

Table A.1 (concluded)

Interpretation of zones on original chart	Requirements on transmitted document
<p>Zone 3.9  Alternating lines, 4 lines per mm (black and white line thickness 250 microns).  Permits verification of standardized facsimile machine definition.</p>	<p>Zone 3.9  The black lines on the received copy shall be separated.</p>
<p>Zone 3.10  Alternating lines, 2 lines per mm (black and white line thickness 500 mm).  This scale represents the minimum permissible definition for a facsimile machine.</p>	<p>Zone 3.10  The black lines on the received copy shall be separated.</p>
<p>Zone 3.11  Vertical and horizontal bundles (converging patterns).  This group of 3 bundles of converging lines permits quantization of the limits of horizontal and vertical definitions. The numbers shown along the bundles indicate the thickness of black and white lines in microns.</p>	<p>Zone 3.11  The 15 black lines on vertical bundles shall be distinguished from thickness of 300 microns. The horizontal bundle is not considered.</p>
<p>Zone 3.13  Black lines, thickness 250 microns, spaced 750 microns.</p>	<p>Zone 3.13  Black lines shall be reproduced.</p>
<p>Zone 3.14  Black lines, thickness 250 microns, spaced 1 000 microns.  The two scales of 3.13 and 3.14 simulate character downstrokes.</p>	<p>Zone 3.14  They shall be reproduced.</p>
<p>Zone 3.22  4 groups of arrows and lines.  These groups permit quantization of framing defects of the facsimile document.  The numbers indicate distances in millimeters measured from the edge of the test pattern.</p>	<p>Zone 3.22  See Annex B (normative).</p>

## **Annex B (normative): Testing**

### **B.1 Scope**

This annex contains test procedures to verify the protocol and application service conformance of CCITT Group 3 facsimile equipment.

These test procedures confirm compliance with the basic requirements of this ETS but do not guarantee full compatibility between facsimile equipment.

#### **B.1.2 Testing conditions**

##### **B.1.2.1 Environments for tests**

All tests shall be performed at:

- an ambient temperature in the range 15 °C to 35 °C;
- a relative humidity in the range 25 % to 75 %;
- an air pressure in range 86 kPa to 106 kPa;

except that tests shall not be performed outside the operating limits for the Group 3 facsimile equipment as stated by the applicant.

##### **B.1.2.2 Power supply limitations**

For Group 3 facsimile equipment that are directly powered from the mains supply, all tests shall be carried out within  $\pm 5\%$  of the normal operating voltage as declared by the applicant. If the power supply is ac the tests shall be conducted within  $\pm 4\%$  of the stated frequency as declared by the applicant.

If Group 3 facsimile equipment are powered by other means and those means are not supplied as part of the facsimile equipment, e.g. batteries, stabilized ac supplies, dc, etc., all tests shall be carried out within the power supply limit declared by the applicant.

All tests described in this ETS shall be carried out external to the facsimile equipment and shall not require the applicant to provide special hardware or software to enable those tests to be performed.

In order to facilitate tests, the applicant shall present the System Under Test (SUT) with a physical printer (not required for send-only-terminals) and a physical scanner (not required for receive-only-terminals), each of them being located in the same private domain, and connected locally or through a LAN or a PABX or etc..., to fulfill the requirements of the present specification.

#### **B.1.3 Test procedures**

The test procedures are applicable to all facsimile equipment. Optional tests are only applicable to facsimile equipment in accordance to the 2nd paragraph (Optional features) of subclause 6.2.

The test procedures are independent from any particular test equipment.

Tests are performed separately for transmit and receive functions with all tests being carried out. For efficiency in testing, tests may be combined.

The test procedures consist of two types. Protocol test procedures and application service test procedures. Protocol test procedures test the conformance of a facsimile equipment to CCITT Recommendation T.30 [3] and to this ETS. Application service test procedures test the conformance to CCITT Recommendation T.4 [2] and to this ETS.

#### **B.1.4 Protocol test procedures**

Protocol test procedures are defined by a set of protocol test schedules and commands/responses lists.

**B.1.4.1 Protocol test schedules**

The test schedules are described in a tabular form. Test conditions and input sequences together with the expected result are specified. Normal protocol tests are designed to be carried out sequentially i.e. a successful conclusion to test N will leave the facsimile equipment in the correct state for test N+1 to be carried out. Exception protocol tests are designed to be carried out individually i.e. the facsimile equipment is driven into the correct state for a particular test by procedures which are defined for that test.

**B.1.4.2 Description of the test tables**

The test tables consist of five columns which are described below.

TEST No.	TYPE OF TEST	TESTER ACTION	TESTER DETECTS	COMMENTS
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**B.1.4.2.1 Test number**

The column TEST No. is represented with the following format: ABCN (see table B.1).

**Table B.1**

	Coding	Description
A	T or R	Indicating that the test is done while the facsimile equipment is Transmitting or Receiving.
B	N E	For Normal tests. For Exception tests.
C	A, B, C, D or E	Indicating the phase for exception tests.
N	1, 2, 3, 4....	Test number.

**B.1.4.2.2 Test type**

The column TYPE OF TEST provides a brief description of the test.

**B.1.4.2.3 Tester action**

The column TESTER ACTION specifies the sequence of commands and responses which are to be sent by the tester during a particular test.

The tester shall follow the signal timings as defined in CCITT Recommendation T.30 [3] unless specified otherwise.

**B.1.4.2.4 Tester detects**

The column TESTER DETECTS specifies the sequence of commands and responses which shall be received by the tester during a particular test to comply with the test.

The format of these commands and responses shall be in accordance with CCITT Recommendations T.4 [2] and T.30 [3].

**B.1.4.2.5 Comments**

This column COMMENTS gives comments and specifies the commands/responses transmitted by the tester.

**B.1.4.3 Commands/responses list**

Separate lists specify the commands/responses used within the test tables (see subclause B.3.10 - "Commands/responses list").

### B.1.5 Application service test procedures

#### B.1.5.1 Application service tests

The application service tests establish a number of scenarios which test the conformance of a facsimile equipment to CCITT Recommendation T.4 [2] and related additional requirements.

Application tests are designed to be carried out individually i.e. the facsimile equipment is driven into the correct state for a particular test by procedures which are designed for that test; these procedures may be also possible by combination of tests.

#### B.1.5.2 Description of application service test schedules

Each test consists of three parts, the title of the test, the actions required to establish the test and the checks that have to be carried out to assess the facsimile equipment.

The tests use the following numbering format: AN (see table B.2).

**Table B.2**

	Coding	Description
A	T or R or L	Indicating that the test is done while the facsimile equipment is Transmitting or Receiving. L indicates Local functions.
N	1, 2, 3, 4...	Test number.

#### B.1.6 Definitions and abbreviations

SUT	System Under Test (System = facsimile equipment)
T	Transmit
R	Receive
V	Valid

Other abbreviations are described in CCITT Recommendations T.4 [2] and T.30 [3].

#### B.1.7 Generalities

Tolerances for the following tests are as defined in the CCITT Recommendations.

Test equipment shall be able to present each picture element faithfully.

For efficiency in testing, tests may be combined.



## B.2 Tests for CCITT Recommendation T.4

### B.2.1 Test No. R1 ... R4

Testing normal conditions.

Facsimile equipment receiving.

**Table B.3**

Test No.	Description	Reference
R1	Receiving and presenting standard resolution, standard scan line length, one-dimensional coding scheme and 20 ms scan line. The tester sets in the DCS information field the 20 ms minimum time per line. The tester transmits two test charts "DIAGO1" and "DIAGO2" (see B.5.1) which use all the Huffman length code words. Check that: - the SUT represents monotonic boundary between black and white.	1/T.4, 2/T.4, 4/T.4, 3.1/T.4 [2]
R2	Test for transmission time of 5 s and reception at 4 800 bit/s. The tester sets in the DCS information field the data signalling rate at 4 800 bit/s V.27 ter. The tester transmits two test charts "DURATION1" and "DURATION2" (see subclause B.5.3). Check that: - the SUT does not disconnect with test chart "DURATION1" and represents it; - the SUT disconnects with test chart "DURATION2".	2/T.4 5/T.4 [2]
R3	Test for reception at 2 400 bit/s. The tester sets in the DCS information field the data signalling rate at 2 400 bit/s V.27 ter. The tester transmits test charts "DIAGO1" and "DIAGO2" at 2 400 bit/s. Check that: - the SUT accepts the test chart and can represent it.	5/T.4 [2]
R4	Receiving an all white page document not exceeding A4 length. Check: - the pause between CED and preamble of the digital handshaking. The minimum shall be 55 ms (75 ms - 20 ms); - the format of the digital handshaking, length of the preamble; - the x-bit in the Facsimile Control Field. (FCF)	6.6

**B.2.2 Test No. T1 ... T6**

Testing normal conditions.

Facsimile equipment transmitting.

**Table B.4**

Test No.	Description	Reference
T1	<p>Transmitting standard resolution, standard scan line length, ISO A4 size and one-dimensional coding scheme.</p> <p>SUT transmits test chart no. 3 of CCITT Recommendation T.21 [4] as purchased from CCITT. Tester uses DIS V1.1.</p> <p>Check that:</p> <ul style="list-style-type: none"> <li>- the contents of the page are represented according to Annex A.</li> </ul>	1/T.4, 2/T.4, 4/T.4 [2]
T2	<p>Test for transmission of 20 ms scan line.</p> <p>The tester indicates in the DIS information field the capability only to receive a 20 ms minimum time per line. The SUT transmits a white page. Tester uses DIS V1.1.</p> <p>Check that:</p> <ul style="list-style-type: none"> <li>- all lines have a duration of at least 20 ms.</li> </ul>	3.1/T.4 [2]
T3	<p>Test for transmission at 4 800 bit/s.</p> <p>The tester indicates in the DIS information field the capability V.27 ter. The SUT transmits test chart no. 3 of CCITT Recommendation T.21 [4] as purchased from CCITT. Tester uses DIS V1.1.</p> <p>Check:</p> <ul style="list-style-type: none"> <li>- that the SUT transmits the page at 4 800 bit/s;</li> <li>- the pause of <math>75 \pm 20</math> ms between DCS and modem training;</li> <li>- the pause of <math>75 \pm 20</math> ms between RTC and digital handshaking.</li> </ul>	5/T.4 [2]
T4	<p>Test for transmission at 2 400 bit/s.</p> <p>The tester indicates in the DIS information field the capability V.27 ter fallback mode. The SUT transmits test chart no. 3 of CCITT Recommendation T.21 [4] as purchased from CCITT. Tester uses DIS V.1.0.</p> <p>Check:</p> <ul style="list-style-type: none"> <li>- the SUT transmits the page at 2 400 bit/s;</li> <li>- the pause of <math>75 \pm 20</math> ms between DCS and modem training;</li> <li>- the pause of <math>75 \pm 20</math> ms between RTC and digital handshaking.</li> </ul>	5/T.4 [2]
T5	<p>Test for transmission with V.27 ter-modulation-system (2 400 and 4 800 bit/s)</p> <p>Tester uses DIS V1.1.</p> <p>Check:</p> <ul style="list-style-type: none"> <li>- that the training is according to CCITT Recommendation V.27 ter long training sequence with protection against talker echo (table 3/V.27 ter).</li> </ul>	5.2/T.4 [2]
T6	<p>Test for transmission with V.29-modulation-system (7 200 and 9 600 bit/s).</p> <p>Tester uses DIS V1.2.</p> <p>Check:</p> <ul style="list-style-type: none"> <li>- that the training is according to CCITT Recommendation V.29.</li> </ul>	5.2/T.4 [2]

### B.3 Tests for CCITT Recommendation T.30

#### B.3.1 Test No. TN1 ... TN12

Testing normal conditions.  
Facsimile equipment transmitting/tester receiving.  
Facsimile equipment transmits two all white pages not exceeding A4 length.

For facsimile equipment capable of transmitting only one page tests TN7, TN8 and TN9 shall not be applied.

NOTE: Optional signals may appear before DCS.

Table B.5

TEST No.	TYPE OF TEST	TESTER ACTION	TESTER DETECTS	COMMENTS
TN1	transmit CNG		R-CNG	optional for manual operation
TN2	receive CED, DIS	T-CED, DIS		DIS V1.1
TN3	transmit DCS		R-DCS	NOTE
TN4	transmit phasing/training TCF		R-phasing/training, TCF	
TN5	receive CFR	T-CFR		
TN6	transmit fax msg		R-fax msg	
TN7	transmit MPSsss		R-MPS	
TN8	receive MCF	T-MCF		
TN9	transmit fax msg		R-fax msg	
TN10	transmit EOP		R-EOP	
TN11	receive MCF	T-MCF		
TN12	transmit DCN		R-DCN R-disconnect	

#### B.3.2 Test No. RN1 ... RN12

Testing normal conditions.  
Facsimile equipment receiving/tester transmitting.  
Receive two all white pages not exceeding A4 length.

For facsimile equipment capable of receiving only one page tests RN1, RN8 and RN9 shall not be applied.

NOTE: Optional signals may appear before DIS.

Table B.6

TEST No.	TYPE OF TEST	TESTER ACTION	TESTER DETECTS	COMMENTS
RN1	transmit CED		R-CED	optional for manual answering
RN2	transmit DIS		R-DIS	NOTE
RN3	receive DCS	T-DCS		DCS V1
RN4	receive phasing/training, TCF	T-phasing/training, TCF		
RN5	transmit CFR		R-CFR	
RN6	receive fax msg	T-fax msg		
RN7	receive MPS	T-MPS		
RN8	transmit MCF		R-MCF	
RN9	receive fax msg	T-fax msg		
RN10	receive EOP	T-EOP		
RN11	transmit MCF		R-MCF	
RN12	receive DCN	T-DCN	R-disconnect	

**B.3.3 Test No. TEB10 ... TEB11**

Testing exception conditions from phase B (state B1: command rec?).  
 Facsimile equipment transmitting/tester receiving. Facsimile equipment is calling.

Before each sequence a call is established.

**Table B.7**

TEST No.	TYPE OF TEST	TESTER ACTION	TESTER DETECTS	COMMENTS
TEB10	time out (T1)	do nothing	R-disconnect	
TEB11	receive initial identification with FCS-error	T-CED T-DIS with FCS-error do nothing during T4  T-DIS with FCS-error do nothing during T4  T-DIS without FCS-error	nothing or R-CRP  nothing or R-CRP  R-DCS R-phasing/ training TCF	Tester sends DIS V1.1 with FCS-error two times

**B.3.4 Test No. TEB20 ... TEB25**

Testing exception conditions from phase B (state B2: response rec?).  
 Facsimile equipment transmitting/tester receiving. Facsimile equipment is calling.

Before each sequence a call is established and the tester shall:

T-DIS V1.2;  
 R-DCS;  
 R-phasing/training, TCF.

NOTE 1: Optional signals may appear before DCS.

NOTE 2: n = 3, however n can have other values if the SUT does not start with 9 600 bit/s or the SUT tries the same speed more than once.

Table B.8

TEST No.	TYPE OF TEST	TESTER ACTION	TESTER DETECTS	COMMENTS
TEB20	receive FTT  continue to receive FTT	T-FTT  repeat n times to T-FTT after R-DCS, R-phasing/training, TCF	R-DCS R-phasing/training, TCF  R-DCN R-disconnect	NOTE 1  NOTE 2
TEB21	time out (T4)	do nothing  do nothing  do nothing	R-DCS R-phasing/training, TCF  R-DCS R-phasing/training, TCF  R-DCN R-disconnect	NOTE 1
TEB22	3rd try	T-DIS  T-DIS  T-DIS	R-DCS R-phasing/training, TCF  R-DCS R-phasing/training, TCF  R-DCN R-disconnect	same DIS as initial NOTE 1
TEB23	receive two times CFR with FCS-error	T-CFR with FCS-error  T-CFR with FCS-error  T-CFR without FCS-error	R-DCS R-Phasing/training, TCF  R-DCS R-Phasing/training, TCF  R-Fax Msg	
TEB24	receive CRP	T-CRP	R-DCS R-phasing/training, TCF	R-DCS immediately or after T4-timeout
TEB25	receive DCN	T-DCN	R-disconnect	

**B.3.5 Test No. TED10 ... TED15**

Testing exception conditions from phase D (state D1: response rec? after no last document).  
Facsimile equipment transmitting/tester receiving. Facsimile equipment is calling. Facsimile equipment is set up to transmit multiple document.

Before each sequence a call is established and the tester shall:

T-DIS V1.1;  
R-DCS;  
R-phasing/training, TCF;  
T-CFR;  
R-fax msg;  
R-MPS.

**Table B.9**

TEST No.	TYPE OF TEST	TESTER ACTION	TESTER DETECTS	COMMENTS
TED10	3rd try	do nothing  do nothing  do nothing	R-MPS  R-MPS  R-DCN R-disconnect	
TED11	receive RTP	T-RTP	R-DCS R-phasing/training, TCF	
TED12	receive RTN	T-RTN	R-DCS R-phasing/training, TCF	
TED13	receive two times MCF with FCS-error	T-MCF with FCS-error T-MCF with FCS-error T-MCF without FCS-error	R-MPS  R-fax msg	R-MPS
TED14	receive CRP	T-CRP	R-MPS	R-MPS may be delayed by T4-timeout
TED15	receive DCN	T-DCN	R-disconnect	
NOTE 1:	The multiple document shall consist of all white pages not exceeding A4 length.			
NOTE 2:	These tests shall not be applied to facsimile equipment capable of transmitting only one page.			

**B.3.6 Test No. TED20 ... TED25**

Testing exception conditions from phase D (state D2: response rec? after last doc yes and change mode no).

Facsimile equipment transmitting/tester receiving. Facsimile equipment is calling. Facsimile equipment is set up to transmit a single page document.

Before each sequence a call is established and the tester shall:

T-DIS V1.1;  
R-DCS;  
R-phasing/training, TCF;  
T-CFR;  
R-fax msg;  
R-EOP.

The document shall be an all white page not exceeding A4 length.

**Table B.10**

TEST No.	TYPE OF TEST	TESTER ACTION	TESTER DETECTS	COMMENTS
TED20	3rd try	do nothing  do nothing  do nothing	R-EOP  R-EOP  R-DCN R-disconnect	
TED21	receive RTP	T-RTP	R-DCN R-disconnect	
TED22	receive RTN	T-RTN	R-DCS R-phasing/training, TCF or R-DCN R-disconnect	
TED23	receive two times MCF with FCS-error	T-MCF with FCS-error T-MCF with FCS-error T-MCF without FCS-error	R-EOP  R-EOP  R-DCN R-disconnect	
TED24	receive CRP	T-CRP	R-EOP	R-EOP may be delayed by T4-timeout
TED25	receive DCN	T-DCN	R-disconnect	

**B.3.7 Test No. TED30 ... TED36**

Testing exception conditions from phase D (state D3: response rec? after last doc yes and change mode yes).

Facsimile equipment transmitting/tester receiving. Facsimile equipment is calling. The Facsimile equipment is set up to send EOM for example by changing vertical resolution for the second page.

Before each sequence a call is established and the tester shall:

T-DIS V1.2;  
R-DCS;  
R-phasing/training, TCF;  
T-CFR;  
R-fax msg;  
R-EOM.

The document shall be all white pages not exceeding A4 length.

These tests shall not be applied to facsimile equipment which is not capable of generating EOM.

**Table B.11**

TEST No.	TYPE OF TEST	TESTER ACTION	TESTER DETECTS	COMMENTS
TED30	3rd try	do nothing  do nothing  do nothing	R-EOM  R-EOM  R-DCN R-disconnect	
TED31	receive MCF	T-MCF  after T2-timeout T-DIS	R-nothing during T2 R-DCS	same DIS as initial
TED32	receive RTP	T-RTP after T2-timeout T-DIS	R-nothing during T2 R-DCS	
TED33	receive RTN	T-RTN  after T2-timeout T-DIS	R-DCS R-phasing/training, TCF or R-DCN after T1 time out R-disconnect or R-disconnect after T1 time out	
TED34	receive two times MCF with FCS-error	T-MCF with FCS-error T-MCF with FCS-error T-MCF without FCS-error T-DIS after T2-timeout	R-EOM  R-EOM  R-nothing  R-DCS	
TED35	receive CRP	T-CRP	R-EOM	R-EOM may be delayed by T4-timeout
TED36	receive DCN	T-DCN	R-disconnect	

**B.3.8 Test No. REB10 ... REB16**

Testing exception conditions from phase B (state B1: response rec?). Facsimile equipment called. Tester calling.

Before each sequence a call is established and the tester shall:

R-DIS.

NOTE: Optional signals may appear before DIS or DCS.



Table B.12

TEST No.	TYPE OF TEST	TESTER ACTION	TESTER DETECTS	COMMENTS
REB10	time out (T1)	do nothing	R-DIS during T1 time out  R-disconnect or R-DCN R-disconnect	
REB11	receive two times DCS with FCS-error	T-DCS with FCS-error T-phasing/ training TCF T-DCS with FCS-error T-phasing/ training TCF T-DCS without FCS-error T-phasing/ training TCF	R-DIS  R-DIS  R-CFR	
REB12	receive DTC	T-DTC	R-DCS R-phasing/training, TCF	DTC V1.1 Document is available for polling without password
REB13	receive DTC	T-DTC	R-DIS or R-DCN R disconnect	DTC V1.1 No document is available for polling or password is implemented
REB14	receive DIS	T-DIS	R-DIS or R-DCS R-phasing/training, TCF	DIS V1.1 document is available for polling without password
REB15	receive DIS	T-DIS	R-DIS or R-DCN R disconnect	DIS V1.1 no document is available for polling or password is implemented
REB16	receive faulty TCF	T-DCS T-phasing/training, faulty TCF	R-FTT	TCF consists of 01010101....

**B.3.9 Test No. REB20 ... REB23**

Testing exception conditions from phase B (state B2: response rec?).  
Facsimile equipment receiving/tester transmitting. Facsimile equipment called.

Before each sequence a call is established and the tester shall:

R-DIS;  
T-DCS V1;  
T-phasing/training, TCF;  
R-CFR.

The document shall be an all white page not exceeding A4 length.

Table B.13

TEST No.	TYPE OF TEST	TESTER ACTION	TESTER DETECTS	COMMENTS
REB20	time out (T2)	do nothing	R-disconnect or R-DCN R-disconnect	
REB21	time out (T2) before message and after EOM	do nothing during 5 s T-fax msg T-EOM  do nothing	R-MCF  R-DIS	
REB22	no training after DCS	T-DCS do nothing	R-FTT	same DCS as initial
REB23	receive DCS with FCS-error	T-DCS with FCS-error T-phasing/training, TCF  T-DCS without FCS-error T-phasing/training, TCF	R-nothing or R-CRP R-disconnect  R-CFR	same DCS as initial

**B.3.10 Commands/responses list**

This list specifies the commands and responses used by the tester. Only valid commands and responses are described.

**B.3.10.1 Content of the DIS/DTC frame**

**Table B.14**

DIS/DTC	Coding (hex) and bit assignment for DIS/DTC-Facsimile Information Field (FIF)
V1.0 Standard capabilities	FIF: 00 40 10 Receiver - T.4 operation Data signalling rate V.27 ter fallback mode (2 400 bit/s) Standard vertical resolution 3,85 l/mm One-dimensional coding Recording width capabilities A4 Max. recording length capability unlimited Min. scan line time capability at the receiver 20 ms at 3,85 and 7,7 l/mm
V1.1 Standard capabilities	FIF: 00 50 10 Receiver - T.4 operation Data signalling rate V.27 ter mode (4 800 bit/s) Standard vertical resolution 3,85 l/mm One-dimensional coding Recording width capabilities A4 Max. recording length capability unlimited Min. scan line time capability at the receiver 20 ms at 3,85 and 7,7 l/mm
V1.2 Extended Standard capabilities	FIF: 00 72 20 Receiver - T.4 operation Data signalling rate V.27 ter and V.29 Vertical resolution 7,7 l/mm One-dimensional coding Recording width capabilities A4 Max. recording length capability A4 and B4 Min. scan line time capability at the receiver 20 ms at 3,85 l/mm and 7,7 l/mm

**B.3.10.2 Content of the DCS frame used by the tester**

The value in the DCS frame shall be in accordance with the following table:

**Table B.15**

DCS	Coding (hex) and bit assignment for DCS-Facsimile Information Field (FIF)
V0 Standard capabilities	FIF: 00 40 00 Receiver - T.4 operation Data signalling rate 2 400 bit/s V.27 ter One-dimensional coding Recording width A4 Max. recording length A4 Min. scan line time 20 ms Standard vertical resolution 3,85 l/mm
V1 Standard capabilities	FIF: 00 50 00 Receiver - T.4 operation Data signalling rate 4 800 bit/s V.27 ter Recording width A4 Max. recording length A4 Min. scan line time 20 ms Standard vertical resolution 3,85 l/mm One-dimensional coding

## B.4 General tests

### B.4.1 Test No. L1 ... L15

Check by inspection:

**Table B.16**

Test No.	Description	Reference
L1	Test for Document Dimensions Document of 212 x 299 mm can be scanned.	6.3.1
L2	Test for adjustable output level	6/T.4 [2]
L3	Test for no control of receiver sensitivity	7/T.4 [2])
L4	Test for facsimile switching	6.7
L5	Test for answer incoming calls	6.8

Inspection shall only be from outside the equipment.

### B.4.2 Test No. T10 ... T20

**Table B.17**

TEST No.	Description	Reference
T10.1	Tester sends DIS with bits 19/20 = unlimited. Tester checks DCS received from SUT: allowed: A4, B4 and unlimited.	T.30 [3]
T10.2	Tester sends DIS with bits 19/20 = B4. Tester checks DCS received from SUT: allowed: A4 and B4.	T.30 [3]
T11	Test for scanning Track. Scan and transmit test chart No. 3 of CCITT from SUT. Tester checks that: - in the case of centre aligned scanner the centre of the central block of pattern 3,1 lies between picture elements 851 and 877; - in the case of right edge aligned scanner the centre of the line representing the extreme right edge of the horizontal scale 3,21 at the top of the test chart lies between picture elements 1 623 and 1 648.	6.3.2
T12	Test for basic scanned line length is 215 mm $\pm$ 1 %. SUT scans and transmits chart no. 3 of CCITT Recommendation T.21 [4] as purchased from CCITT. Verify that: - the length of the horizontal scales 3,21 on the top or the bottom of the page is represented by 1 512 to 1 542 pixels when decoded; - the image reconstructed, assuming 1 728 pels per line, is similar to the test chart.	6.3.2
T13	Test for scanning density 3,85 lines per mm $\pm$ 1 %. SUT scans and transmits chart no. 3 of CCITT Recommendation T.21 [4] as purchased from CCITT. Verify that: - the total number of transmitted lines lies between 1 132 and 1 155 for a scanning density of 3,85 lines per mm.	6.3.2

(continued)

Table B.17 (concluded)

TEST No.	Description	Reference
T14	<p>Test for position of the document. SUT scans and transmits chart no. 3 of CCITT Recommendation T.21 [4] as purchased from CCITT. Verify that:</p> <ul style="list-style-type: none"> <li>- the top edge of the reproduced document corresponds to one of the first 4 mm of the test chart (area 3.22 gives an easy reference).</li> </ul>	6.3.2
T15	<p>Test for fallback to the available receiving resolution. Tester sends DIS indicating standard capabilities (V1.1). The operator requires the transmission of a document by the SUT at the resolution of 7,7 l/mm (if available). Verify by monitoring DCS that SUT falls back to the resolution available on the other side.</p>	T.30 [3]
T16	<p>Introduce the characters of the FIF in the SUT, according to the procedure defined by the manufacturer and the role of T.30/5.3.6.2.4, T.30/3.6.2.5 and T.30/3.6.2.6. Check that:</p> <ul style="list-style-type: none"> <li>- the contents received by the tester from the SUT in the FIF of CSI/CIG/TSI are in line with T.30.</li> </ul>	T.30 [3]
T17	<p>Tests for automatic call. Set the SUT up to make an automatic call (if provided). Check that:</p> <ul style="list-style-type: none"> <li>- CNG according to 4.3.3.3/T.30 is transmitted.</li> </ul>	T.30 [3]
T18	<p>Tests for TSI (if possible). Perform test TN2-TN4. Check that:</p> <ul style="list-style-type: none"> <li>- TSI is transmitted before DCS.</li> </ul>	T.30 [3]
T19	<p>Tests for incompatible receiver. The tester transmits DIS with FIF 00 00 00 (hex). Check that:</p> <ul style="list-style-type: none"> <li>- the SUT disconnects after receiving DIS.</li> </ul>	T.30 [3]

B.4.3 Test No. R10 ... R20

Table B.18

Test No.	Description	Reference
R10	Test for orientation of picture elements. Tester sends chart "IMPRESS". Check that: - it is represented with the correct orientation.	6.4
R11	Tests for density of picture elements, centre or right hand edge position and first recorded line The tester transmits test chart "IMPRESS" (see T5.2). Check that: - area No. 9 is between 198 mm and 202 mm long; - in the case of centre aligned printer the centre of the recording medium lies within the central bar of area No. 2 over top 20 mm of printed document; - in the case of right edge aligned printer the point 10 mm from right edge of recording medium lies within the right bar of area No. 2 within the top 20 mm of printed document; - area No. 1 is present over at least 200 mm of the document width and between 0 and 4 mm from the top edge.	6.4
R12	Test for recorded density 3,85 lines per mm $\pm$ 1 %. Tester sends chart "IMPRESS". Check that: - area 16 is between 198 mm and 202 mm in height.	2/T.4 [2]
R13	Tests for printing capability and receiver sensitivity. The tester transmits test chart "IMPRESS" (see sub-clause B.5.2) at - 43 dBm. Check that: - areas No. 4, 5, 7, 11, 13, 14, 15 are represented.	7/T.4 [2]  6.5
R14	Tests for calling SUT, wishing to receive. The SUT is set up to receive (if possible) and make a call. Check that: - the SUT transmits CIG (if possible) + DTC after receiving DIS.	T.30 [3]
R15	Tests for CSI (if possible). Perform test RN1, RN2. Check that: - CSI is transmitted before DIS.	T.30 [3]
R16	Test for received image quality criteria. The tester transmits two test charts "ERROR" (see T5.4) with the following number of faulty lines: 4,9 %, 15,1 %. Check: - that the chart with 4,9 % is accepted; - that the chart with 15,1 % is rejected.	6.6.3

## B.5 Test charts

### B.5.1 Test of 1-dimensional coding

The test chart is sent by the tester to the equipment under test. It allows the verification that the receiver understands all the Huffman code words. The chart is prepared by synthesis and its coded form contains all the existing code words for a A4 size paper.

Since there are equipment which are limited to A4 size, the test chart consists of two parts:

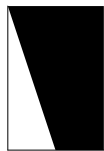
Part 1:

Line No.	No of white run length	No of black run length	Remark
0	0	1 728	
1	1	1 727	
...			
1 000	1 000	728	
1 001	0	1 728	End of page reference

Part 2:

Line No.	No of white run length	No of black run length	Remark
0	728	1000	
1	729	999	
...			
1 000	1 728	0	
1 001	0	1 728	End of page reference

These two charts are shown in figure B.1. Their names are "DIAGO1" and "DIAGO2".



"DIAGO1"



"DIAGO2"

Figure B.1

**B.5.2 Test of printing resolution**

In order to test the characteristics of the printing (or displaying) device of the SUT, a synthesised chart is sent to the SUT and printed (or displayed). It contains thin details.

The chart is shown in figure B.2 (IMPRESS).

"B" = "black pixel";

"W" = "white pixel".

**Table B.19**

No. of area	Description of area	Vertical location (line no.)	Horizontal location (pixel no.)	Height (lines)	Width (pixel)	Form Description
1	Horizontal reference	1		1	1 728	1 728 B
2	Vertical block bars	2 ... 78		77	1 728	850 W + 27 B + 745 W + 26 B + 80 W
3	Space	79		1	1 728	1 728 W
4	4 cycles/mm vertical lines	80 ... 117		38	1 728	864 x [ 1 B+ 1 W] 432 x [ 2 B+ 2 W]
5	4 cycles/mm	118 ... 155		38	1 728	864 x [ 1 B+ 1 W] 432 x [ 2 B+ 2 W]
6	Space	156 ... 193		38	1 728	1 728 W
7	1,9 cycles/mm horizontal lines	194 ... 231		38	1 728	19 [1 line [1 728 B] + 1 line [1 728 W]]
8	Space	232 ... 269		38	1 728	1 728 W
9	200 mm horizontal line	270 ... 276		7	1 728	[60 W + 1607 B + 61 W]
10	Space	277 ... 314		38	1 728	1 728 W
11	Isolated black pixels	315		1	1 728	64 [1 B + 26 W]
12	Space	316 ... 353		38	1 728	1 728 W
13	White cross on black background - background - vertical branch - horizontal branch	354 ... 480 358 ... 476 417	209 ... 768 488, 489 217 ... 760	127 119 1	560 2 544	
14	Black cross on white background + black frame - frame upper - frame lower - frame left - frame right - vertical branch - horizontal branch	354 ... 357 477 ... 480 358 ... 476 358 ... 476 358 ... 476 417	962 ... 1 521 962 ... 1 521 962 ... 969 1 514 ... 1 521 1 241 970 ... 1 513	4 4 119 119 119 1	560 560 8 8 1 544	
15	Black vertical line	354 ... 1 079	864	726	1	
16	Black vertical bar	157 ... 926	884 ... 899	770	16	



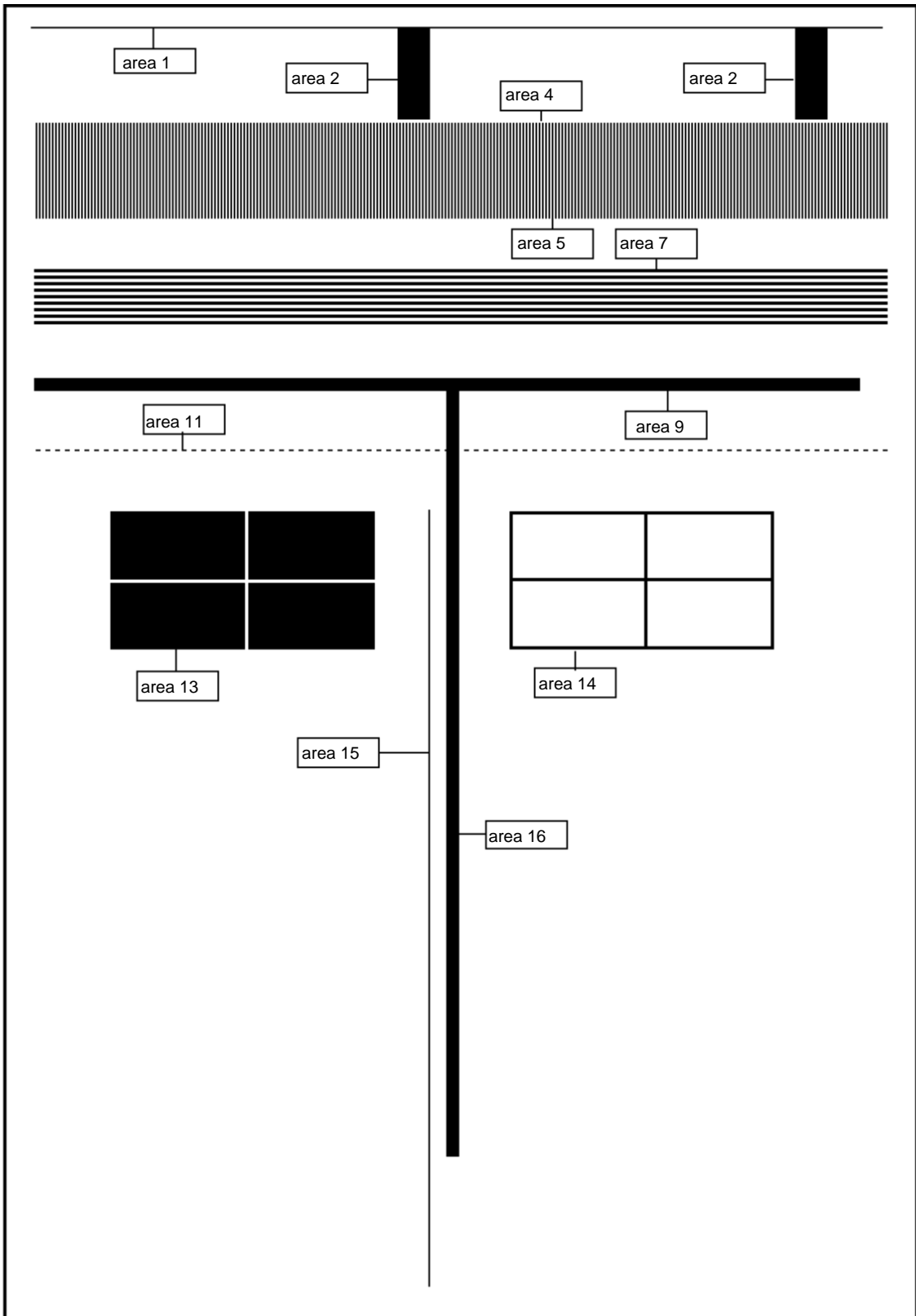


Figure B.2

**B.5.3 Testing of the acceptance of lines 5 seconds long**

Two test charts are sent to the SUT:

- DURATION1, which encloses lines which are 4,9 s long;
- DURATION2, which encloses lines which are 5,1 s long.

Description of the charts.

The lines of the chart which are 4,9 or 5,1 s long are made of a long pattern of bit, completed by fill bits before the EOL signal.

**Table B.20**

No of area	Description of area	No. of lines (height)	Length in mm or width in pixel	Remark/Pixels
1	For delimitation	1	1 728 pixel	1 728 B
2	For delimitation	116	1 728 pixel	1 728 W
3	For delimitation	1	1 728 pixel	1 728 B
5	Test pattern + fill bits	200	1 728 pixel	864 x [1W+ 1B]
6	For delimitation	1	1 728 pixel	1 728 B
7	For delimitation	116	1 728 pixel	1 728 W
8	For delimitation	1	1 728 pixel	1 728 B

The pattern is a line of 864 x [1 white pixel + 1 black pixel]. After Huffman coding this pattern is 864 x [6 bits + 3 bits] = 7 776 bits. Depending on the transmission speed the actual number of fill bits is:

DURATION1 (4,9 s)	DURATION2 (5,1 s)	
2 400 bit/s	3 972	4 452
4 800 bit/s	15 732	16 692
7 200 bit/s	27 492	28 932
9 600 bit/s	39 252	41 172

**B.5.4 Test chart for 20 ms and copy quality criteria**

The chart "ERROR" could be described as "zig-zag-shaped" (see figure B.3).

**B.5.4.1 Description of the pattern**

The chart consists of a pattern separated ten times. The pattern consists of 26 lines, each of them including a black part 64 points long surrounded by white points.

- The first black point of the first line of the pattern begins at the seventeenth point among the 1 728 ones of an A4 page.
- Each of the 25 lines following has its black portion offset to the right with regard to the black portion of the previous line.
- The offset is 64 points long.

NOTE: "B" = "black pixel";  
 "W" = "white pixel".

Table B.21

Line No.	No of white (W) and black (B) pixel	Remark
1	[ 16 W + 64 B + 1 648 W]	
2	[ 80 W + 64 B + 1 584 W]	
...		
26	[ 1 616 W + 64 B + 48 W]	End of the pattern

**B.5.4.2 Description of the whole error-free test chart**

An idea of the test chart is given in figure B.3.

Table B.22

No.	Area Name location	Vertical (lines)	Height (pixel)	Width	Formal Description
1	Space	1 ... 68	68	1 728	68 x [ 1 728 W]
2	Reference	69	1	1 728	1 728 B
3	Space	70	1	1 728	1 728 W
4	Pattern 1	71	26	1 728	[ 16 W + 64 B + 1 648W]
		72	26	1 728	[ 80 W + 64 B + 1 584 W]
		73	26	1 728	.
		.	.	.	.
		.	.	.	.
5	Pattern 2	96	26	1 728	[ 1 616 W + 64 B + 48 W]
		97	26	1 728	[ 16 W + 64 B + 1 648 W]
		98	26	1 728	[ 80 W + 64 B + 1 584 W]
		.	26	1 728	.
		.	.	.	.
6	Pattern 3	122	26	1 728	[ 1 616 W + 64 B + 48 W]
		123	1 728		
		.	.		
		.	.		
		148	1 728		
.					
.					
.					
13	Pattern 10	305	26	1 728	.
		.	.	.	.
		.	.	.	.
14	Space	330	26	1 728	[ 1 616 W + 64 B + 48 W]
		331	1	1 728	1 728 W
15	Reference	332	1	1 728	1 728 B
16	Space	333 ... 400	68	1 728	68 x [ 1 728 W]

**B.5.4.3 Test charts including errors**

Errors are introduced in the test chart by modifying one bit of the Huffman coded line. The first bit of the line is replaced by its complement. Errors do not affect EOL code words.

**B.5.4.4 Test charts with single errors**

In order to get a defined percentage of errors in the document which is 400 lines long, faulty lines are introduced in the 260 lines of the 10 patterns.

- For 4,9 % 19 errors are necessary.
- For 15,1 % 61 errors are necessary.

Errors are introduced on lines numbered:

For < 5 % lines           79, 85, 105, 111, 133, 137, 157, 163, 183, 189, 209, 215, 235, 248, 261, 267,  
287, 293, 313;

For > 15 % lines        listed above + 73, 76, 88, 91, 94, 99, 102, 117, 120, 125, 128, 143, 146, 151,  
154, 169, 172, 177, 180, 195, 198, 203, 206, 221, 224, 229, 232, 247, 250, 255,  
258, 273, 276, 281, 284, 299, 302, 307, 310, 319, 325, 328.

**B.5.4.5        Reading of the charts received and recorded, interpretation of the results**

A faulty line on any of the 26 patterns is easily detectable because of the structure of the chart:

- if the SUT does not record the faulty lines, each of them will appear on a 26 lines pattern as a white discontinuity 64 points long;
- if the SUT records the previous safe line when it receives a faulty line, each faulty line will appear on the pattern as a white discontinuity 64 points long, following a doubled black portion line 64 points long.

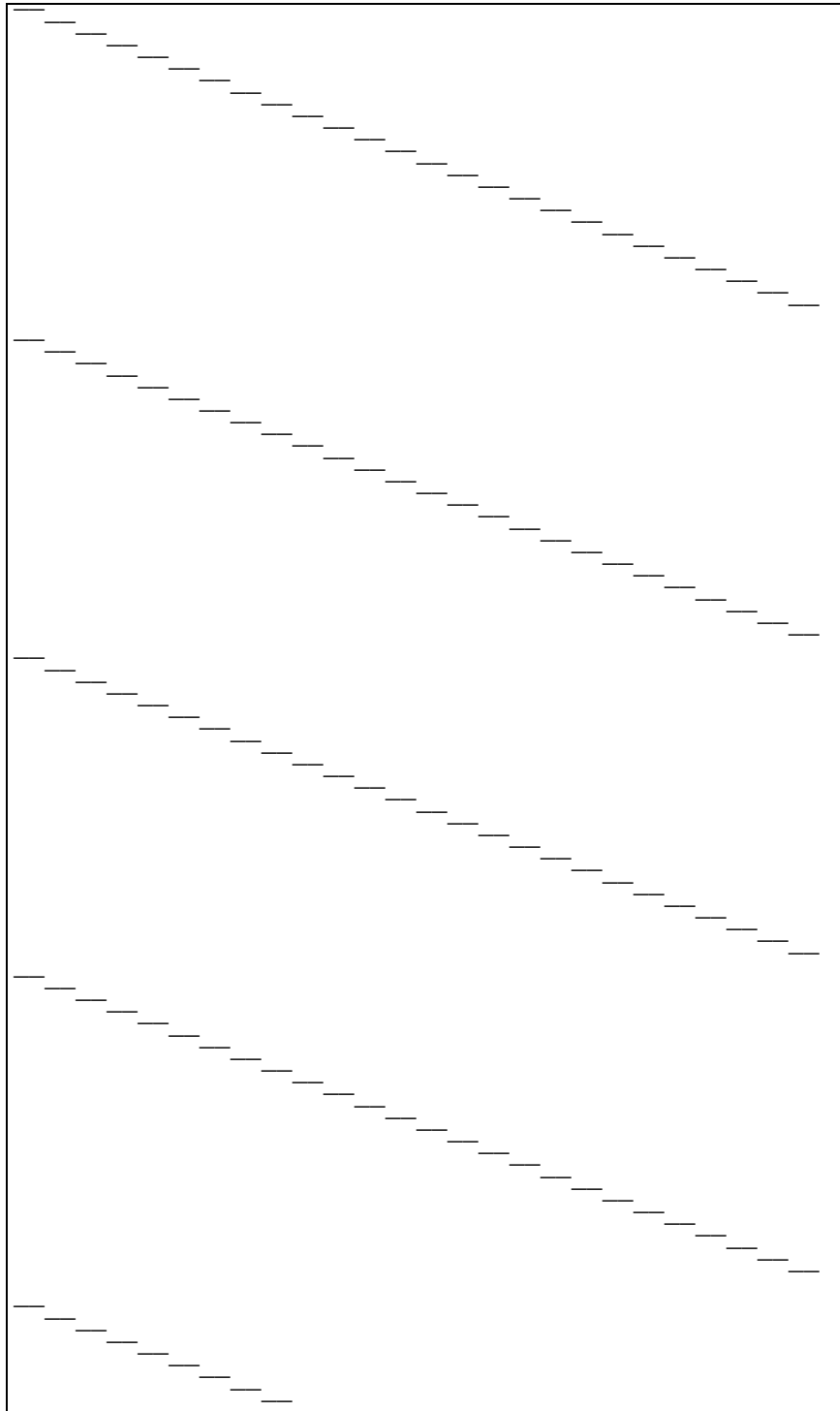


Figure B.3

## B.6 Tests for extended facsimile functions

Table B.23

TEST No.	Description	Reference
1	Test for activity log: Check: - that an activity log is available.	6.9.2

## History

Document history	
December 1992	First Edition
February 1996	Converted into Adobe Acrobat Portable Document Format (PDF)