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

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Foreword

This second edition 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 second edition European Telecommunication Standard (ETS) specifies the technical characteristics to be met by Group 3 facsimile equipment to enable reliable document interchange between compliant equipment. This edition contains amendments to align the text with the relevant ITU-T Recommendations current at the end of December 1994 and also to correct some editorial errors and it cannot be fully applied to equipment designed to later versions of the relevant ITU-T Recommendations.

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

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: "Attachments to Public Switched Telephone Network (PSTN); General technical requirements for equipment connected to an analogue subscriber interface in the PSTN".
- [2] ITU-T Recommendation T.4 (1994): "Standardization of Group 3 facsimile apparatus for document transmission".
- [3] ITU-T Recommendation T.30 (1994): "Procedures for document facsimile transmission in the general switched telephone network".
- [4] ITU-T Recommendation T.22 (1994): "Standardized test charts for document facsimile transmission".
- [5] ITU-T Recommendation V.17 (1991): "A 2-wire modem for facsimile applications with rates up to 14 400 bit/s".
- [6] ITU-T Recommendation V.27 ter (1989): "4 800/2 400 bits per second modem standardized for use in the general switched telephone network".
- [7] ITU-T Recommendation V.29 (1989): "9 600 bits per second modem standardized for use on point-to-point 4-wire leased telephone-type circuits".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of this ETS, the following definitions apply:

NOTE: In addition to the definitions shown below, the definitions given in ITU-T Recommendations T.4 [2], T.30 [3] and T.22 [4] also apply.

group 3 facsimile terminal equipment: This is referred to throughout this ETS as the "facsimile equipment".

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.

3.2 Abbreviations

For the purposes of this ETS, the following abbreviations apply:

ac	alternating current
CED	Called Station Identification
CFR	Confirmation to Receive
CIG	Calling Subscriber Identification
CNG	Calling Tone
CRP	Command Repeat
CSI	Called Subscriber Identification
CTC	Continue To Correct
dc	direct current
DCN	Disconnect
DCS	Digital Command Signal
DIS	Digital Identification Signal
DTC	Digital Transmit Command
ECM	Error Correction Mode
EMC	Electromagnetic Compatibility
EOL	End of Line
EOM	End of Message
EOP	End of Procedure
FIF	Facsimile Information Field
FCF	Facsimile Control Field
FCS	Frame Checking Sequence
FTT	Failure to Train
LAN	Local Area Network
MCF	Message ConFirmation
MPS	Multi Page Signal
PABX	Private Automatic Branch Exchange
pel	picture elements
PIN	Procedural Interrupt Negative
PIP	Procedural Interrupt Positive
PPR	Partial Page Request
PPS-EOP	Partial Page Signal - End of Procedure
PPS-MPS	Partial Page Signal - Multi Page Signal
PPS-NULL	Partial Page Boundary Signal
PSTN	Public Switched Telephone Network
RNR	Receive Not Ready
RTC	Return to Control
RTN	ReTrain Negative
RTP	ReTrain Positive
SUT	System Under Test
TCF	Training Check
TSI	Transmitting Subscriber Identification

4 General requirements

General requirements concerning access to the PSTN, safety and EMC requirements are not contained in this ETS.

5 Technical characteristics

5.1 General

The facsimile equipment shall comply with the requirements of ITU-T Recommendation T.4 [2], paragraphs 1, 2, 3, 4, 5, 6, 7, 8 and ITU-T Recommendation T.30 [3], paragraphs 1, 2, 3, 4.3, 5, and additional requirements as described in this ETS. The facsimile equipment may also include the optional error correction mode described in ITU-T Recommendation T.30 [3], annex A.

The testing specification is given in annex B.

Requirements for the scanner of the facsimile equipment based on test chart No. 4 of ITU-T Recommendation T.22 [4], are contained in annex A. This applies only if a physical scanner is implemented.

5.2 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.

5.3 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.

5.3.1 Document dimensions

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

5.3.2 Scanning track

The density of picture elements (pel)s along the scanned line shall be between 7,79 pel/mm (200 pels/25,4 mm -1 %) and 8,12 pel/mm (1 728 pels/215 mm +1 %). The basic scanned line contains 1 728 pels. This length is thus between $1\ 728/7,79 = 221,8$ mm and $1\ 728/8,12 = 212,8$ mm.

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 line length, other lengths may be implemented.

The basic scanning density shall be between 3,81 line/mm (3,85 line/mm -1 %) and 3,98 line/mm (100 line/25,4 mm +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 equipment.

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 if the facsimile equipment does not transmit information related to its identity as part of the image signal. If the facsimile equipment does transmit information related to its identity as part of the image signal, then the first line to be coded and transmitted lies between 0 mm and 14 mm down the document from the top edge.

5.4 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 be between 7,79 pel/mm and 8,12 pel/mm.

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 5 mm down the received copy from the top edge.

5.5 Performance

The performance of the facsimile equipment shall be evaluated using the ITU-T Facsimile Test Chart No. 4 detailed in ITU-T Recommendation T.22 [4]. Performance tests of the facsimile equipment are described in annex A of this ETS.

5.6 Control procedures for message transmission and reception

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

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

5.7 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 ReTrain Negative (RTN) or Procedural Interrupt Negative (PIN) signal 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 Message ConFirmation (MCF), ReTrain Positive (RTP), Procedural Interrupt Positive (PIP) signal during phase D of the facsimile procedure if less than 5 % of the detected lines are faulty.

5.8 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.

5.8.1 Automatic calling equipment

Automatic calling is not a mandatory feature.

5.8.2 Facsimile to telephone mode switching

The facsimile equipment shall disconnect itself from the telephone line:

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

5.9 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 ITU-T 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.

5.10 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.4 of ITU-T Recommendation T.22

Application of TEST CHART No. 4

Due to the width of the test chart No 4 as purchased from ITU-T (width 222 mm), and as the scanner of the System Under Test (SUT) is not required to accept documents larger than 212 mm (see subclause 5.3.1), it is necessary to trim the chart by reducing its width to perform some of the tests described in annexes A and B.

Specifically, to perform test T9 the chart is trimmed equally about the centre line so that it becomes 210 mm wide.

Operational conditions for the test are as follows:

- standard operational conditions as indicated by the manufacturer;
- basic scanning density.

Table A.1: Interpretation of zones of test chart n°4 in ITU-T Recommendation T.22

Interpretation of zones on original chart	Requirement on transmitted document
<p>Pattern 2 Black band covering the entire page width. Permits adjustment of characteristic "black" signals through the entire sequence of electronic devices.</p>	<p>Pattern 2 This zone shall be reproduced with a homogeneous black colour.</p>
<p>Pattern 7A 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 thickness is indicated in microns.</p>	<p>Pattern 7A Black lines: at least the line with a thickness greater than 100 microns shall be reproduced. The whole black colour shall be obtained for lines with thickness greater than 200 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 a thickness greater than 300 microns.</p>
<p>Pattern 8 Calibrated line pairs (black plus white) per millimetre. Permits verification of standardized facsimile machine definition.</p>	<p>Pattern 8 The black lines with 2 pairs of lines per mm on the received copy, shall be separated.</p>
<p>Pattern 3D Vertical bundles (converging patterns). These bundles of converging lines permit 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>Pattern 3D The 15 black lines on vertical bundles shall be distinguished from a thickness of 300 microns.</p>

Annex B (normative): Testing

B1 Overview

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

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

B.1.1 Testing conditions

B.1.1.1 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 facsimile equipment as stated by the applicant.

B.1.1.2 Power supply limitations

For facsimile equipment that is 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 alternating current (a.c.) the tests shall be conducted within $\pm 4\%$ of the stated frequency as declared by the applicant.

If the facsimile equipment is powered by other means and those means are not supplied as part of the facsimile equipment, e.g. batteries, stabilized ac supplies, direct current (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 SUT with a physical printer (not required for send-only-facsimile equipment) and a physical scanner (not required for receive-only-facsimile equipment), each of them being located in the same private domain, and connected locally or through a Local Area Network (LAN) or a Private Automatic Branch Exchange (PABX) etc., to fulfil the requirements of the present specification.

B.1.2 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 5.2.

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.

All the tests that are not speed specific can be carried out at the highest speed provided by the facsimile equipment.

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 ITU-T Recommendation T.30 [3] and to this ETS. Application service test procedures test the conformance to ITU-T Recommendation T.4 [2] and to this ETS.

B.1.3 Protocol test procedures

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

B.1.3.1 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. However, for efficiency, tests may be combined.

NOTE: For brevity the tables indicate a single command followed by the expected response. It is acceptable for the response to be given to a subsequent repeat of the command.

B.1.3.2 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

B.1.3.2.1 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.1.3.2.2 Test type

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

B.1.3.2.3 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 ITU-T Recommendation T.30 [3] unless specified otherwise.

B.1.3.2.4 Tester detects

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

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

B.1.3.2.5 Comments

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

B.1.3.3 Commands/responses list

Separate lists specify the commands/responses used within the test tables (see clause B.8 "Commands/responses list").

B.1.4 Application service test procedures

B.1.4.1 Application service tests

The application service tests establish a number of scenarios which test the conformance of the facsimile equipment to ITU-T 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 through a combination of tests.

B.1.4.2 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.1.5 Definitions and abbreviations

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

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

B.1.6 Generalities

Tolerances for the following tests are as defined in the ITU-T Recommendations.

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

For efficiency in testing, tests may be combined.

B.2 Tests for ITU-T Recommendation T.4

B.2.1 Test No. T1 to T6

Testing normal conditions.

Facsimile equipment transmitting.

NOTE: To perform the test T1, the test chart No.4 of Recommendation T.22 [4] as purchased from ITU-T may be trimmed (see annex A).

Table B.3

Test No.	Description	Reference
T1	Transmitting standard resolution, standard scan line length, ISO A4 size and one-dimensional coding scheme. SUT transmits test chart No. 4 of ITU-T Recommendation T.22 [4] (note). Tester uses DIS V1.3. Check that: - the contents of the page are represented according to annex A.	ITU-T Recommendation T.4 [2] clauses 1, 2 and 4
T2	Test for transmission of 20 ms scan line. 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 V1.2. Check that: - all lines have a duration of at least 20 ms.	ITU-T Recommendation T.4 [2] subclause 3.1
T3	Test for transmission at 4 800 bit/s. The tester indicates in the DIS information field the capability ITU-T Recommendation V.27 ter [6]. The SUT transmits a white page. Tester uses DIS V1.1. Check: - that the SUT transmits the page at 4 800 bit/s; - the pause of 75 ± 20 ms between Digital Command Signal (DCS) and modem training; - the pause of 75 ± 20 ms between Return to Control (RTC) and digital handshaking.	ITU-T Recommendation T.4 [2] clause 5
T4	Test for transmission at 2 400 bit/s. The tester indicates in the DIS information field the capability ITU-T Recommendation V.27 ter [6] fallback mode. The SUT transmits a white page. Tester uses DIS V1.0. Check: - the SUT transmits the page at 2 400 bit/s; - the pause of 75 ± 20 ms between DCS and modem training; - the pause of 75 ± 20 ms between RTC and digital handshaking.	ITU-T Recommendation T.4 [2] clause 5
T5	Test for transmission with ITU-T Recommendation V.27 ter [6] modulation system (2 400 and 4 800 bit/s). Tester uses DIS V1.1. Check: - that the training is according to ITU-T Recommendation V.27 ter [6] long training sequence with protection against talker echo (ITU-T Recommendation V.27 ter [6], table 3).	ITU-T Recommendation T.4 [2] subclause 5.2
T6	This test is applicable only to facsimile equipment that claims to incorporate the ITU-T Recommendation V.29 [7] modulation system. Test for transmission with ITU-T Recommendation V.29 [7] modulation system (7 200 and 9 600 bit/s). Tester uses DIS V1.2. Check: - that the training is according to ITU-T Recommendation V.29 [7].	ITU-T Recommendation T.4 [2] subclause 5.2

B.2.2 Test No. R1 to R5

Testing normal conditions.

Facsimile equipment receiving.

Table B.4

Test No.	Description	Reference
R1	<p>Receiving and presenting standard resolution, standard scan line length, one-dimensional coding scheme and 20 ms scan line. The tester transmits two test charts "DIAGO1" and "DIAGO2" (see subclause B.5.1) using DCS V1.1 which uses all the Huffman length code words. Check that:</p> <ul style="list-style-type: none"> - the SUT represents monotonic boundary between black and white. 	<p>ITU-T Recommendation T.4 [2] clauses 1, 2, 4 and subclause 3.1</p>
R2	<p>Test for transmission time of 5 s and reception at 4 800 bit/s. The tester transmits two test charts "DURATION1" and "DURATION2" (see B.5.3) using DCS V1.1. Check that:</p> <ul style="list-style-type: none"> - the SUT does not disconnect with test chart "DURATION1" and represents it; - the SUT disconnects with test chart "DURATION2". 	<p>ITU-T Recommendation T.4 [2] clauses 2 and 5</p>
R3	<p>Test for reception at 2 400 bit/s. The tester transmits test charts "DIAGO1" and "DIAGO2" at 2 400 bit/s using DCS V1.0. Check that:</p> <ul style="list-style-type: none"> - the SUT accepts the test chart and can represent it. 	<p>ITU-T Recommendation T.4 [2] clause 5</p>
R4	<p>Receiving an all white page document not exceeding A4 length. Check that:</p> <ul style="list-style-type: none"> - the pause between Called Station Identification (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). 	<p>subclause 5.6 of this ETS</p>
R5	<p>Test for reception at 14 400 bit/s if applicable with normal conditions. The tester transmits test chart "IMPRESS" using DCS V1.2. Check that:</p> <ul style="list-style-type: none"> - the SUT accepts the test chart and can represent it. 	<p>ITU-T Recommendation T.4 [2] clauses 1, 2 and 4</p>

B.3 Tests for ITU-T Recommendation T.30

B.3.1 Test No. TN1 to 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.

Table B.5

Test No.	Type of test	Tester action	Tester detects	Comments
TN1	Transmit Calling Tone (CNG)		R-CNG	
TN2	Receive CED, Digital Identification Signal (DIS)	T-CED, DIS		DIS V1.3
TN3	Transmit DCS		R-DCS	(note)
TN4	Transmit training, Training Check (TCF)		R-training, TCF	
TN5	Receive Confirmation to Receive (CFR)	T-CFR		
TN6	Transmit fax message		R-fax message	
TN7	Transmit Multi Page Signal (MPS)		R-MPS	
TN8	Receive MCF	T-MCF		
TN9	Transmit fax message		R-fax message	
TN10	Transmit End of Procedure (EOP)		R-EOP	
TN11	Receive MCF	T-MCF		
TN12	Transmit Disconnect (DCN)		R-DCN R-disconnect	

NOTE: Optional signals may appear before DCS.

B.3.2 Test No. RN1 to 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 RN7, RN8 and RN9 shall not be applied.

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 V1.2
RN4	Receive training, TCF	T-training, TCF		
RN5	Transmit CFR		R-CFR	
RN6	Receive fax message	T-fax message		
RN7	Receive MPS	T-MPS		
RN8	Transmit MCF		R-MCF	
RN9	Receive fax message	T-fax message		
RN10	Receive EOP	T-EOP		
RN11	Transmit MCF		R-MCF	
RN12	Receive DCN	T-DCN	R-disconnect	
NOTE: Optional signals may appear before DIS.				

B.3.3 Test No. TEB10 to TEB11

Testing exception conditions from phase B (state B1: command rec? = yes).

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	Timeout (T1)	Do nothing	R-disconnect	
TEB11	Receive initial identification with Frame Checking Sequence (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-Command Repeat (CRP) Nothing or R-CRP R-DCS, R-training, TCF	Tester sends DIS V1.3 with FCS error twice

B.3.4 Test No. TEB20 to TEB25

Testing exception conditions from phase B (state B2: response rec? = yes).

Facsimile equipment transmitting/tester receiving. Facsimile equipment is calling.

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

- T-DIS V1.3;
- R-DCS;
- R-training, TCF.

Table B.8

Test No.	Type of test	Tester action	Tester detects	Comments
TEB20	Receive Failure to Train (FTT) Continue to receive FTT	T-FTT Repeat n times to T-FTT after R-DCS, R-training, TCF	R-DCS R-training R-DCN R-disconnect	(note 1) (note 2)
TEB21	Time out (T4)	Do nothing Do nothing Do nothing	R-DCS R-training, TCF R-DCS R-training, TCF R-DCN R-disconnect	(note 1)
TEB22	3rd try	T-DIS T-DIS T-DIS	R-DCS R-training, TCF R-DCS R-training, TCF R-DCN R-disconnect	(note 1)
TEB23	Receive CFR twice with FCS error	T-CFR with FCS error T-CFR with FCS error T-CFR without FCS error	R-DCS R-training, TCF R-DCS R-training, TCF R-Fax message	
TEB24	Receive CRP	T-CRP	R-DCS R-training, TCF	R-DCS immediately or after T4 timeout
TEB25	Receive DCN	T-DCN	R-disconnect	
NOTE 1: Optional signals may appear before DCS.				
NOTE 2: The value of n depends on the SUT.				

B.3.5 Test No. TED10 to TED15

Testing exception conditions from phase D (state D1: response rec? after last doc? = no).

Facsimile equipment transmitting/tester receiving. Facsimile equipment is calling. Facsimile equipment is set up to transmit multiple document.

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.

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

- T-DIS V1.3;
- R-DCS;
- R-training, TCF;
- T-CFR;
- R-fax message;
- 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-training, TCF	
TED12	Receive RTN	T-RTN	R-DCS R-training, TCF	
TED13	Receive MCF twice with FCS error	T-MCF with FCS error T-MCF with FCS error T-MCF without FCS error	R-MPS R-MPS R-fax message	
TED14	Receive CRP	T-CRP	R-MPS	R-MPS may be delayed by T4 timeout
TED15	Receive DCN	T-DCN	R-disconnect	

B.3.6 Test No. TED20 to 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 perform:

- T-DIS V1.3;
- R-DCS;
- R-training, TCF;
- T-CFR;
- R-fax message (the document shall be an all white page not exceeding A4 length);
- R-EOP.

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-training, TCF or R-DCN R-disconnect	
TED23	Receive MCF twice 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 to 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 End of Message (EOM) for example by changing vertical resolution for the second page.

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

- T-DIS V1.3;
- R-DCS;
- R-training, TCF;
- T-CFR;
- R-fax message (the document shall be all white pages not exceeding A4 length);
- R-EOM.

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 T-DIS (after T2 timeout)	R-nothing during T2 timeout R-DCS	
TED32	Receive RTP	T-RTP T-DIS (after T2 timeout)	R-nothing during T2 timeout R-DCS	
TED33	Receive RTN	T-RTN If no DCS, training - TCF received, after T2 timeout T-DIS	R-DCS R-training, TCF or R-DCN after T1 time out R-disconnect or R-disconnect after T1 timeout	
TED34	Receive MCF twice with FCS error	T-MCF with FCS error T-MCF with FCS error T-MCF without FCS error R-nothing T-DIS after T2 timeout	R-EOM R-EOM 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 to REB14

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 perform:

- 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	Timeout (T1)	Do nothing	R-DIS during T1 timeout R-disconnect or R-DCN R-disconnect	
REB11	Receive DCS twice with FCS error	T-DCS with FCS error T-training, TCF T-DCS with FCS error T-training, TCF T-DCS without FCS error T-training, TCF	R-DIS R-DIS R-CFR	
REB12	Receive Digital Transmit Command (DTC)	T-DTC	R-DCS R-training, TCF	DTC V1.3 document is available for polling without password (note)
REB13	Receive DIS	T-DIS	R-DIS or R-DCS R-training, TCF	DIS V1.3 document is available for polling without password (note)
REB14	Receive faulty TCF	T-DCS T-training, faulty TCF	R-FTT	TCF consists of 01010101....
NOTE: Test not performed if the SUT does not provide the capability to the terminal to be polled.				

B.3.9 Test No. REB20 to REB22

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 perform:

- R-DIS;
- T-DCS V1.2;
- T-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	Timeout (T2)	Do nothing	R-disconnect or R-DCN R-disconnect	
REB21	Timeout (T2) before message and after EOM To check reset of timer T2	Do nothing during 5 s T-fax message T-EOM Do nothing	R-MCF R-DIS	
REB22	Receive second occurrence of DCS-TCF	T-DCS T-training, TCF	R-CFR	

B.3.10 Test No. RED10 to RED11

Testing exception conditions from phase D (state D1: response rec? after last doc? = no).

Facsimile equipment receiving/tester transmitting. Facsimile equipment called.

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

- R-DIS;
- T-DCS V1.2;
- T-training, TCF;
- R-CFR;
- T-fax message;
- Table B.14.

Table B.14

Test No.	Type of test	Tester action	Tester detects	Comments
RED10	Simulation of MCF received in error	T-MPS T-MPS T-MPS	R-MCF R-MCF R-MCF	
RED11	Test timer T2 in phase D	Do nothing during 5 s T-MPS	R-nothing R-MCF	

B.4 General tests

B.4.1 Test No. L1 to L5

Check by inspection:

Table B.15

Test No.	Description	Reference
L1	Test for document dimensions. Document of 212 x 299 mm can be scanned	subclause 5.3.1 of this ETS
L2	Test for non-accessibility of access to the adjustment of the output level	ITU-T Recommendation T.4 [2], clause 6
L3	Test for no control of receiver sensitivity	ITU-T Recommendation T.4 [2], clause 7
L4	Test for facsimile switching	subclause 5.8 of this ETS
L5	Test for answer incoming calls	subclause 5.9 of this ETS

Inspection shall only be from outside the equipment.

B.4.2 Test No. T7 to T18

Table B.16

Test No.	Description	Reference
T7	Tester sends DIS with bits 19/20 = unlimited. Tester checks DCS received from SUT: allowed: A4, B4 and unlimited.	ITU-T Recommendation T.30 [3]
T8	Tester sends DIS with bits 19/20 = B4. Tester checks DCS received from SUT: allowed: A4 and B4.	ITU-T Recommendation T.30 [3]
T9	Test for scanning Track. Scan and transmit test chart No. 4 of ITU-T Recommendation T.22 [4] as purchased from ITU-T and trimmed as described in annex A. Tester checks that: <ul style="list-style-type: none"> - in the case of centre aligned scanner the vertical line corresponding to the figure "0" of pattern 2 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 of pattern 1 at the top of the test chart lies between picture elements 1 623 and 1 648. 	subclause 5.3.2 of this ETS
T10	Test for density of picture elements. SUT scans and transmits chart no. 4 of ITU-T Recommendation T.22 [4] as purchased from ITU-T. Verify that: <ul style="list-style-type: none"> - the length of the horizontal scales of pattern 1 on the top or the bottom of the page is represented by 1 481 to 1 542 pels when decoded; - the image reconstructed is similar to the test chart. 	subclause 5.3.2 of this ETS

(continued)

Table B.16 (concluded)

Test No.	Description	Reference
T11	<p>Test for basic scanning density. SUT scans and transmits chart no. 4 of ITU-T Recommendation T.22 [4] as purchased from ITU-T. Verify that:</p> <ul style="list-style-type: none"> - the length of the vertical scales of pattern 1 on the left or the right of the page is represented by 991 to 1 034 lines when decoded. 	subclause 5.3.2 of this ETS
T12	<p>Test for position of the document. SUT scans and transmits chart no. 4 of ITU-T Recommendation T.22 [4] as purchased from ITU-T. Verify that:</p> <ul style="list-style-type: none"> - the first line of the transmitted data represents a scanned line within the first 4 mm of the test chart when decoded if the SUT does not transmit information related to the transmitting terminal identity or the first line of the transmitted data represents a scanned line within the first 14 mm of the test chart when decoded if the SUT does transmit information relating to the transmitting terminal identity. 	subclause 5.3.2 of this ETS
T13	<p>Introduce the characters of the Facsimile Information Field (FIF) in the SUT, according to the procedure defined by the manufacturer and the rule of ITU-T Recommendation T.30 [3] subclauses 3.6.2.4, 3.6.2.5 and 3.6.2.6. Check that:</p> <ul style="list-style-type: none"> - the contents received by the tester from the SUT in the FIF of CSI/CIG/TSI are in line with ITU-T Recommendation T.30 [3]. 	ITU-T Recommendation T.30 [3]
T14	<p>Tests for CNG. Set the SUT up to make a call in manual and automatic mode (if provided). Check that:</p> <ul style="list-style-type: none"> - CNG according to ITU-T Recommendation T.30 [3] is transmitted. 	ITU-T Recommendation T.30 [3]
T15	<p>Tests for TSI (if possible). Perform test TN2 to TN4. Check that:</p> <ul style="list-style-type: none"> - TSI is transmitted before DCS. 	ITU-T Recommendation T.30 [3]
T16	<p>Tests for incompatible receiver. The tester transmits DIS with FIF 00 00 00 (hex). Check that:</p> <ul style="list-style-type: none"> - the SUT does not start the communication. 	ITU-T Recommendation T.30 [3]
T17	<p>Test for acceptance of bit 44, if appropriate. Tester sends DIS with bit 44 set to 1, indicating inch resolution preferred. The operator requires the transmission of a document by the SUT at the resolution of 7,7 l/mm or 200 l/25,4 mm (if available). Verify that transmission takes place anyway.</p>	ITU-T Recommendation T.30 [3]
T18	<p>Test for acceptance of bit 45, if appropriate. Tester sends DIS with bit 45 set to 1, indicating metric resolution preferred. The operator requires the transmission of a document by the SUT at the resolution of 7,7 l/mm or 200 l/25,4 mm (if available). Verify that transmission takes place anyway.</p>	ITU-T Recommendation T.4 [2] subclause 3.1

B.4.3 Test No. R6 to R12

The SUT may have user selectable settings affecting the printing process, such as scaling factor or printing of a communication identification line. The following tests shall be met by one combination of settings declared by the manufacturer.

Table B.17

Test No.	Description	Reference
R6	<p>Tests for density of picture elements, centre or right hand edge position and first recorded line. The tester transmits test chart "IMPRESS" (see annex B.5.2). Check that:</p> <ul style="list-style-type: none"> - area No. 9 is between 198 mm and 206 mm in length; - 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 5 mm from the top edge. 	subclause 5.4 of this ETS
R7	<p>Test for recorded density between 3,81 lines per mm (3,85 - 1 %) and 3,98 lines per mm (100 lines/25,4 mm +1 %) Tester sends chart "IMPRESS". Check that:</p> <ul style="list-style-type: none"> - area 16 is between 193 mm and 202 mm in height. 	ITU-T Recommendation T.4 [2] clause 2
R8	<p>Tests for printing capability and receiver sensitivity. The tester transmits test chart "IMPRESS" (see annex B.5.2) at -43 dBm. Check that:</p> <ul style="list-style-type: none"> - areas No. 4, 5, 7, 11, 13, 14, 15 are represented. 	ITU-T Recommendation T.4 [2] clause 7
R9	<p>Tests for calling SUT, wishing to receive. The SUT is set up to receive (if possible) and make a call. Check that:</p> <ul style="list-style-type: none"> - the SUT transmits CIG (if possible) + DTC after receiving DIS. 	ITU-T Recommendation T.30 [3]
R10	<p>Tests for CSI (if possible). Perform test RN1, RN2. Check that:</p> <ul style="list-style-type: none"> - CSI is transmitted before DIS. 	ITU-T Recommendation T.30 [3]
R11	<p>Test for received image quality criteria. The tester transmits two test charts "ERROR" (see annex B.5.4) with the following number of faulty lines: 4,9 % and 15,1 %. Check:</p> <ul style="list-style-type: none"> - that the chart with 4,9 % is accepted (e.g. tester receives MCF or RTP) - that the chart with 15,1 % is rejected (e.g. tester receives RTN). 	subclause 6.6.3 of this ETS
R12	<p>Test for acceptance of bit 44. Tester sends DCS with bit 44 set to 1. Tester sends Chart IMPRESS. Verify that the DCS-TCF is accepted by SUT (CFR is sent back).</p>	ITU-T Recommendation T.30 [3]

B.5 Test charts

B.5.1 One-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 A4 size paper.

Since some equipment is limited to A4 size, the test chart consists of two parts:

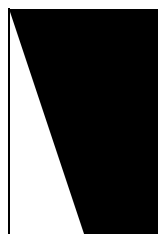
Part 1:

Line No.	White run length	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

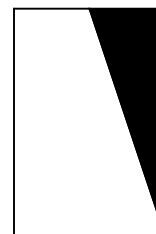
Part 2:

Line No.	White run length	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: Test charts DIAGO1 and DIAGO2

B.5.2 Printing resolution

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

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

B" = "black pel";

W" = "white pel".

Table B.18

No. of area	Description of area	Vertical location (line No.)	Horizontal location (pel No.)	Height (lines)	Width (pel)	Form description
1	Horizontal reference	1		1	1 728	1 728 B
2	Vertical block bars	2 to 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 to 117		38	1 728	864 x [1 B + 1 W]
5	4 cycles/mm vertical lines	118 to 155		38	1 728	864 x [1 W + 1 B]
6	Space	156 to 193		38	1 728	1 728 W
7	1,9 cycles/mm horizontal lines	194 to 231		38	1 728	19 [1 line [1 728 B] + 1 line [1 728 W]]
8	Space	232 to 269		38	1 728	1 728 W
9	200 mm horizontal line	270 to 276		7	1 728	[60 W + 1 607 B + 61 W]
10	Space	277 to 314		38	1 728	1 728 W
11	Isolated black pels	315		1	1 728	64 [1 B + 26 W]
12	Space	316 to 353		38	1 728	1 728 W
13	White cross on black background:					
	- background	354 to 480	209 to 768	127	560	
	- vertical branch	358 to 476	488 to 489	119	2	
	- horizontal branch	417	217 to 760	1	544	
14	Black cross on white background with black frame:					
	- frame upper	354 to 357	962 to 1 521	4	560	
	- frame lower	477 to 480	962 to 1 521	4	560	
	- frame left	358 to 476	962 to 969	119	8	
	- frame right	358 to 476	1 514 to 1 521	119	8	
	- vertical branch	358 to 476	1 241	119	1	
	- horizontal branch	417	970 to 1 513	1	544	
15	Black vertical line	354 to 1 079	864	726	1	
16	Black vertical bar	157 to 926	884 to 899	770	16	

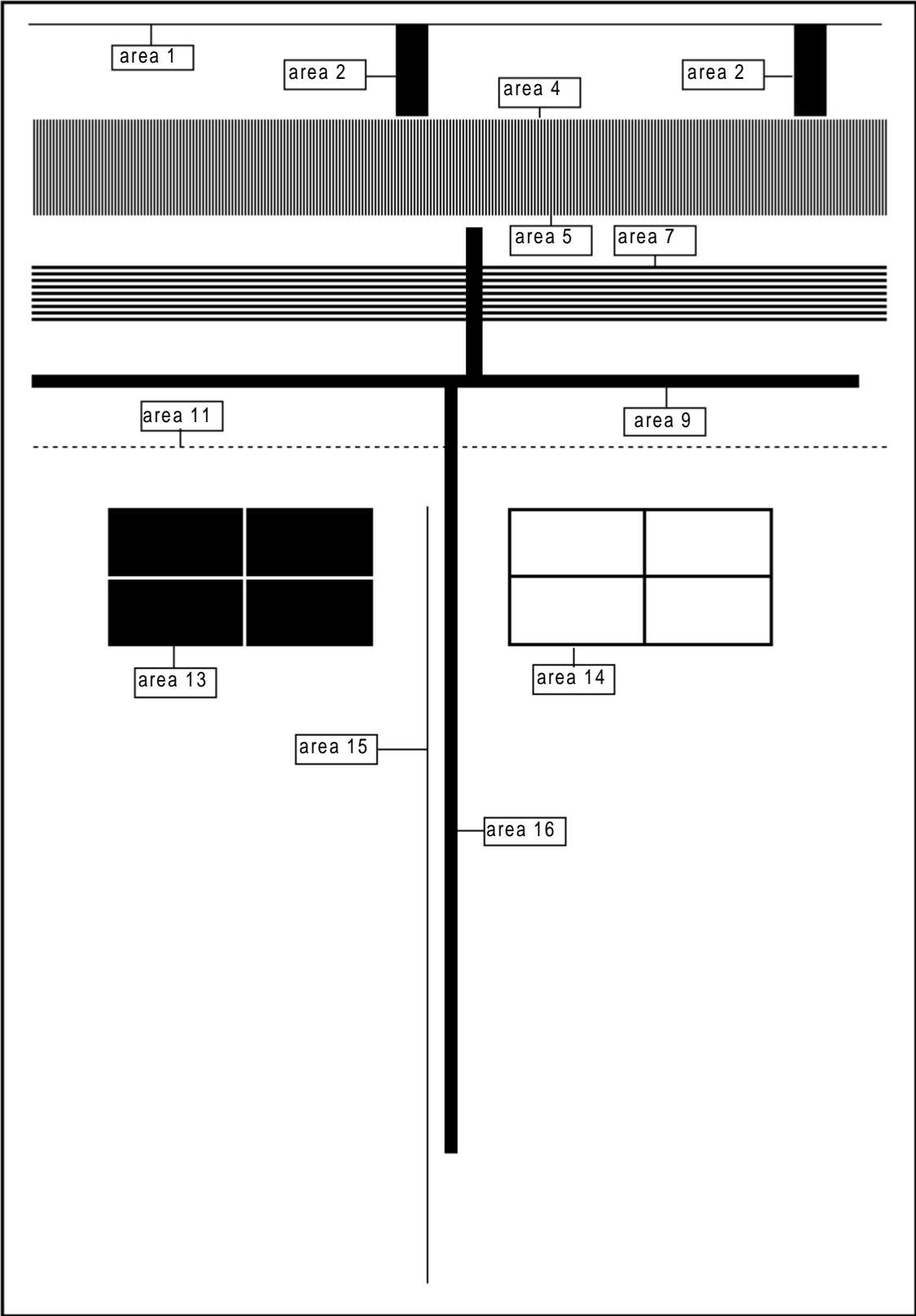


Figure B.2: Test chart IMPRESS

B.5.3 Acceptance of total coded scan line duration

Two test charts are sent to the SUT:

- DURATION1, includes lines which are 4,9 s long;
- DURATION2, includes lines which are 13,1 s long.

Description of the charts:

The lines of the chart which are 4,9 s or 13,1 s long are made of a long pattern of bits, completed by fill bits before the End of Line (EOL) signal.

Table B.19

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

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

Speed	Duration1 (4,9 s)	Duration2 (13,1 s)
4 800 bit/s	15 732	55 104

B.5.4 Copy quality criteria

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

B.5.4.1 Description of the pattern

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

- the first black pel of the first line of the pattern is the seventeenth pel of the 1 728 pels;
- 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 pels in length.

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

Table B.20

Line No.	No. of White (W) and Black (B) pels	Remark
1	[16 W + 64 B + 1 648 W]	
2	[80 W + 64 B + 1 584 W]	
to		
26	[1 616 W + 64 B + 48 W]	End of the pattern

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

Table B.21

No.	Area name	Vertical location	Height (lines)	Width (pel)	Formal description
1	Space	1 to 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	1	1 728	[16 W + 64 B + 1 648 W] [80 W + 64 B + 1 584 W]
		72	1	1 728	
		73	1	1 728	
		.	.	.	
		.	.	.	
		96	1	1 728	[1 616 W + 64 B + 48 W]
5	Pattern 2	97	1	1 728	[16 W + 64 B + 1 648W] [80 W + 64 B + 1 584 W]
		98	1	1 728	
		.	1	1 728	
		.	.	.	
		122	1	1 728	[1 616 W + 64 B + 48 W]
6	Pattern 3	123	1	1 728	
		.	.	.	
		.	.	.	
		148	1	1 728	
.					
.					
13	Pattern 10	305	1	1 728	
		.	.	.	
		330	1	1 728	[1 616 W + 64 B + 48 W]
14	Space	331	1	1 728	1 728 W
15	Reference	332	1	1 728	1 728 B
16	Space	333 to 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 pels long;
- if the SUT records the previous correct line when it receives a faulty line, each faulty line will appear on the pattern as a white discontinuity 64 pels long, following a doubled black portion line 64 pels long.

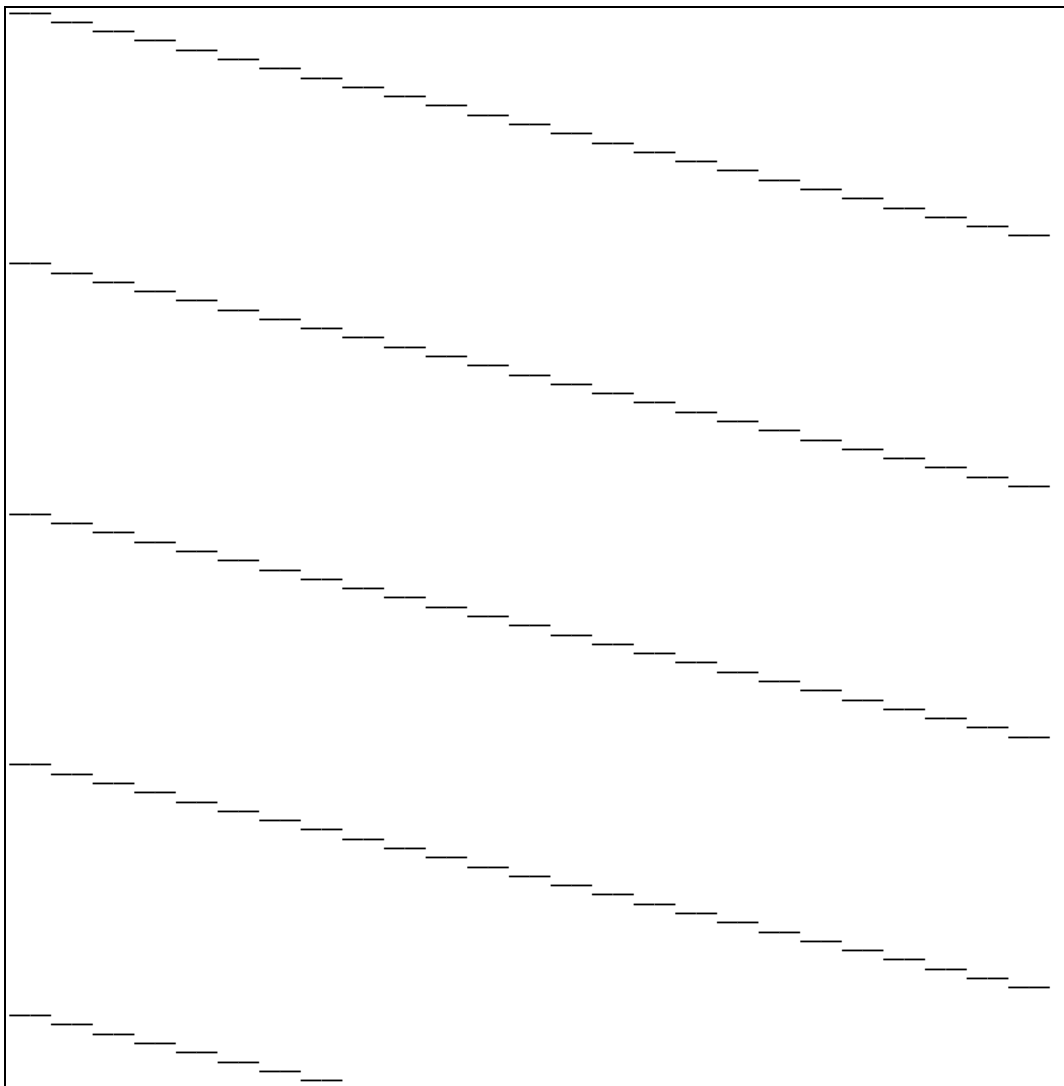


Figure B.3: Test chart ERROR

B.6 Tests for extended facsimile functions

Table B.22

Test No.	Description	Reference
1	Test for activity log: Check: - that an activity log is available	subclause 5.10 of this ETS

B.7 Tests for ITU-T Recommendation T.30 Error Correction Mode

These tests are applicable to facsimile equipment that claims to conform to the annex A of ITU-T Recommendation T.30 [3] procedures for communicating in Error Correction Mode (ECM).

B.7.1 Tests for normal conditions

B.7.1.1 Test No. TNO1 to TNO9

Testing normal conditions with ECM capability.

Facsimile equipment transmitting/tester receiving.

Facsimile equipment transmits two test charts in fine resolution (7,7 l/mm): first Test Chart No.4 of ITU-T Recommendation T.22 [4] followed by an all white page not exceeding A4 length.

For facsimile equipment not capable of transmitting in fine resolution (7,7 l/mm), tests TNO1 up to TNO9 shall not be applied.

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

- T-DIS V2.1;
- R-DCS;
- R-training, TCF;
- T-CFR;
- R-fax message in ECM.

For facsimile equipment capable of transmitting only one page, tests TNO4, TNO5 and TNO6 shall not be applied.

Table B.23

Test No.	Type of test	Tester action	Tester detects	Comments
TNO1	Transmit Partial Page Boundary Signal (PPS-NULL)		R-PPS-NULL	(note 2)
TNO2	Receive MCF	T-MCF		
TNO3	Transmit fax message		R-fax message	
TNO4	Transmit Partial Page Signal-Multi Page Signal (PPS-MPS)		R-PPS-MPS	
TNO5	Receive MCF	T-MCF		
TNO6	Transmit fax message		R-fax message	
TNO7	Transmit Partial Page Signal-End of Procedure (PPS-EOP)		R-PPS-EOP	
TNO8	Receive MCF	T-MCF		
TNO9	Transmit DCN		R-DCN R-disconnect	
NOTE 1:	Optional signals may appear before DCS.			
NOTE 2:	Tests TNO1 to TNO3 may be repeated several times, depending on the number of bytes per frame selected in the DCS frame.			

B.7.1.2 Test No. RNO1 to RNO9

Testing normal testing conditions with ECM capability.

Facsimile equipment receiving/tester transmitting.

Facsimile equipment receives two pages not exceeding A4 length generated electronically by the tester: the first chart is the chart "IMPRESS", the second one is a white page.

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

- R-DIS;
- T-DCS V2;
- T-training, TCF;
- R-CFR;
- T-fax message in ECM.

For facsimile equipment capable of receiving only one page, tests RNO4, RNO5 and RNO6 shall not be applied.

Table B.24

Test No.	Type of test	Tester action	Tester detects	Comments
RNO1	Receive PPS-NULL	T-PPS-NULL		
RNO2	Transmit MCF		R-MCF	(note 2)
RNO3	Receive fax message	T-fax message		
RNO4	Receive PPS-MPS	T-PPS-MPS		
RNO5	Transmit MCF		R-MCF	(note 2)
RNO6	Receive fax message	T-fax message		
RNO7	Receive PPS-EOP	T-PPS-EOP		
RNO8	Transmit MCF		R-MCF	(note 2)
RNO9	Receive DCN	T-DCN	R-disconnect	
NOTE 1:	Optional signals may appear before DIS.			
NOTE 2:	After PPS-Q is sent by tester, it is possible to receive other signals from the SUT such as Partial Page Request (PPR) or Receive Not Ready (RNR). In these cases, the tester shall act as defined in ITU-T Recommendation T.30 [3].			

B.7.2 Tests for exception conditions

B.7.2.1 Test TE01 to TE02

Testing exceptional conditions during a transmission of document using ECM.

Facsimile equipment transmitting/tester receiving.

Facsimile equipment is set up to transmit one white page.

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

- T-DIS V2.0;
- R-DCS;
- R-training, TCF;
- T-CFR;
- R-fax message in ECM;
- R-PPS-EOP.

Table B.25

Test No.	Type of test	Tester action	Tester detects	Comments
TEO1	Receive RNR and testing T5 timeout	T-RNR during T5 timeout	R-RR or PPS-EOP during T5 timeout R-DCN after timeout T5 R-disconnect	
TEO2	Receive PPR 4 times	T-PPR T-PPR T-PPR T-PPR	R-fax message (only frames with error) R-PPS-EOP R-fax message (only frames with error) R-PPS-EOP R-fax message (only frames with error) R-PPS-EOP R-CTC or R-EOR-EOP	(note)
NOTE: The SUT behaviour depends on the facsimile equipment capability "continue to correct". The action of SUT shall be according to ITU-T Recommendation T.30 [3].				

B.7.2.2 Tests REO1 and REO2

Testing exceptional conditions during a reception of document using ECM.

Facsimile equipment receiving/tester transmitting.

Tester is set up to transmit one white page.

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

- R-DIS;
- T-DCS V2;
- T-training, TCF;
- R-CFR;
- T-fax message with FCS error;
- T-PPS-EOP;
- R-PPR.

Table B.26

Test No.	Type of test	Tester action	Tester detects	Comments
REO1	Receive Continue to Correct (CTC) after PPR is sent 4 times	T-fax message (only frames with FCS error) T-PPS-EOP T-fax message (only frames with FCS error) T-PPS-EOP T-fax message (only frames with FCS error) T-PPS-EOP T-CTC	R-PPR R-PPR R-PPR R-CTR	
REO2	Receive EOR after PPR is sent 4 times	T-fax message (only frames with FCS error) T-PPS-EOP T-fax message (only frames with FCS error) T-PPS-EOP T-fax ms (only frames with FCS error) T-PPS-EOP T-EOR-EOP	R-PPR R-PPR R-PPR R-ERR or RNR or RR	

B.7.2.3 Test REO3

Testing exceptional conditions during a reception of document using ECM.

Facsimile equipment receiving/tester transmitting.

Tester is set up to transmit two white pages.

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

- R-DIS;
- T-DCS V2;
- T-training, TCF;
- R-CFR.

Table B.27

Test No.	Type of test	Tester action	Tester detects	Comments
REO3	Flow control by the transmitter	T-fax message with first frame preceded by 30 s of flags T-PPS-MPS T-fax message Flags of a duration of 30 s are present between frames no.1 and no.2 T-PPS-EOP T-DCN	R-MCF R-MCF	ITU-T Recommendation T.30 [3], annex A.5 30 s represent minimum of T1 timeout (note)
NOTE: The transmission of flags during 30 s can occur between any two consecutive frames. The reference in this test case to frames no. 1 and no. 2 is given as an example.				

B.8 Commands/responses list

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

B.8.1 Content of the DIS/DTC frame used by the tester

Where a test does not specify a DIS version, DIS/DTC V1.3 shall be used.

Table B.28

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 ITU-T Recommendation V.27 ter [6] fallback mode (2 400 bit/s); - standard vertical resolution 3,85 l/mm or 100 lines/25,4 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 l/mm and 7,7 l/mm.
V1.1 Standard capabilities	FIF: 00 50 10 Receiver - T.4 operation: - data signalling rate ITU-T Recommendation V.27 ter [6] mode (4 800 bit/s); - standard vertical resolution 3,85 l/mm or 100 lines/25,4 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 l/mm and 7,7 l/mm.
V1.2 Extended standard capabilities	FIF: 00 72 20 Receiver - T.4 operation: - data signalling rate ITU-T Recommendations V.27 ter [6] and V.29 [7]; - vertical resolution 7,7 l/mm or 200 lines/25,4 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.
V1.3 Standard capabilities with highest available speed	FIF: 00 F6 1E or 00 F2 1E (if ITU-T Recommendation V.17 [5] modulation scheme is not available in the tester). Receiver/transmitter - T.4 operation: - highest speed modulation available in the tester (up to ITU-T Recommendation V.17 [5]); - vertical resolution 7,7 l/mm or 200 lines/25,4 mm; - one-dimensional coding; - recording width capabilities A4; - max. recording length capability unlimited; - min. scan line time capability at the receiver 0 ms at 3,85 l/mm or 100 l/25,4 mm and 7,7 l/mm or 200 l/25,4 mm.
V2.0 Extended standard capabilities	FIF: 00 F4 11 20 or 00 F0 11 20 (if ITU-T Recommendation V.17 [5] modulation scheme is not available in the tester). Receiver - T.4 operation, transmitter-T.4 operation: - highest speed modulation available in the tester (up to ITU-T Recommendation V.17 [5]); - standard vertical resolution 3,85 l/mm; - one-dimensional coding; - recording width 215 mm (1 728 pels) A4; - max. recording length capability unlimited; - min. scan line time capability at the receiver 20 ms at 3,85 l/mm and 7,7 l/mm; - extend field; - error correction mode.
	(continued)

Table B.28 (concluded)

DIS/DTC	Coding (hex) and bit assignment for DIS/DTC-Facsimile Information Field (FIF)
V2.1 Extended standard capabilities	FIF: 00 F6 11 20 or 00 F2 11 20 (if ITU-T Recommendation V.17 [5] modulation scheme is not available in the tester). Receiver - T.4 operation, transmitter - T.4 operation: <ul style="list-style-type: none"> - highest speed modulation available in the tester (up to ITU-T Recommendation V.17 [5]); - vertical resolution 7,7 l/mm; - one-dimensional coding; - recording width 215 mm (1 728 pels) A4; - max. recording length capability unlimited; - min. scan line time capability at the receiver 20 ms at 3,85 l/mm and 7,7 l/mm; - extend field; - error correction mode.

B.8.2 Content of the DCS frame used by the tester

Where a test does not specify a DCS version then DCS V1.2 shall be used.

Table B.29

DCS	Coding (hex) and bit assignment for DCS-Facsimile Information Field (FIF)
V1.0 Standard capabilities	FIF: 00 40 00 Receiver - T.4 operation: <ul style="list-style-type: none"> - data signalling rate 2 400 bit/s ITU-T Recommendation V.27 ter [6]; - one-dimensional coding; - recording width A4; - max. recording length A4; - min. scan line time 20 ms ; - standard vertical resolution 3,85 l/mm.
V1.1 Standard capabilities	FIF: 00 50 00 Receiver - T.4 operation: <ul style="list-style-type: none"> - data signalling rate 4 800 bit/s ITU-T Recommendation V.27 ter [6]; - recording width A4; - max. recording length A4; - min. scan line time 20 ms; - standard vertical resolution 3,85 l/mm; - one-dimensional coding.
V1.2 Standard capabilities with highest available speed	Receiver - T.4 operation: <ul style="list-style-type: none"> - highest common speed modulation between the tester and the SUT (up to ITU-T Recommendation V.17 [5], 14 400 bit/s); - standard vertical resolution 3,85 l/mm or 100 l/25,4 mm; - one-dimensional coding; - recording width A4; - max. recording length A4; - min. scan line time set to the shortest common time between the tester and the SUT.
V2 Extended standard capabilities	Receiver - T.4 operation: <ul style="list-style-type: none"> - highest common speed modulation between the tester and the SUT (up to ITU-T Recommendation V.17 [5], 14 400 bit/s); - standard vertical resolution 3,85 l/mm; - one-dimensional coding; - recording width A4; - max. recording length capability A4; - min. scan line time receiver capability: 0 ms; - extend Field; - Error Correction Mode (frame size = 64 octets).

History

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