TECHNICAL BASIS for REGULATION

FINAL DRAFT
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Attachment requirements for Data Terminal Equipment (DTE) to connect to Packet Switched Public Data Networks (PSPDNs) for CCITT Recommendation X.25 interfaces at data signalling rates up to 1 920 kbit/s utilising interfaces derived from CCITT Recommendations X.21 and X.21 bis

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Contents

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Foreword

This final draft Technical Basis for Regulation (TBR) has been produced by the Terminal Equipment (TE) Technical Committee of the European Telecommunication Standards Institute (ETSI), and is now submitted for the Voting phase of the ETSI standards approval procedure.

Introduction

The physical layer requirements contained in this TBR are a superset of the physical layer requirements contained in TBR 1 (see annex D), which relate to the connection of a terminal to a Circuit Switched Public Data Network (CSPDN) using CCITT Recommendation X.21 [7]. It is recommended that a demonstration of compliance with these requirements be accepted as a demonstration of compliance with the relevant parts of TBR 1 for the purpose of determining conformity with that TBR, and vice versa.

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1 Scope

This Technical Basis for Regulation (TBR) specifies the technical characteristics (electrical and mechanical interface requirements) and access control protocol to be provided by packet mode terminal equipment intended for connection to a dedicated interface of a Packet Switched Public Data Network (PSPDN) using CCITT Recommendation X.25 [1], [2] and [3] making use of Link Access Procedure Balanced (Modulo 8 operation) (LAPB) and Link Access Procedure Balanced (Modulo 128 operation) (LAPB Extended) modes of operation.

The objective of this TBR is to ensure that no disturbance occurs to the public network, and to ensure interworking between network and terminal, but without any guarantee of terminal operation and end to end operability across networks.

This TBR contains the minimum set of requirements derived from CCITT Recommendation X.25 [1], [2] and [3] in accordance with prior European harmonisation documents (NET 2, see annex D). The requirements of this TBR are suitable for testing terminal equipment for connection to CCITT Recommendation X.25 [1], [2] and [3] (1980, 1984, and 1988) PSPDNs. Terminal equipment that is capable of either originating only or terminating only, packet level modes of operation have been included. Data Terminal Equipment (DTE) which satisfies the relevant technical requirements of this TBR may be connected to every PSPDN, use any of the essential (E) facilities and invoke any of the provided additional (A) facilities as given in CCITT Recommendation X.2 [4] and [5].

For each requirement in this TBR, a test is given, including measurement methods. Requirements apply at the public network interface of the terminal equipment, which may be stimulated to perform tests by additional equipment if necessary. For the purposes of this TBR a terminal equipment comprises of that apparatus included between a PSPDN Network Termination Point (Data Circuit Terminating Equipment (DCE)), and the terminal equipment boundary point that delimits the Network to Transport layers as defined in ITU-T (CCITT Recommendation X.200) subclause 7.5 (Reference model of Open Systems Interconnection). Equipment in this context is taken to mean either software, firmware or hardware.

Where the packet mode terminal equipment supplied for test does not contain the functions of layers 1, 2 and 3 (as defined in ITU-T (CCITT Recommendation X.200) subclause 7.5 (Reference model of Open Systems Interconnection)), the terminal's documentation and instructions for use shall state which additional equipment is required for compliance to this TBR and the additional equipment shall be submitted for test, as though all the functional layers were provided by the packet terminal equipment.

This TBR also gives guidance on appropriate standards relating to the essential requirements on safety.

Terminal equipment may be subject to additional or alternative attachment requirements in other CTRs depending on its functionality, in particular if it supports a service which is considered a justified case for regulation of terminal equipment interworking via the public telecommunications network.

2 Normative references

This TBR 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 are to apply to this TBR only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

[1] CCITT Recommendation X.25 (1980): "Interface between Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) for terminals operating in the packet mode and connected to public data networks by dedicated circuit".

[2] CCITT Recommendation X.25 (1984): "Interface between Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) for terminals operating in the packet mode and connected to public data networks by dedicated circuit".

[3] CCITT Recommendation X.25 (1988): "Interface between Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) for terminals operating in the packet mode and connected to public data networks by dedicated circuit".

[4] CCITT Recommendation X.2 (1984): "International data transmission services and optional user facilities in public data networks".

[5] CCITT Recommendation X.2 (1988): "International data transmission services and optional user facilities in public data networks and ISDNs".

[6] CCITT Recommendation X.21bis (1988): "Use on public data networks of data terminal equipment (DTE) which is designed for interfacing to synchronous V-series modems".

[7] CCITT Recommendation X.21 (1988): "Interface between data terminal equipment (DTE) and data circuit-terminating equipment (DCE) for synchronous operation on public data networks".

[8] ISO 2110 (1980): "Information Technology - Data communication - 25-pole DTE/DCE interface connector and contact number assignments".

[9] ISO/IEC 11569 (1992): "Information Technology - Telecommunications and information exchange between systems - 26-pole interface connector mateability dimensions and contact number assignments".

[10] ISO 4902 (1980): "Information Technology - Data communication - 37-pole DTE/DCE interface connector and contact number assignments".

[11] ISO 2593 (1984): "Information Technology - Telecommunications and information exchange between systems - 34-pole DTE/DCE interface connector and contact number assignments".

[12] ISO 4903 Second edition (1989): "Information Technology - Data communication - 15-pole DTE/DCE interface connector and contact number assignments".

[13] CCITT Recommendation X.200 : "Information technology - Open Systems Interconnection - Basic reference model: The basic model".

3 Definitions, symbols and abbreviations

3.1 Definitions

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

CCITT Recommendation X.25 [1] to [3] network: A PSPDN network which offers a CCITT Recommendation X.25 [1], [2] and [3] DTE/DCE interface providing the (E) facilities for user classes of service 8-11 as defined in CCITT Recommendation X.2, [4] and [5].

All other definitions are as given in the CCITT series of Recommendations.

3.2 Abbreviations

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

C_L	total effective capacitance associated with the load, measured at the interchange point.
DCE	Data Circuit Terminating Equipment
DTE	Data Terminal Equipment
EMC	Electro-Magnetic Compatability
hex	hexadecimal
IUT	Implementation Under Test
LAPB	Link Access Procedure Balanced (Modulo 8 operation)
LAPB Extended	Link Access Procedure Balanced (Modulo 128 operation)
PIXIT	Protocol Implementation Extra Information For Testing
PSPDN	Packet Switched Public Data Network
R_L	total effective resistance associated with the load, measured at the interchange point.
TBR-RT	TBR Requirements Table
V_o	open-circuit generator voltage.

4 Modes of operation and signalling rates

4.1 Types of operation

This TBR is applicable to packet mode terminal equipment intended for connection to a dedicated interface of a packet switched public data network.

NOTE: The requirements contained in this TBR may be suitable for terminal equipment intended for connection to a public data network interface using CCITT Recommendations X.21 [6] or X.21bis [7] interfaces that is not a PSPDN.

4.2 Data signalling rate

This TBR is applicable for packet mode terminal equipment operating at data signalling rates up to and including 1 920 kbit/s (User Class 59 of CCITT Recommendation X.1, see annex D).

5 Safety and EMC requirements

5.1 Safety requirements

There are no safety requirements under this TBR.

NOTE: Safety requirements are imposed under the Low Voltage Directive (73/23/EEC) and articles 4 (a) and 4 (b) of Directive 91/263/EEC.

5.2 EMC requirements

There are no EMC requirements under this TBR.

NOTE: General EMC requirements are imposed under EMC Directive (89/336/EEC).

6 Electrical, mechanical, and access control protocol requirements

The requirements of this clause apply at the means of connection to the DCE.

6.1 General characteristics

6.1.1 Generator presentations

6.1.1.1 Balanced generator

In the case of balanced terminal equipment generators, points A and B are defined as the two physical connections, on the means provided for connection to the DCE, to which the output of a terminal generator is connected, and point C is the physical connection on the means of connection to the DCE to which the terminal equipment signal ground may optionally be connected (see figure 5).

6.1.1.2 Unbalanced generator

In the case of unbalanced terminal equipment generators, point A is defined as the physical connection on the means provided for connection to the DCE, to which the output of a terminal generator is connected, and point C is the physical connection on the means of connection to the DCE to which the signal ground associated with that generator is connected.

6.1.2 Receiver presentations

6.1.2.1 Balanced receiver

In the case of balanced terminal equipment receivers, points A' and B' are defined as the two physical connections, on the means provided for connection to the DCE, to which the input of a terminal receiver is connected, and point C' is the physical connection on the means of connection to the DCE to which the terminal equipment signal ground may optionally be connected.

6.1.2.2 Unbalanced receiver

In the case of unbalanced terminal equipment receivers, point A' is defined as the physical connection on the means provided for connection to the DCE, to which the input of a terminal receiver is connected, and point C' is the physical connection on the means of connection to the DCE to which the signal ground associated with that generator is connected.

6.2 Connector characteristics and contact number assignments

The means of connection to the DCE shall conform to either subclause 6.2.1, 6.2.2, 6.2.3 ,6.2.4 or 6.2.5.

6.2.1 Attachment to a DCE interface presented on a 25-pole connector

6.2.1.1 Connector

The means of connection to the DCE shall be a male connector conforming to ISO 2110 [8].

NOTE: This requirement is based upon subclause 1.2 of CCITT Recommendation X.21 bis [6].

Compliance shall be checked by the test given in subclause 7.2.1.1.

Justification: Directive 91/263/EEC, article 4 (d).

6.2.1.2 Contact number assignments

On the means of connection to the DCE, the presentation of the interchange circuits shall be in accordance with annex A, tables A.4.1.1 and A.4.1.2 or tables A.4.2.1 and A.4.2.2.

NOTE: This requirement is based upon subclause 1.2 of CCITT Recommendation X.21 bis [6] and ISO 2110 [8].

Compliance shall be checked as described in subclause 7.2.1.2.

Justification: Directive 91/263/EEC, article 4 (d).

6.2.2 Attachment to a DCE interface presented on a 26-pole connector

6.2.2.1 Connector

The means of connection to the DCE shall be a male connector conforming to ISO/IEC 11569 [9].

NOTE: This requirement is based upon ISO/IEC 11569 [9].

Compliance shall be checked by the test given in subclause 7.2.2.1 as appropriate.

Justification: Directive 91/263/EEC, article 4 (d).

6.2.2.2 Contact number assignments

On the means of connection to the DCE, the presentation of the interchange circuits shall be in accordance with annex A, tables A.4.2.1 and A.4.2.2 or tables A.4.2.5 and A.4.2.6.

NOTE: This requirement is based upon ISO/IEC 11569 [9].

Compliance shall be checked as described in subclause 7.2.2.2 as appropriate.

Justification: Directive 91/263/EEC, article 4 (d).

6.2.3 Attachment to a DCE interface presented on a 37-pole connector

6.2.3.1 Connector

The means of connection to the DCE shall be a male connector conforming to ISO 4902 [10].

NOTE: This requirement is based upon subclause 1.2 of CCITT Recommendation X.21 bis [6].

Compliance shall be checked by the test given in subclause 7.2.3.1 as appropriate.

Justification: Directive 91/263/EEC, article 4 (d).

6.2.3.2 Contact number assignments

On the means of connection to the DCE, the presentation of the interchange circuits shall be in accordance with annex A, tables A.4.3.1 and A.4.3.2.

NOTE: This requirement is based upon subclause 1.2 of CCITT Recommendation X.21 bis [6] and ISO 4902 [10].

Compliance shall be checked as described in subclause 7.2.3.2 as appropriate.

Justification: Directive 91/263/EEC, article 4 (d).

6.2.4 Attachment to a DCE interface presented on a 34-pole connector

6.2.4.1 Connector

The means of connection to the DCE shall be a male connector conforming to ISO 2593 [11].

NOTE: This requirement is based upon subclause 1.2 of CCITT Recommendation X.21 bis [6].

Compliance shall be checked by the test given in subclause 7.2.4.1 as appropriate.

Justification: Directive 91/263/EEC, article 4 (d)

6.2.4.2 Contact number assignments

On the means of connection to the DCE, the presentation of the interchange circuits shall be in accordance with annex A, tables A.4.4.1 and A.4.4.2.

NOTE: This requirement is based upon subclause 1.2 of CCITT Recommendation X.21 bis [6] and ISO 2593 [11].

Compliance shall be checked as described in subclause 7.2.4.2 as appropriate.

Justification: Directive 91/263/EEC, article 4 (d).

6.2.5 Attachment to a DCE interface presented on a 15-pole connector

6.2.5.1 Connector

The means of connection to the DCE shall be a male connector conforming to ISO 4903 [12].

NOTE: This requirement is based upon subclause 2.2 of CCITT Recommendation X.21 [7].

Compliance shall be checked by the test given in subclause 7.2.5.1 as appropriate.

Justification: Directive 91/263/EEC, article 4 (d).

6.2.5.2 Contact number assignments

On the means of connection to the DCE, the presentation of the interchange circuits shall be in accordance with annex A, tables A.4.5.1 and A.4.5.2.

NOTE: This requirement is based upon subclause 2.2 of CCITT Recommendation X.21 [7] and ISO 4903 [12].

Compliance shall be checked as described in subclause 7.2.5.2 as appropriate.

Justification: Directive 91/263/EEC, article 4 (d).

6.3 Electrical requirements

For a particular terminal implementation, the generator requirements of this TBR apply only to the extent that they are relevant to a particular generator. For instance, where, in a particular terminal implementation, a particular generator circuit, in normal operation, is fixed in one of the binary states, only those requirements relevant to that fixed binary state shall apply.

NOTE: It is possible for particular interchange circuits of a TE to be intended for connection to more than one type of interchange circuit which could be presented by a DCE (e.g. to both CCITT Recommendations V.10 and V.28, see annex D).

Where an interchange circuit, presented by the TE, to which a particular section of subclause 6.4 applies, is intended to be connected additionally to interchange circuits presented by a DCE which conform to other sections of subclause 6.4, the requirements of that section of subclause 6.4 relevant to those characteristics also apply.

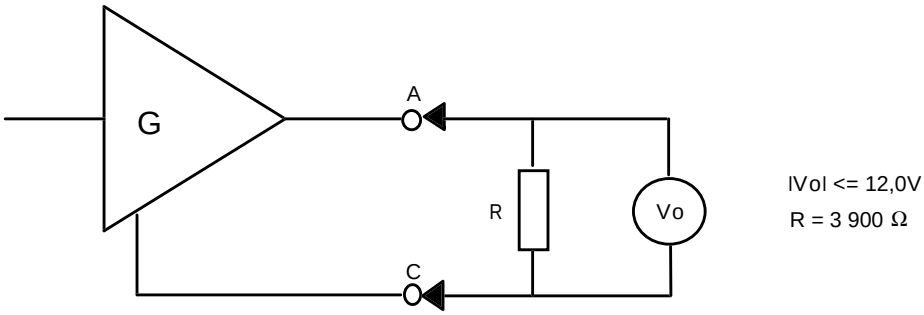
Additionally, for a particular DTE-DCE interface, not all signals may be employing the same interchange circuit characteristics. It is the interchange characteristic of the individual signals presented by the network that dictate which sections of subclause 6.4 apply.

6.3.1 Requirements for attachment to CCITT Recommendation V.10 interchange circuits

The requirements of this subclause apply to interchange circuits, presented by the TE on the means for connection to the DCE, that are intended for connection to circuits presented by the DCE that conform to CCITT Recommendation V.10 (see annex D).

6.3.1.1 Generator open circuit output voltage

When a 3 900 Ω non-reactive impedance is connected between points A and C, for each binary state, the magnitude of the voltage between points A and C shall be less than or equal to 12,0 V.



NOTE: This requirement is based upon CCITT Recommendation V.10 subclauses 5.2.1 and 6.3 (see annex D).

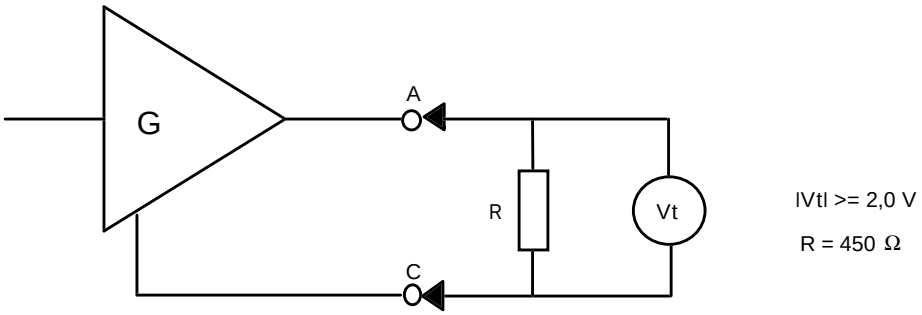
Figure 1

Compliance shall be verified in accordance with the test specified in subclause 7.3.1.1.

Justification: Directive 91/263/EEC, article 4d.

6.3.1.2 Generator terminated output voltage

The magnitude of the output voltage, for either binary state, of a generator when terminated with a 450 Ω non-reactive impedance connected between points A and C shall be greater than or equal to 2,0 V.



NOTE: This requirement is based upon CCITT Recommendation V.10 subclause 5.2.2 (see annex D).

Figure 2

Compliance shall be verified in accordance with the test specified in subclause 7.3.1.2.

Justification: Directive 91/263/EEC, article 4f.

6.3.1.3 Generator output rise time

During transitions from one binary state to another, the time taken for the differential voltage measured between points A and C to pass between the points at which, for each binary state, it is 90 % of its steady state value, shall be less than or equal to 0,3 of the nominal duration of a bit. For the purposes of this requirement, transient signals are ignored. (see figure 4).

This requirement applies when the output of the generator is connected to the circuit shown in figure 3.

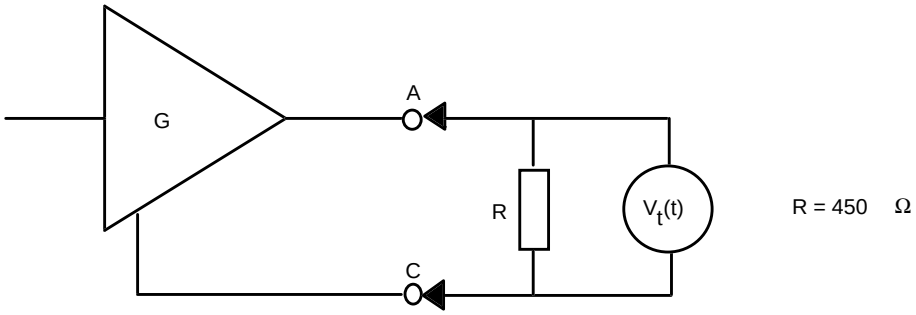
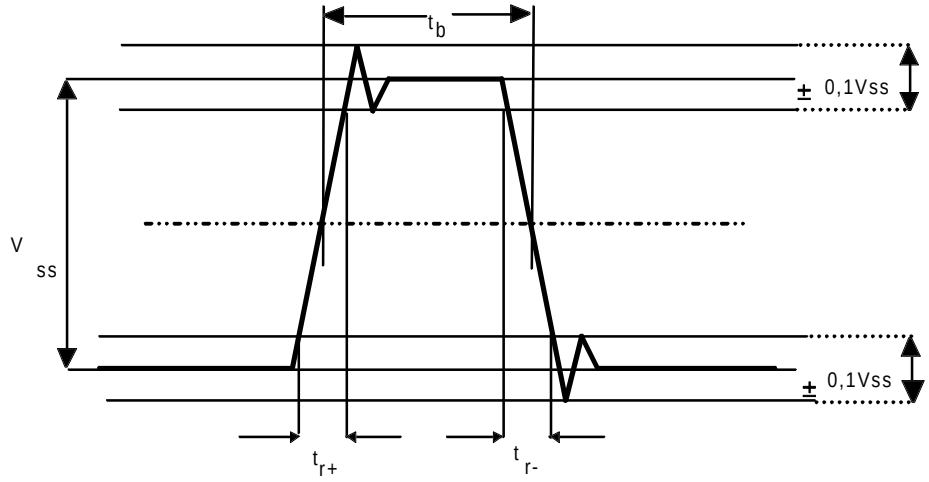


Figure 3



Vss=Voltage difference between steady-state signal conditions;
tb=nominal duration of a bit. For tb ≥ 50µs, tr ≤ 0,3 tb

NOTE: This requirement is based upon CCITT Recommendation V.10 subclause 5.3 (see annex D).

Figure 4

Compliance shall be verified in accordance with the test specified in subclause 7.3.1.3.

Justification: Directive 91/263/EEC, article 4f.

6.3.1.4 Generator polarities

The generator output voltage at point A shall be:

a) positive with respect to point C when the signal condition 0 (space) for data circuits, or ON for control circuits, is transmitted; and

b) negative with respect to point C when the signal condition 1 (mark) for data circuits, or OFF for control circuits, is transmitted.

Compliance shall be checked with the tests described in subclause 7.3.1.2.

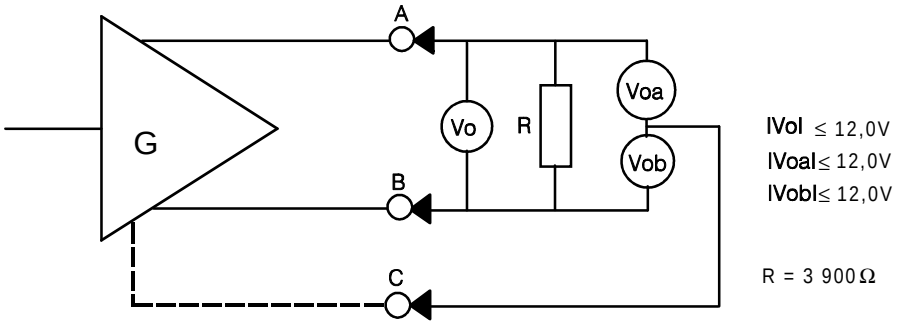
6.3.2 Requirements for attachment to CCITT Recommendation V.11 interchange circuits

The requirements of this subclause apply to interchange circuits, presented by the TE on the means for connection to the DCE, intended for connection to circuits presented by the DCE that conform to CCITT Recommendation V.11 (see annex D).

6.3.2.1 Generator open circuit output voltage

When a 3 900 Ω non-reactive impedance is connected between points A and B, for each binary state (see figure 5):

a) the magnitude of the voltage between points A and B shall be less than or equal to 12,0 V;
b) The magnitude of the voltage between either points A or B and point C shall be less than or equal to 12,0 V.



NOTE: This requirement is based upon CCITT Recommendation V.11 subclauses 5.2.1 and 6.3 (see annex D).

Figure 5

Compliance shall be verified in accordance with the test specified in subclause 7.4.1.1.

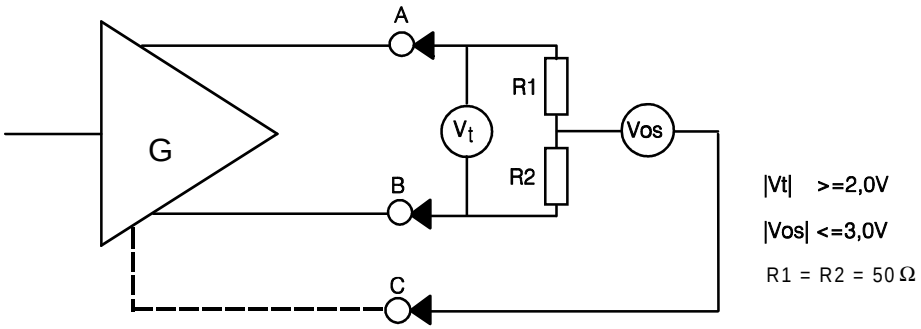
Justification: Directive 91/263/EEC, article 4d.

6.3.2.2 Generator terminated output voltage

When terminated with two 50 Ω non reactive impedances connected in series between points A and B (see figure 6):

a) the magnitude of the steady state voltage, for either binary state, shall be greater than or equal to 2,0 V between points A and B; and

b) the magnitude of the steady state voltage, for either binary state, shall be less than or equal to 3,0 V, between the centre point of the two 50 Ω non reactive impedances and point C.



NOTE: This requirement is based upon CCITT Recommendation V.11 subclause 5.2.2 (see annex D).

Figure 6

Compliance shall be verified in accordance with the test specified in subclause 7.4.1.2.

Justification: Directive 91/263/EEC, article 4f.

6.3.2.3 Generator output rise time

During transitions from one binary state to another, the time taken for the differential voltage measured between points A and B to pass between the points at which, for each binary state, it is 90 % of its steady state value, shall be less than or equal to 0,3 of the nominal duration of a bit. For the purposes of this requirement, transient signals are ignored.(see figure 8).

This requirement applies when the output of the generator is connected to the circuit shown in figure 7.

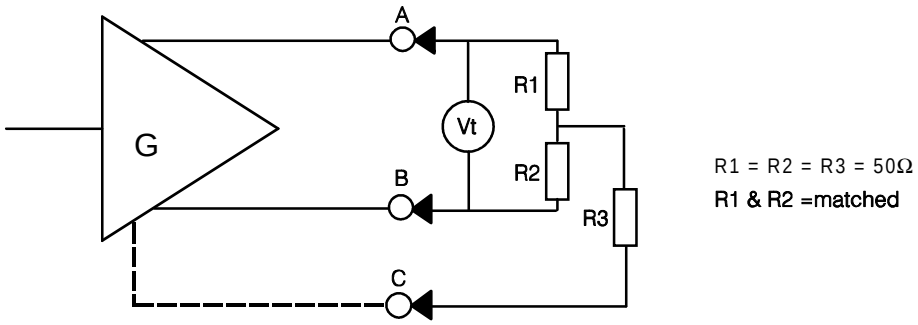
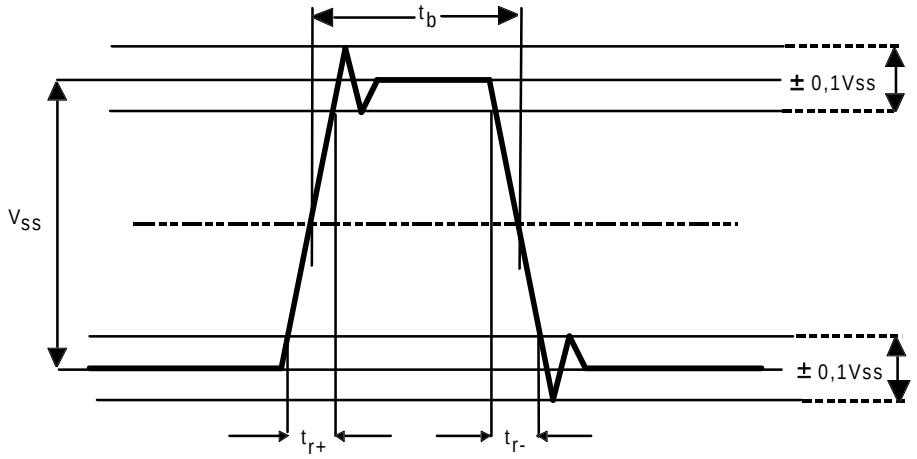


Figure 7



Vss=Voltage difference between steady-state signal conditions;
tb=nominal duration of a bit. For tb ≥ 50µs, tr ≤ 0,3 tb.

NOTE: This requirement is based upon CCITT Recommendation V.11 subclause 5.3 (see annex D).

Figure 8

Compliance shall be verified in accordance with the test specified in subclause 7.4.1.3.

Justification: Directive 91/263/EEC, article 4f.

6.3.2.4 Generator polarities

The generator output voltage at point A shall be:

a) positive with respect to point B when the signal condition 0 (space) for data circuits, or ON for control circuits, is transmitted; and

b) negative with respect to point B when the signal condition 1 (mark) for data circuits, or OFF for control circuits, is transmitted.

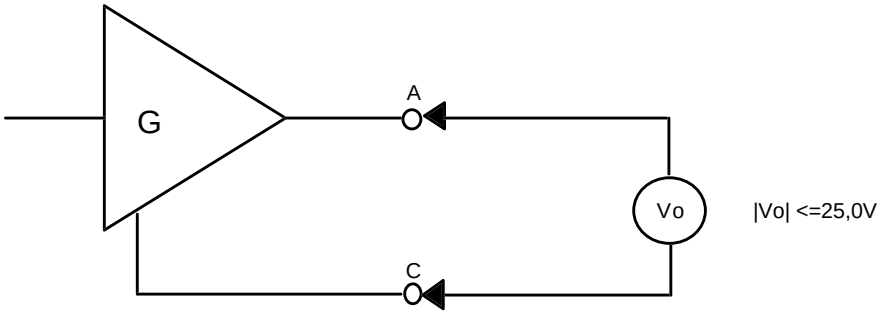
Compliance shall be checked with the tests described in subclause 7.4.1.2.

6.3.3 Requirements for attachment to CCITT V.28 interchange circuits

The requirements of this subclause apply to interchange circuits, presented by the TE on the means for connection to the DCE, that are intended for connection to circuits presented by the DCE that conform to CCITT Recommendation V.28 (see annex D).

6.3.3.1 Generator open circuit output voltage

When connected as shown in figure 9, the magnitude of the voltage between points A and C shall be less than or equal to 25,0 V.



NOTE: This requirement is based upon CCITT Recommendation V.28 subclause 4 (see annex D).

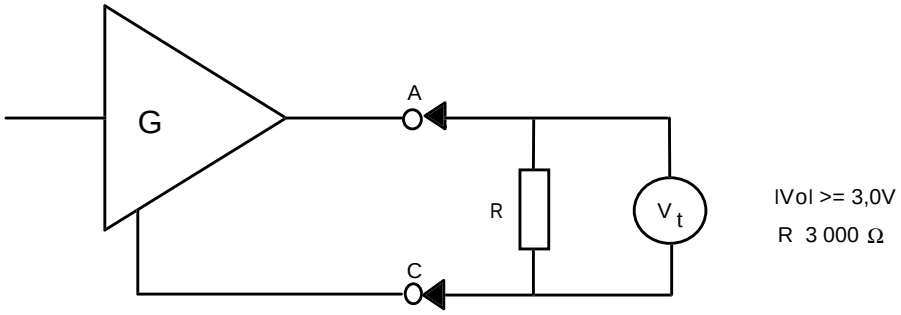
Figure 9

Compliance shall be verified in accordance with the test specified in subclause 7.5.1.1.

Justification: Directive 91/263/EEC, article 4d.

6.3.3.2 Generator terminated output voltage

The output voltage for either binary state shall be greater than or equal to 3,0 V, when terminated in a 3 000 Ω non-reactive impedance between generator points A and C (see figure 10).



NOTE: This requirement is based upon CCITT Recommendation V.28 subclause 4 (see annex D).

Figure 10

Compliance shall be verified in accordance with the test specified in subclause 7.5.1.2.

Justification: Directive 91/263/EEC, article 4f.

6.3.3.3 Generator output signal transition time

The time required for the generator output voltage to traverse the region between -3,0 V and +3,0 V during a transition from one binary state to the other shall not exceed 1,0 ms, or 3 % of the nominal duration of a bit, whichever is the lesser (see figure 12).

This requirement applies when the output of the generator is connected to the circuit shown in figure 11.

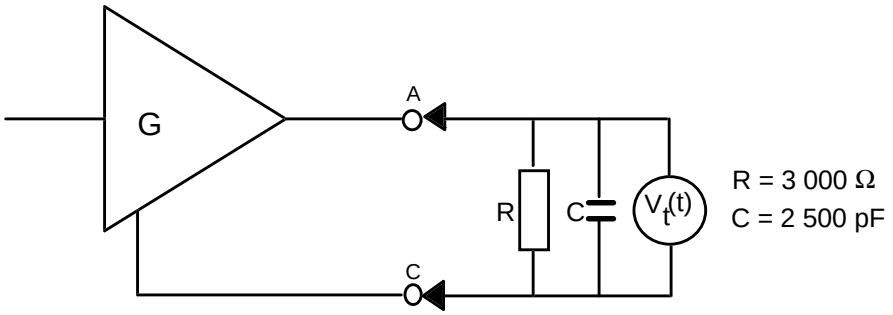
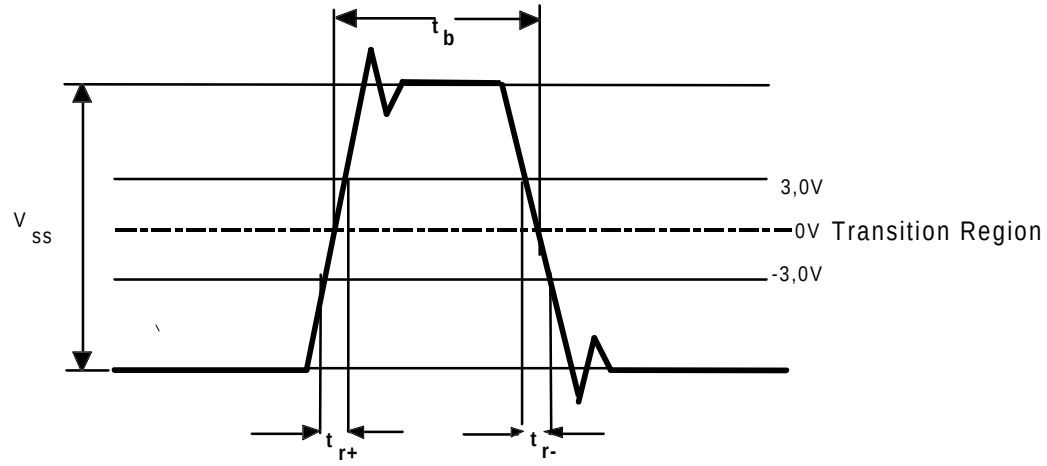


Figure 11



Vss=Voltage difference between steady-state signal conditions;
t_b=nominal duration of a bit.

NOTE: This requirement is based upon CCITT Recommendation V.28 subclause 6, paragraph 4 (see annex D).

Figure 12

Compliance shall be verified in accordance with the test specified in subclause 7.5.1.3.

Justification: Directive 91/263/EEC, article 4f.

6.3.3.4 Generator polarities

The generator output voltage at point A shall be:

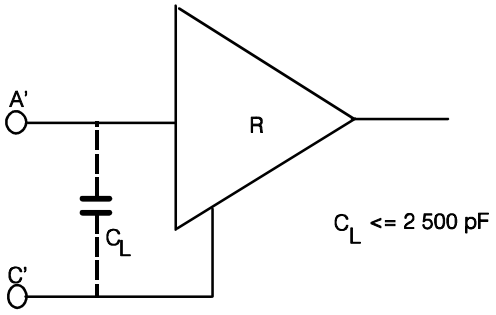
a) positive with respect to point C when the signal condition 0 (space) for data circuits, or ON for control circuits, is transmitted; and

b) negative with respect to point C when the signal condition 1 (mark) for data circuits, or OFF for control circuits, is transmitted.

Compliance shall be checked with the tests described in subclause 7.5.1.2.

6.3.3.5 Receiver maximum effective shunt capacitance.

The total effective shunt capacitance shall be less than or equal to 2 500 pF between the receiver points A' and C' (see figure 13):



NOTE: This requirement is based upon CCITT Recommendation V.28 subclause 3, fourth paragraph (see annex D).

Figure 13

Compliance shall be verified in accordance with the test specified in subclause 7.5.2.1.

Justification: Directive 91/263/EEC, article 4f.

6.3.4 Requirements for attachment to CCITT Recommendation V.35 interchange circuits

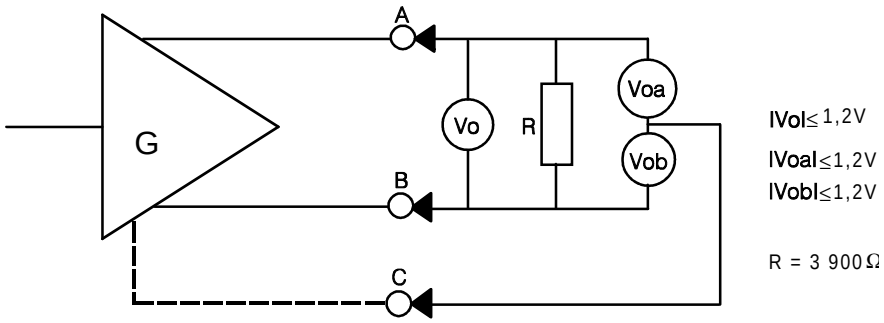
The requirements of this subclause apply to interchange circuits, presented by the TE on the means for connection to the DCE, that are intended for connection to circuits presented by the DCE that conform to CCITT Recommendation V.35 (see annex D).

6.3.4.1 Generator open circuit output voltage

When terminated with a 3 900 Ω non-reactive impedance connected between points A and B (see figure 14), for each binary state:

a) the magnitude of the voltage between points A and B shall be less than or equal to 1,2 V;

b) the magnitude of the voltage between either points A or B and point C shall be less than or equal to 1,2 V.



NOTE: This requirement is based upon CCITT Recommendation V.35 annex 2 subclause 5.2.3 (see annex D of this TBR).

Figure 14

Compliance shall be verified in accordance with the test specified in subclause 7.6.1.1.

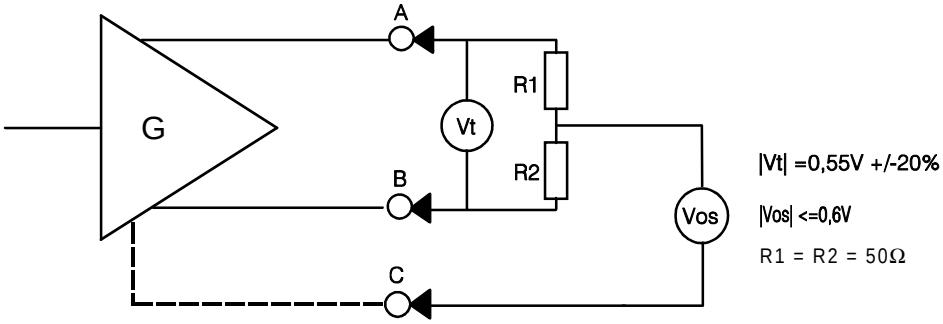
Justification: Directive 91/263/EEC, article 4d.

6.3.4.2 Generator terminated output voltage

When terminated with two 50 Ω non reactive impedances connected in series between points A and B (see figure 15):

a) the magnitude of the steady state voltage, for each of the binary states, shall be 0,55 V ± 20 %, between points A and B; and

b) the magnitude of the steady state voltage, for each of the binary states, shall be less than or equal to 0,6 V, between the centre point of the two 50 Ω non reactive impedances and point C.



NOTE: This requirement is based upon CCITT Recommendation V.35 annex 2 subclause 2.3 paragraph (c) & (e) (see annex D of this TBR).

Figure 15

Compliance shall be verified in accordance with the test specified in subclause 7.6.1.2.

Justification: Directive 91/263/EEC, article 4f.

6.3.4.3 Generator output rise time

During transitions from one binary state to another, the time taken for the differential voltage measured between points A and B to pass between the points at which, for each binary state, it is 80 % of its steady state value, shall be less than or equal to 0,1 of the nominal duration of a bit. For the purposes of this requirement, transient signals are ignored (see figure 17).

This requirement applies when the output of the generator is connected to the circuit shown in figure 16.

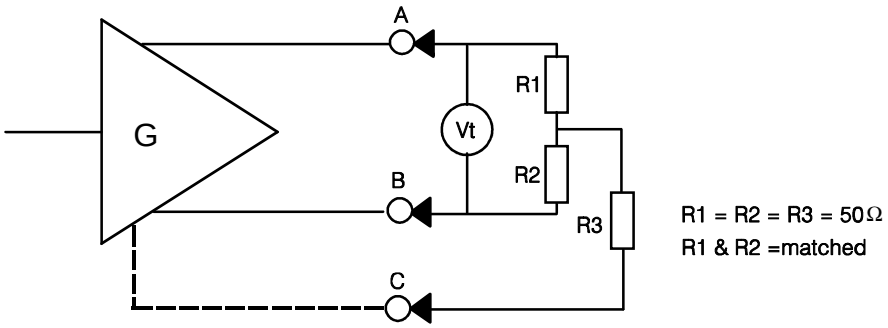
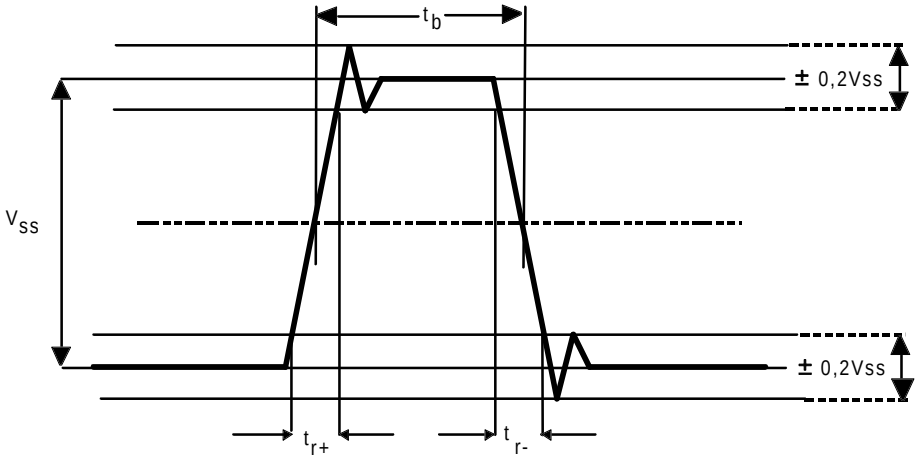


Figure 16



Vss=Voltage difference between steady-state signal conditions;
tb=nominal duration of a bit, tr ≤ 0,1 tb.

NOTE: This requirement is based upon CCITT Recommendation V.35 (1984) annex 2 subclause 2.3 paragraph (d) (see annex D of this TBR).

Figure 17

Compliance shall be verified in accordance with the test specified in subclause 7.6.1.3.

Justification: Directive 91/263/EEC, article 4f.

6.3.4.4 Generator polarities

The generator output voltage at point A shall be:

a) positive with respect to point B when the signal condition 0 (space) for data circuits, or ON for control circuits, is transmitted; and

b) negative with respect to point B when the signal condition 1 (mark) for data circuits, or OFF for control circuits, is transmitted.

Compliance shall be checked with the tests described in subclause 7.6.1.2.

6.4 X.25 link layer (layer 2) requirements

There are no requirements relating to the X.25 link layer.

6.5 X.25 packet layer (layer 3) requirements

There are no requirements relating to the X.25 packet layer.

7 TBR Test Specification

7.1 Conditions of test

7.1.1 Environment for tests

All tests shall be performed at:

a) an ambient temperature in the range 15°C to 35°C;

b) a relative humidity in the range of 5 % to 75 %.

The tests shall not be performed outside the operating limits for the terminal equipment as stated by the client.

7.1.2 Power supply limitations

For apparatus that is directly powered from the mains supply all tests shall be carried out within 5 % of the normal operating voltage.

If apparatus is powered by other means and those means are not supplied as part of the apparatus, e.g. batteries, stabilised a.c. supplies, d.c., etc., all tests shall be carried out within the power supply limit declared by the supplier. If the power supply is a.c., the tests shall be conducted within 4 % of the stated frequency as declared by the supplier.

7.1.3 Test condition

All requirements apply and tests are carried out with the terminal in the "power on" condition unless otherwise stated.

7.1.4 Test point

Tests shall be carried out at the point of connection to the DCE on the means provided by the terminal equipment for connecting to the DCE.

In order to carry out these tests the client shall provide a means of connecting the terminal equipment to a DCE (e.g. a cable) which is representative of the means of connecting to a DCE intended to be used by, or supplied with the apparatus. The definition of points A, B, and C in respect of generators is contained in subclause 6.1.1.

The definition of points A', B', and C' in respect of receivers is contained in subclause 6.1.2.

7.1.5 Bit patterns

It may be necessary in certain instances, for the tester to send specified bit patterns to the terminal equipment to ensure that a particular state is maintained. The applicant shall inform the test laboratory of such cases and specify the nature of the bit patterns to be sent.

7.1.6 Signal element timing

It is necessary for the terminal equipment to be supplied with Signal Element Timing as defined in CCITT Recommendation X.25 [1], [2] and [3], at the data signalling rate at which the test is to be performed. For some terminal equipment it may be necessary to provide Signal Element Timing in order to carry out tests for static conditions.

7.1.7 Data signalling rates

Except where stated otherwise, the tests shall be conducted at the highest signalling rate declared by the client for which approval is sought.

7.1.8 Interchange circuits presentation

The tester shall assume that the interchange circuits are presented on the means for connection to the DCE on the poles of the connector as declared in the TBR Requirements Table (TBR-RT) in annex A.

7.1.9 Physical layer tests

7.1.9.1 Verification of the electrical characteristics

Verification of the electrical characteristics shall be based upon either:

a) the tests described in subclauses 7.2, 7.3, 7.4, 7.5, or 7.6 as appropriate; or

b) by agreement between the client and the test laboratory, the submission by the client to the test laboratory of a declaration of conformance, including circuit diagrams, component specifications, and other relevant information. The test laboratory shall, on the basis of the evidence accompanying the declaration, be responsible for satisfying itself that the declaration gives assurance of conformity not less than that achieved by method a) above.

7.1.9.2 Identically implemented circuits

Where, for the purpose of testing, two or more circuits are identically implemented, the test need only be carried out on one of them.

This shall be declared by the client in annex B, table B.2.

7.1.9.3 Fixed state generators

Where, for particular terminal equipment, a certain state is not relevant for a specific interchange for a specific interchange circuit, there is no requirement for that generator output state to be tested in respect of that interchange circuit.

This shall be declared by the client in annex B table B.1.

7.2 Test descriptions for connector characteristics and contact number assignments

7.2.1 25-pole connector

7.2.1.1 Connector characteristics

An attempt shall be made to mate the connector provided by the terminal equipment for connecting it to a DCE with an ISO 2110 [8] compliant connector with female contacts.

Successful mechanical mating shall occur.

7.2.1.2 Contact number assignments

The client shall complete the TBR-RT contained in annex A.

a) circuits shown in annex A, table A.4.1.1 or A.4.1.2 as mandatory (m) shall be declared as implemented;

b) it is also permitted for circuits shown in annex A, table A.4.1.1 or A.4.2.1 as optional (o) to be declared as implemented.

Compliance shall be verified by Static Conformance Review of the completed form.

7.2.2 26-pole connector

7.2.2.1 Connector characteristics

An attempt shall be made to mate the connector provided by the terminal equipment for connecting it to a DCE with an ISO/IEC 11569 [9] compliant connector with female contacts.

Successful mechanical mating shall occur.

7.2.2.2 Contact number assignments

7.2.2.2.1 Connection to a DCE presenting CCITT Recommendation V.10 or V.11 electrical characteristics

The client shall complete TBR-RT contained in annex A:

a) circuits shown in annex A, table A.4.2.1 or A.4.2.2 as mandatory (m) shall be declared as implemented;

b) it is also permitted for circuits shown in annex A, table A.4.2.1 or A.4.2.2 as optional (o) to be declared as implemented.

Compliance shall be verified by Static Conformance Review of the completed form.

7.2.2.2.2 Connection to a DCE presenting CCITT Recommendation V.28 electrical characteristics

The client shall complete TBR-RT contained in annex A:

a) circuits shown in annex A, table A.4.2.5 or A.4.2.6 as mandatory (m) shall be declared as implemented;

b) it is also permitted for circuits shown in annex A, table A.4.2.5 or A.4.2.6 as optional (o) to be declared as implemented.

Compliance shall be verified by Static Conformance Review of the completed form.

7.2.3 37-pole connector

7.2.3.1 Connector characteristics

An attempt shall be made to mate the connector provided by the terminal equipment for connecting it to a DCE with an ISO 4902 [10] compliant connector with female contacts.

Successful mechanical mating shall occur.

7.2.3.2 Contact number assignments

The client shall complete TBR-RT contained in annex A.

a) circuits shown in annex A, table A.4.3.1 or A.4.3.2 as mandatory (m) shall be declared as implemented;

b) it is also permitted for circuits shown in annex A, table A.4.3.1 or A.4.3.2 as optional (o) to be declared as implemented.

Compliance shall be verified by Static Conformance Review of the completed form.

7.2.4 34-pole connector

7.2.4.1 Connector characteristics

An attempt shall be made to mate the connector provided by the terminal equipment for connecting it to a DCE with an ISO 2593 [11] compliant connector with female contacts.

Successful mechanical mating shall occur.

7.2.4.2 Contact number assignments

The client shall complete TBR-RT contained in annex A.

a) circuits shown in annex A, table A.4.4.1 or A.4.4.2 as mandatory (m) shall be declared as implemented;

b) it is also permitted for circuits shown in annex A, table A.4.4.1 or A.4.4.2 as optional (o) to be declared as implemented.

Compliance shall be verified by Static Conformance Review of the completed form.

7.2.5 15-pole connector

7.2.5.1 Connector characteristics

An attempt shall be made to mate the connector provided by the terminal equipment for connecting it to a DCE with an ISO 4903 [12] compliant connector with female contacts.

Successful mechanical mating shall occur.

7.2.5.2 Contact number assignments

The client shall complete TBR-RT contained in annex A

a) circuits shown in annex A, table A.4.5.1 or A.4.5.2 as mandatory (m) shall be declared as implemented;

b) it is also permitted for circuits shown in annex A, table A.4.5.1 or A.4.5.2 as optional (o) to be declared as implemented.

Compliance shall be verified by Static Conformance Review of the completed form.

7.3 Test descriptions for attachment to CCITT V.10 interchange circuits

7.3.1 Generator characteristics

7.3.1.1 Generator open circuit output voltage

Test purpose:

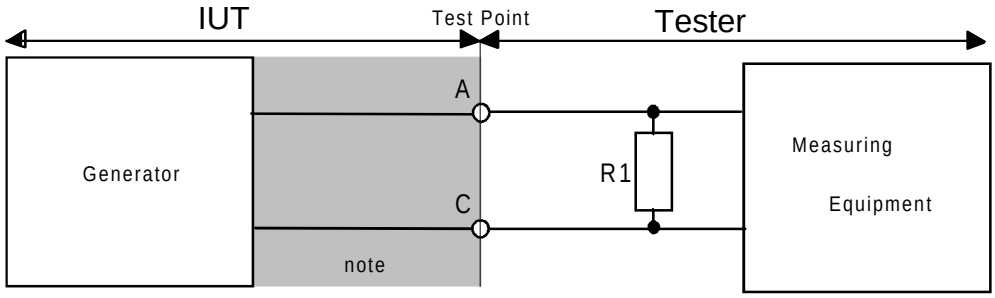
This test is to demonstrate compliance with the requirements of subclause 6.3.1.1.

Test considerations:

This test is most easily performed using signals that do not make transitions from one binary state to another while measurement is in progress. However, these tests may be carried out using other signal patterns which the terminal is capable of generating. In this case the effects of transient signal conditions shall be disregarded.

Test Configuration:

A 3 900 Ω non-reactive impedance (R1) is connected between points A and C. A device for measuring d.c. voltage is connected across points A and C. Point C shall be taken as circuit 102a for ISO 4902 [10] and circuit 102 for ISO 4903 [12] implementations.



NOTE: The shaded area denotes an interconnection means e.g. Interface cable and connector.

Figure 18

IUT interface state:

The Implementation Under Test (IUT) shall be powered.

Test stimulus and action:

The IUT is stimulated to generate each of the binary states for the generator under test. The test shall be repeated for each generator to be tested. The d.c. voltage shall be measured between points A and C.

Expected results:

The magnitude of the voltages measured between points A and C shall be less than or equal to 12,0 V for each binary state.

7.3.1.2 Generator terminated output voltage

Test purpose:

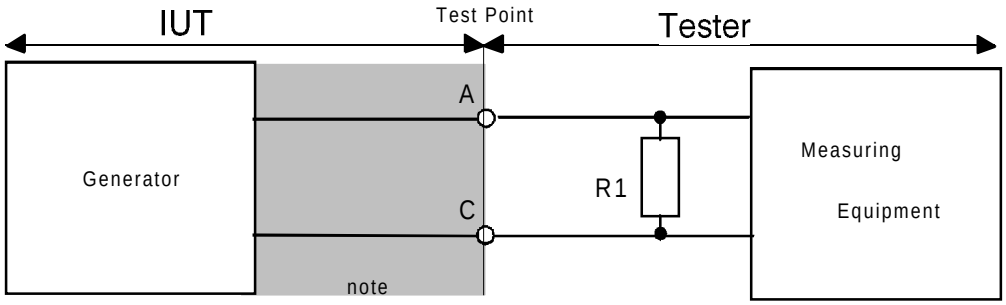
This test is to demonstrate compliance with the requirements of subclauses 6.3.1.2 and 6.3.1.4.

Test considerations:

This test is most easily performed using signals that do not make transitions from one binary state to another whilst measurement is in progress. However, these tests may be carried out using signal patterns which the terminal is capable of generating. In this case the effects of transient signal conditions shall be disregarded.

Test configuration:

A 450 Ω non-reactive impedance (R1) is connected between points A and C. A device for measuring d.c. voltage is connected across points A and C. Point C shall be taken as circuit 102a for ISO 4902 [10] and circuit 102 for ISO 4903 [12] implementations.



NOTE: The shaded area denotes an interconnection means e.g. interface cable and connector.

Figure 19

IUT interface state:

The IUT will be powered.

Test stimulus and action:

The IUT is stimulated to generate each of the binary states for the generator under test. The test shall be repeated for each generator to be tested.

Expected results:

a) the voltage measured (Vt) between points A and C shall be greater than or equal to 2 V;

b) for each of the binary states, the polarity of the voltage measured between points A and C shall be the opposite of that measured in the other binary state.

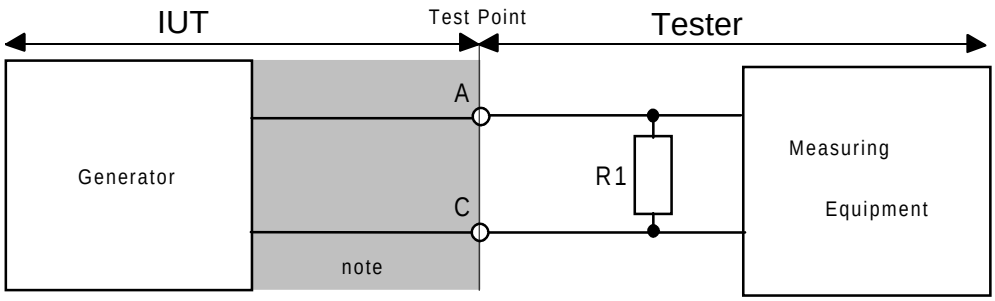
7.3.1.3 Generator output rise time

Test purpose:

This test is to demonstrate compliance with the requirements of subclause 6.3.1.3.

Test Configuration:

A 450 Ω non-reactive impedance (R1) is connected between points A and C. A device capable of measuring a differential voltage is connected between points A and C. Point C shall be taken as circuit 102a for ISO 4902 [10] and circuit 102 for ISO 4903 [12] implementations.



NOTE: The shaded area denotes an interconnection means e.g. interface cable and connector.

Figure 20

IUT interface state:

The IUT is stimulated to produce transitions from one binary state to another on the interchange circuit under test, e.g. a binary 1:1 bit pattern or with the IUT data stream set to Hex 7E (flags).

Test stimulus and action:

During the transition from one binary state to another, the time that elapses between the differential voltage reducing to 90 % of its steady state value for the binary state that existed prior to this transition, and its reaching 90 % of the steady state value that is attained following this transition, is measured. The effects of transient signal conditions shall be disregarded. The test shall be repeated with the polarity of the transition reversed.

Expected results:

The time measured between points A and C shall be less than or equal to the 0.3 of the nominal duration of a bit.

7.4 Test descriptions for attachment to CCITT Recommendation V.11 interchange circuits

7.4.1 Generator characteristics

7.4.1.1 Generator open circuit output voltage

Test purpose

This test is to demonstrate compliance with the requirements of subclause 6.3.2.1.

Test considerations:

This test is most easily performed using signals that do not make transitions from one binary state to another whilst measurement is in progress. However, these tests may be carried out using signal patterns which the terminal is capable of generating. In this case the effects of transient signal conditions shall be disregarded.

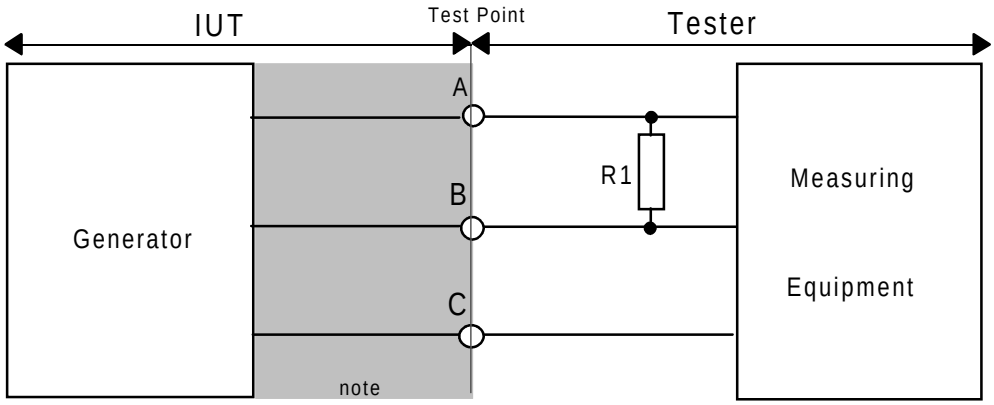
Test Configuration

Point C shall be taken as circuit 102a for ISO 4902 [10] and circuit 102 for ISO 4903 [12] implementations.

a) a 3 900 Ω non-reactive impedance (R1) is connected between points A and B. A device for measuring d.c. voltage (Vo) is connected between points A and B;

b) a 3 900 Ω non-reactive impedance (R1) is connected between points A and B. A device for measuring d.c. voltage (Voa) is connected between points A and C;

c) a 3 900 Ω non-reactive impedance (R1) is connected between points A and B. A device for measuring d.c. voltage (Vob) is connected between points B and C.



NOTE: This area denotes an interconnection means e.g. interface cable and connector.

Figure 21

IUT interface state:

The IUT shall be powered.

Test stimulus & action:

The terminal is caused to generate each of the binary states for the generator under test. The test shall be repeated for each generator to be tested. The d.c. voltage is measured between points A and B, between points A and C, and between points B and C.

Expected results:

The magnitudes of the voltages measured between:

a) points A and B (Vo);

b) points A and C (Voa);

c) points B and C (Vob);

shall each be less than or equal to 12,0 V for each binary state.

7.4.1.2 Generator terminated output voltage

Test purpose:

This test is to demonstrate compliance with the requirements of subclauses 6.3.2.2 and 6.3.2.4.

Test considerations:

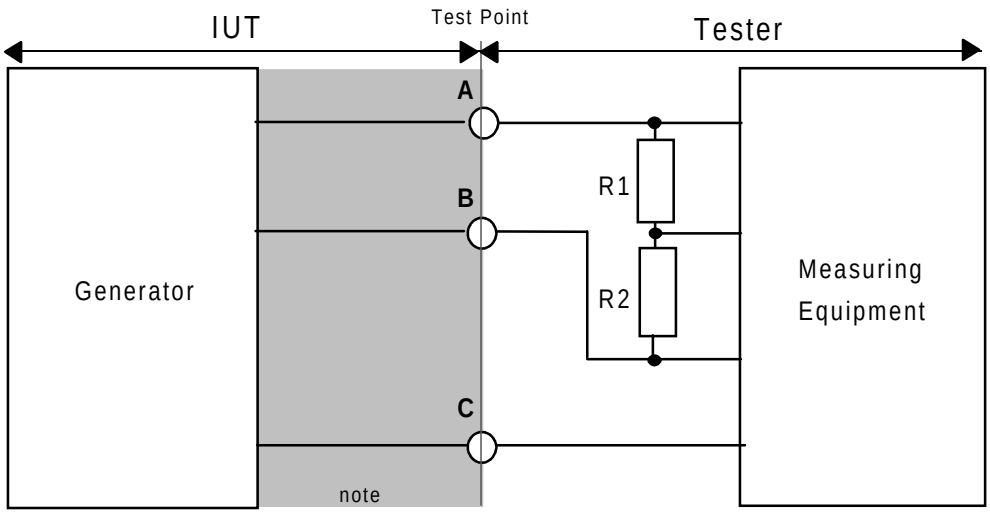
This test is most easily performed using signals that do not make transitions from one binary state to another while measurement is in progress. However, these tests may be carried out using signal patterns which the terminal is capable of generating. In this case the effects of transient signal conditions shall be disregarded.

Test configuration:

The generator is terminated with two 50 Ω non reactive impedances (R1 and R2) which are connected in series between points A and B (see figure 24)

a) a device for measuring d.c. voltage (Vt) is connected between points A and B;

b) a device for measuring d.c. voltage (Vos) is connected to the centre point of the two 50 Ω impedances and point C. Point C shall be taken as circuit 102a for ISO 4902 [10] and circuit 102 for ISO 4903 [12] implementations.



NOTE: The shaded area denotes an interconnection means e.g. interface cable and connector.

Figure 22

IUT interface state:

The IUT shall be powered.

Test stimulus and action:

The terminal is caused to generate each of the binary states for the generator under test. The test shall be repeated for each generator to be tested. The d.c. voltage is measured between points A and B, and between the centre point of the series terminations R1 and R2 and point C.

Expected results:

a) the voltage measured between points A and B (Vt) shall be greater than or equal to 2,0 V for each binary state;

b) the voltage measured between the centre-point of the series terminations R1 and R2 and point C (Vos) shall be less than or equal to 3,0 V for each binary state;

c) for each of the binary states, the polarity of the voltage measured between points A and B shall be opposite of that measured in the other binary state.

7.4.1.3 Generator output rise time

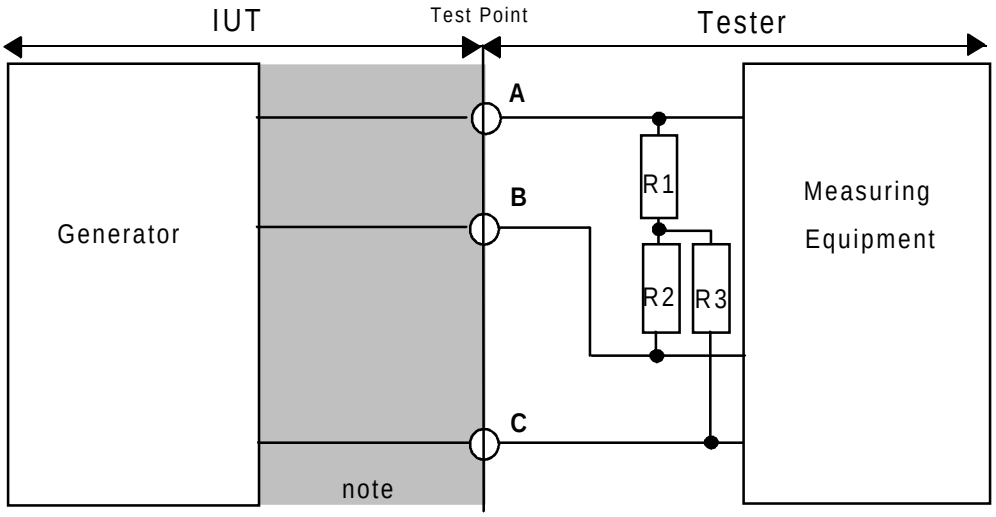
Test purpose:

This test is to demonstrate compliance with the requirements of subclause 6.3.2.3.

Test Configuration:

The generator is terminated with two 50 Ω non reactive impedances (R1 and R2) connected in series between points A and B and a 50 Ω non reactive impedance (R3) connected between point C and the centre point of the series connected impedances.(see figure 25). A device capable of measuring a differential voltage (Vt) is connected between points A and B.

Point C shall be taken as circuit 102a for ISO 4902 [10] and circuit 102 for ISO 4903 [12] implementations.



NOTE: The shaded area denotes an interconnection means e.g. interface cable and connector.

Figure 23

IUT interface state:

The IUT is stimulated to produce transitions from one binary state to another on the interchange circuit under test, e.g. a binary 1:1 bit pattern or with the DTE data stream set to Hex 7E(flags).

Test stimulus and action:

During the transition from one binary state to another, the time that elapses between the differential voltage reducing to 90 % of its steady state value for the binary state that existed prior to this transition, and its reaching 90 % of the steady state value that is attained following this transition, is measured. The effects of transient signal conditions shall be disregarded. The test shall repeated with the polarity of the transition reversed.

Expected results:

The time measured between point A and B shall be less than or equal to the 0,3 of the nominal duration of a bit.

7.5 Test descriptions for attachment to CCITT V.28 interchange circuits

7.5.1 Generator characteristics

7.5.1.1 Generator open circuit output voltage

Test purpose:

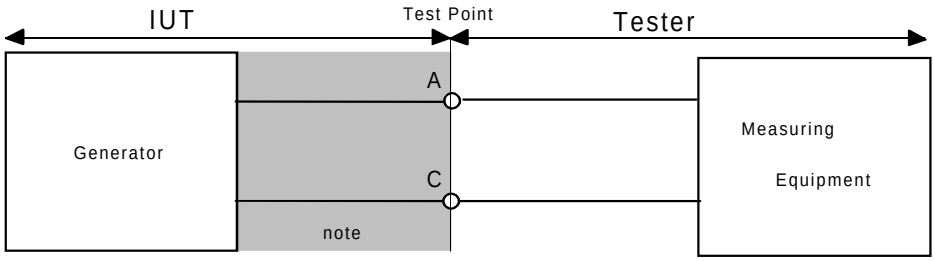
This test is to demonstrate compliance with the requirements of subclause 6.3.3.1.

Test considerations:

This test is most easily performed using signals that do not make transitions from one binary state to another while measurement is in progress. However, these tests may be carried out using signal patterns which the terminal is capable of generating. In this case the effects of transient signal conditions shall be disregarded.

Test configuration:

A device for measuring d.c voltage is connected across points A and C.



NOTE: The shaded area denotes an interconnection means e.g. interface cable and connector.

Figure 24

IUT interface state:

The IUT shall be powered.

Test stimulus and action:

The IUT is stimulated to generate each of the binary states for the generator under test. The test shall be repeated for each generator to be tested.

Expected results:

The magnitude of the voltage measured between points A and C, shall be less than or equal to 25,0 V for each binary state.

7.5.1.2 Generator terminated output voltage

Test purpose:

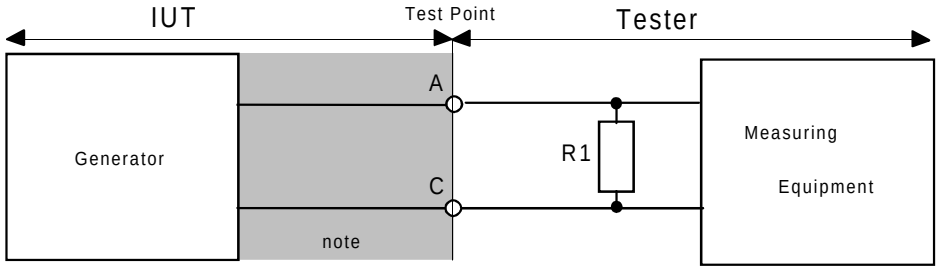
This test is to demonstrate compliance with the requirements of subclauses 6.3.3.2 and 6.3.3.4.

Test considerations:

This test is most easily performed using signals that do not make transitions from one binary state to another while measurement is in progress. However, these tests may be carried out using signal patterns which the terminal is capable of generating. In this case the effects of transient signal conditions shall be disregarded.

Test configuration:

A 3 000 Ω non-reactive impedance (R1) is connected between points A and C. A device for measuring d.c. voltage is connected across points A and C.



NOTE: The shaded area denotes an interconnection means e.g. interface cable and connector.

Figure 25

IUT interface state:

The IUT shall be powered.

Test stimulus and action:

The IUT is stimulated to generate each of the binary states for the generator under test. The test shall be repeated for each generator to be tested.

Expected results:

a) the measured voltage (Vt) between points A and C shall be greater than or equal to 3,0 V for each binary state.

b) for each of the binary states, the polarity of the voltage measured between points A and C shall be the opposite of that measured in the other binary state.

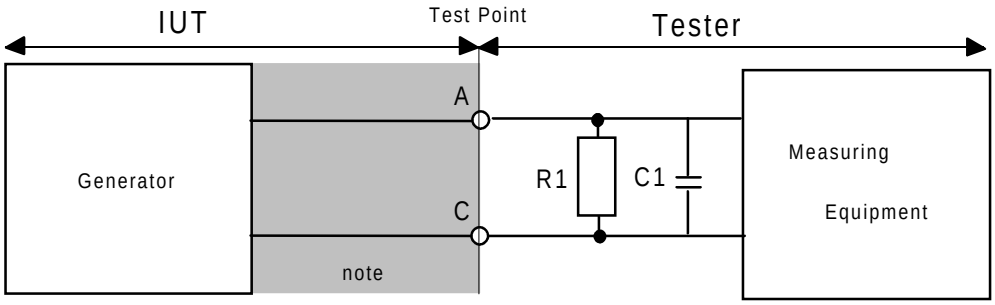
7.5.1.3 Generator output signal transition time

Test purpose:

This test is to demonstrate compliance with the requirements of subclause 6.3.3.3.

Test Configuration:

A 3 000 Ω non-reactive impedance (R1) is connected in parallel with a 2 500 pF (C1) capacitor between points A and C. A device capable of measuring a voltage is connected between points A and C.



NOTE: The shaded area denotes an interconnection means e.g. interface cable and connector.

Figure 26

IUT interface state:

The IUT shall be powered.

Test stimulus and action:

During the transition from one binary steady state to the other steady state, the time required for the voltage measured between points A and C to traverse the region between -3,0 V to +3,0 V is measured. The effects of transient signal conditions shall be disregarded. The test shall be repeated with the polarity of the transition reversed.

Expected results:

The time measured shall be less than or equal to 1,0 millisecond or 3 % of the nominal duration of a bit, whichever is the lesser.

7.5.2 Receiver characteristics

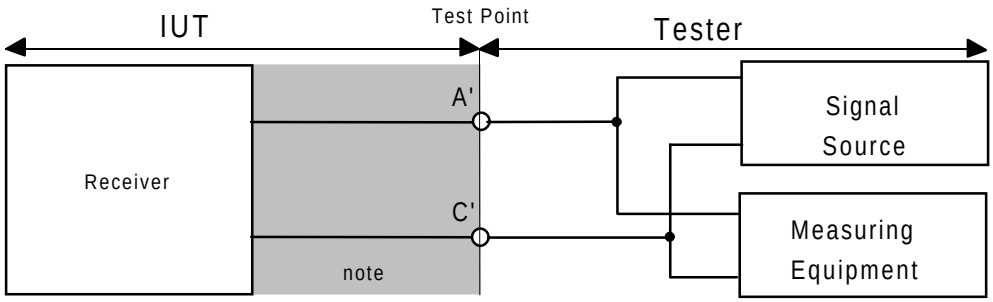
7.5.2.1 Receiver effective shunt capacitance

Test purpose:

This test is to demonstrate compliance with the requirements of subclause 6.3.3.5.

Test Configuration:

An IUT is connected to a signal source with an internal impedance of 1 200 Ω non-reactive. The signal source shall provide a binary 1:1 bit pattern at a rate of 9 600 bit/s with an e.m.f. of 14 V, balanced in voltage about point C'. A device for measuring d.c. voltage is connected across points A' and C'.



NOTE: The shaded area denotes an interconnection means e.g. interface cable and connector.

Figure 27

IUT interface state:

The IUT shall be powered.

Test stimulus and action:

An IUT is connected to a signal source with an internal impedance of 1 200 Ω non-reactive. The signal source is set to provide a binary 1:1 bit pattern at a rate of 9 600 bit/s with an e.m.f. of 14 V, balanced in voltage about point C'.

The time for the voltage at point A' relative to point C' to pass between -3 V to +3 V (for positive going transitions) (t1), and between +3 V and -3 V (for negative going transitions) (t2), during transitions of the test signal, is recorded.

The IUT is replaced with a reference receiver circuit comprising a 3 000 Ω non-reactive impedance in parallel with a capacitance of 2 500 pf. The time for the voltage at point A' relative to point C' to pass between -3 V and +3 V (t3), during transitions of the test signal, is recorded.

Expected Results:

a) time t1 shall be less than or equal to time t3; and

b) time t2 shall be less than or equal to time t3.

7.6 Test descriptions for attachment to CCITT Recommendation V.35 interchange circuits

7.6.1 Generator characteristics

7.6.1.1 Generator open circuit output voltage

Test purpose:

This test is to demonstrate compliance with the requirements of subclause 6.3.4.1.

Test considerations:

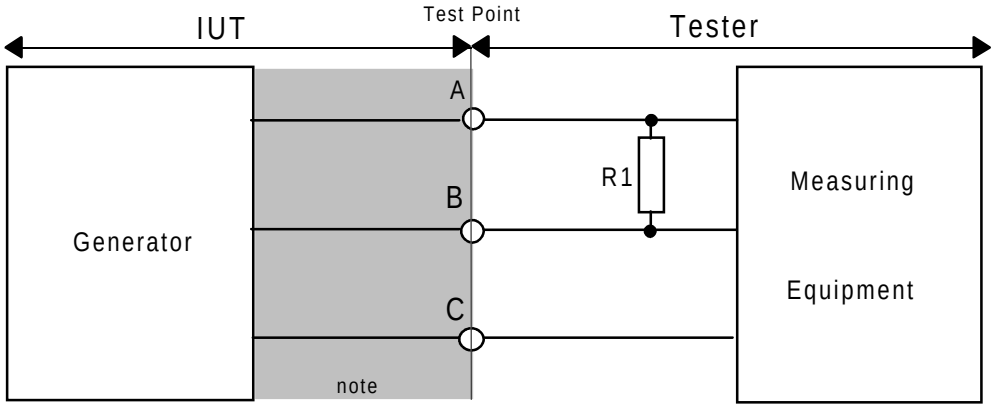
This test is most easily performed using signals that do not make transitions from one binary state to another while measurement is in progress. However, these tests may be carried out using signal patterns which the terminal is capable of generating. In this case the effects of transient signal conditions shall be disregarded.

Test Configuration:

a) a 3 900 Ω non-reactive impedance (R1) is connected between points A and B. A device for measuring d.c. voltage (Vo) is connected between points A and B;

b) a 3 900 Ω non-reactive impedance (R1) is connected between points A and B. A device for measuring d.c. voltage (Voa) is connected between points A and C;

c) a 3 900 Ω non-reactive impedance (R1) is connected between points A and B. A device for measuring d.c. voltage (Vob) is connected between points B and C.



NOTE: This area denotes an interconnection means e.g. interface cable and connector.

Figure 28

IUT interface state:

The IUT shall be powered.

Test stimulus & action:

The terminal is caused to generate each of the binary states for the generator under test. The test shall be repeated for each generator to be tested. The d.c. voltage is measured between points A and B, between points A and C, and between points B and C.

Expected results:

The magnitudes of the voltages measured between:

a) points A and B (Vo);
b) points A and C (Voa);
c) points B and C (Vob).

shall each be less than or equal to 1,2 V for each binary state.

7.6.1.2 Generator terminated output voltage

Test purpose:

This test is to demonstrate compliance with the requirements of subclauses 6.3.4.2 and 6.3.4.4.

Test considerations:

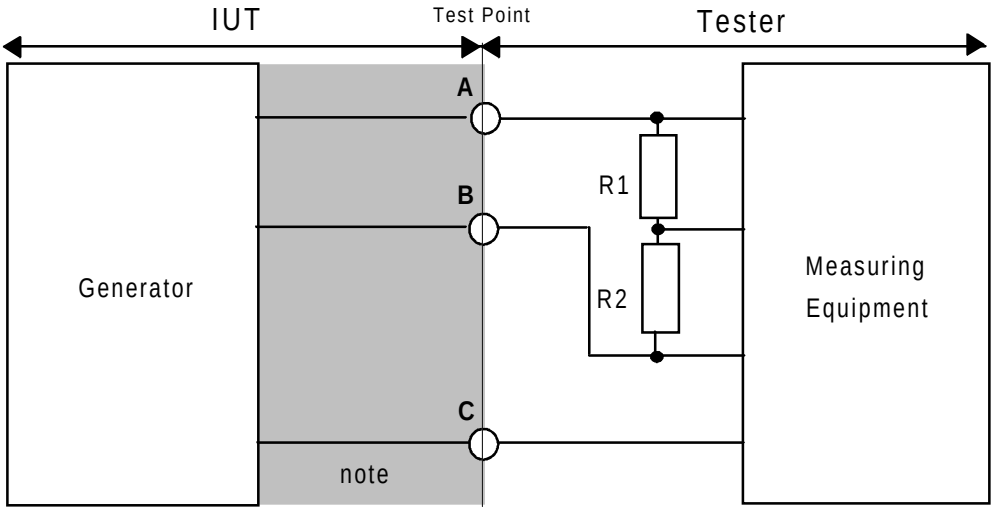
This test is most easily performed using signals that do not make transitions from one binary state to another while measurement is in progress. However, these tests may be carried out using signal patterns which the terminal is capable of generating. In this case the effects of transient signal conditions shall be disregarded.

Test Configuration:

The generator is terminated with two 50 Ω non reactive impedances (R1 and R2) which are connected in series between points A and B.(see figure 31)

a) a device for measuring d.c. voltage (Vt) is connected between points A and B;

b) a device for measuring d.c. voltage (Vos) is connected to the centre point of the two 50 Ω impedances and point C.



NOTE: The shaded area denotes an interconnection means e.g. interface cable and connector.

Figure 29

IUT interface state:

The IUT shall be powered.

Test stimulus and action:

The terminal is caused to generate each of the binary states for the generator under test. The test shall be repeated for each generator to be tested. The d.c. voltage is measured between points A and B, and between the centre point of the series terminations R1 and R2 and point C.

Expected results:

a) the voltage measured between points A and B (Vt) shall be greater than or equal to 0,44 V and shall be less than or equal to 0,66 V for each binary state;

b) the voltage measured between the centre-point of the series terminations R1 and R2 and point C (Vos) shall be less than or equal to 0,6 V for each binary state;

c) for each of the binary states, the polarity of the voltage measured between points A and B shall be opposite of that measured in the other binary state.

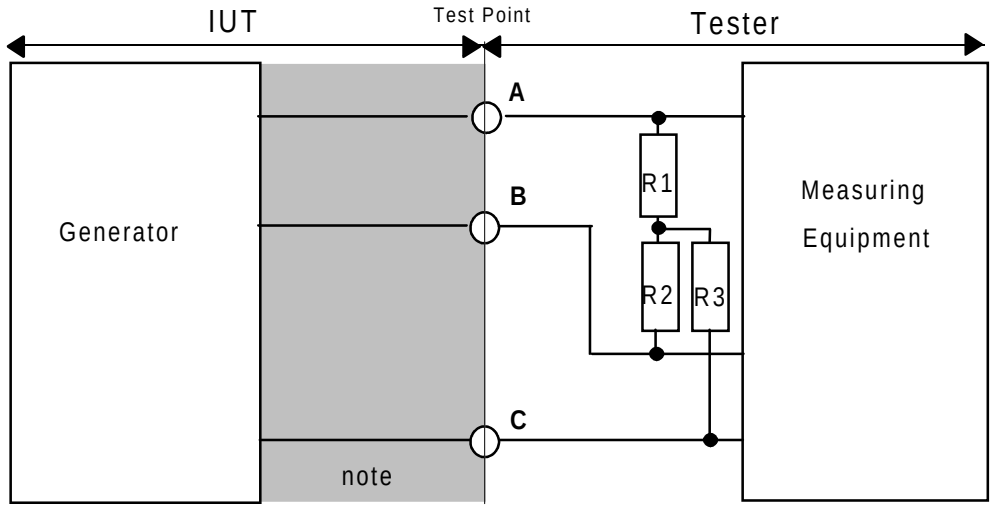
7.6.1.3 Generator output rise time

Test purpose:

This test is to demonstrate compliance with the requirements of subclause 6.3.4.3.

Test Configuration:

The generator is terminated with two 50 Ω non reactive impedances (R1 and R2) connected in series between points A and B and a 50 Ω non reactive impedance (R3) connected between point C and the centre-point of the series connected impedances (see figure 25). A device capable of measuring a differential voltage (Vt) is connected between points A and B.



NOTE: The shaded area denotes an interconnection means e.g. interface cable and connector.

Figure 30

IUT interface state:

The IUT is stimulated to produce transitions from one binary state to the other on the interchange circuit under test, e.g. a binary 1:1 bit pattern or with the DTE data stream set to Hex 7E(flags).

Test stimulus and action:

During the transition from one binary state to another, the time that elapses between the differential voltage reducing to 80 % of its steady state value for the binary state that existed prior to this transition, and its reaching 80 % of the steady state value that is attained following this transition, is measured. The

effects of transient signal conditions shall be disregarded. The test is repeated with the polarity of the transition reversed.

Expected results:

The time measured between point A and B shall be less than or equal to the 10 % of the nominal duration of a bit.

7.7 TBR 2 Test Case Selection Expression Definition table

The TBR 2 Test Case Selection Expression Definition table defines the selection expressions used in selecting the relevant test groups and test cases to be performed for a given implementation to assess conformance with TBR 2.

The Expression Name is a short form notation used in the TBR Test Suite Structure Table and Test Case Index Table to express the selection criteria for the different test groups and test cases.

The Selection Expression is a Boolean expression which shall be evaluated in terms of the support answers given for individual TBR-RT entries, expressed by the relevant entry number.

NOTE: For reasons of clarity, in table 1, CCITT Recommendations are shown as CCITT Rec. followed by the series number, therefore CCITT Rec. V.34 means CCITT Recommendation V.34.

Table 1:
TBR 2 Test Case Selection Expression Definitions

Expression Name	Selection Expression	Comments
15p	if TBR-RT 4.5.2.1 then TRUE	15-pole connector
25p	if TBR-RT 4.1.2.1 then TRUE	25-pole connector
26p	if TBR-RT (4.2.2.1 OR 4.2.6.1) then TRUE	26-pole connector
26p1	if TBR-RT 4.2.2.1 then TRUE	26-pole connector-connection to CCITT Rec. V.10/V.11 DCE
26p2	if TBR-RT 4.2.6.1 then TRUE	26-pole connector - connection to CCITT Rec. V.28 DCE
34p	if TBR-RT 4.4.2.1 then TRUE	34-pole connector
37p	if TBR-RT 4.3.2.1 then TRUE	37-pole connector
v10g	if c29=m OR c61=m OR c76=m OR c88=m then TRUE	generators for connection to DCE CCITT Rec. V.10 receivers
v11g	if c30=m OR c60=m OR c75=m OR c87=m then TRUE	generators for connection to DCE CCITT Rec. V.11 receivers
v28g	if c14=m OR c44=m OR c78=m then TRUE	generators for connection to DCE CCITT Rec. V.28 receivers
v28r	if c15=m OR c45=m OR c79=m then TRUE	receivers for connection to DCE CCITT Rec. V.28 generators
v35g	if c77=m then TRUE	generators for connection to DCE CCITT Rec. V.34 receivers

7.8 Test case Index

Table 2:
TBR 2 Test Case Index Table for connector characteristics and contact number assignments

Test Group Reference	Test Case Id.	Selection Ref.	Description
Connector characteristics	7.2.1.1	25p	25-pole connector
Contact number assignments	7.2.1.2	25p	
Connector characteristics	7.2.2.1	26p	26-pole connector
Contact number assignments	7.2.2.2.1	26p1	
Contact number assignments	7.2.2.2.2	26p2	
Connector characteristics	7.2.3.1	37p	37-pole connector
Contact number assignments	7.2.3.2	37p	
Connector characteristics	7.2.4.1	34p	34-pole connector
Contact number assignments	7.2.4.2	34p	
Connector characteristics	7.2.5.1	15p	15-pole connector
Contact number assignments	7.2.5.2	15p	

Table 3:
TBR 2 Test Case Index Table for DTE declared as intended for connection to DCE interchange circuits conforming to CCITT Recommendation V.10

Test Group Reference	Test Case Id.	Selection Ref.	Description
Generator characteristics	7.3.1.1	v10g	Generator open circuit output voltage
	7.3.1.2	v10g	Generator terminated output voltage
	7.3.1.3	v10g	Generator output rise time

Table 4:
TBR 2 Test Case Index Table for DTE declared as intended for connection to DCE interchange circuits conforming to CCITT Recommendation V.11

Test Group Reference	Test Case Id.	Selection Ref.	Description
Generator characteristics	7.4.1.1	v11g	Generator open circuit output voltage
	7.4.1.2	v11g	Generator terminated output voltage
	7.4.1.3	v11g	Generator output rise time

Table 5:
TBR 2 Test Case Index Table for DTE declared as intended for connection to DCE interchange circuits conforming to CCITT Recommendation V.28

Test Group Reference	Test Case Id.	Selection Ref.	Description
Generator characteristics	7.5.1.1	v28g	Generator open circuit output voltage
	7.5.1.2	v28g	Generator terminated output voltage
	7.5.1.3	v28g	Generator output signal transition time
Receiver characteristics	7.5.2.1	v28r	Receiver effective shunt capacitance

Table 6:
TBR 2 Test Case Index Table for DTE declared as intended for connection to DCE interchange circuits conforming to CCITT Recommendation V.35

Test Group Reference	Test Case Id.	Selection Ref.	Description
Generator characteristics	7.6.1.1	v35g	Generator open circuit output voltage
	7.6.1.2	v35g	Generator terminated output voltage
	7.6.1.3	v35g	Generator output rise time

Annex A (normative): The TBR Requirements Table (TBR-RT)

Users of this specification may freely reproduce the TBR-RT proforma in this annex so that it can be used for its intended purpose and may also publish the completed TBR-RT

A.1 Introduction to the TBR-RT

This TBR-RT provides a summary of all the requirements of this TBR. It shows the status of each TBR requirement, whether it is essential to implement in all circumstances, or whether the requirement is dependant on the manufacturer having chosen to support a particular optional service or functionality. In particular it enables the TBR requirements associated with a particular optional service or functionality to be grouped and identified.

The proforma provides the means to capture the choices which the manufacturer has made in implementing the equipment.

When completed in respect of a particular equipment it provides a means to undertake the Static Assessment of conformity with the TBR, and to select the appropriate test cases to be used in dynamically testing the equipment.

A.2 Format of the tables

In the "No." column a local entry number for the requirement in the TBR-RT is given. This entry number is further used for the evaluation of the boolean expressions in other parts of the TBR-RT and in the Test Case selection expression definition table of the TBR.

In the "Cat." column the class of essential requirements is indicated. Essential requirements are classified according to article 4 of the EC Council Directive, 91/263/EEC. Valid entries used in this TBR-RT are D and F, corresponding respectively to "Protection of public networks" and "Interworking with the public networks".

The "Ref." column references the corresponding requirement subclause of the TBR.

In the "TBR-R" column a short non-exhaustive description of the requirement is found.

In the "Status" column the status of the entry, as further detailed in the following clause, is indicated.

The "Support" column is blank in the proforma, and shall be completed by the manufacturer in respect of each particular requirement to indicate the choices, which have been in the implementation.

In the "Maximum Range" column the maximum allowed range of data rates according to the TBR is indicated, and the actual range for which the implementation is intended shall be completed by the manufacturer.

A.3 Notations used in the TBR-RT

A.3.1 Status notations

The "Status" column shows the status of the entries as follows:

m= Mandatory: must be implemented under all circumstances;

o= Optional: may be provided, but if provided must be implemented in accordance with the requirements;

o<n>= This status is used for mutually exclusive or selectable options among a set, in cases where it is mandatory to implement one or more options among a set. The integer <n> refers to a unique group of options within the TBR-RT. A footnote under the table in which it is used states explicitly what the requirement is for each numbered group.

c<n>= Conditional number <n>: Reference is made to a boolean expression under the table with predicates of support answers, which will resolve to either "m", "x", or "o<n>" for a specific implementation. In all cases "ELSE Not Applicable" is implied, if an ELSE expression Is omitted.

x= Excluded: This notation is relevant in the case of the contact number assignments, where the specified poles only are permitted to be used as described.

A.3.2 Support answer notations

The "Support" column is reserved for completion in respect of a particular implementation.

Yes (or Y or y)	Indicating that the implementation claims to fully implement the TBR-R in accordance with the specification. The entry of a "Yes" against an "x" status entry means the equipment does not conform to the TBR.
No (or N or n)	Indicating that the implementation does not claim full support of the TBR-R in accordance with the specification. The entry of a "No" against an "m" status entry means the equipment does not conform to the TBR.

A.4 The TBR Requirement Tables

A.4.1 Connection to a DCE presenting an ISO 2110 [8] (25-pole) connector

Table A.1:
Use of interchange circuits on DTE intended for connection to a DCE presenting CCITT Recommendation V.28 electrical characteristics on an ISO 2110 (25-pole) connector

TBR Reference:					
No.	**Cat.**	**Ref.**	**TBR-R**	**Status**	**Support**
4.1.1.1	D	6.2.1.2	Circuit 102 - Signal ground or common return	o	
4.1.1.2	D	6.2.1.2	Circuit 103 - Transmitted data	o	
4.1.1.3	D	6.2.1.2	Circuit 104 - Received data	o	
4.1.1.4	D	6.2.1.2	Circuit 105 - Request to send	o	
4.1.1.5	D	6.2.1.2	Circuit 106 - Ready for sending	o	
4.1.1.6	D	6.2.1.2	Circuit 107 - Data set ready	o	
4.1.1.7	D	6.2.1.2	Circuit 108/1 - Connect data set to line	o	
4.1.1.8	D	6.2.1.2	Circuit 109 - Data channel received line signal detector	o	
4.1.1.9	D	6.2.1.2	Circuit 114 - Transmit signal element timing (DCE)	o	
4.1.1.10	D	6.2.1.2	Circuit 115 - Receiver signal element timing (DCE)	o	
4.1.1.11	D	6.2.1.2	Circuit 140 - Loopback/Maintenance	o	
4.1.1.12	D	6.2.1.2	Circuit 141 - Local loop back	o	
4.1.1.13	D	6.2.1.2	Circuit 142 - Test indicator	o	

Table A.2:
Connector type and contact number assignments for DTE intended for connection to a DCE presenting CCITT Recommendation V.28 electrical characteristics on an ISO 2110 [8] (25-pole) connector

TBR Reference:					
No.	**Cat.**	**Ref.**	**TBR-R**	**Status**	**Support**
4.1.2.1	D	6.2.1.1	ISO 2110 connector	m	
4.1.2.2	D	6.2.1.2	Signal ground or common return on pole 7	c1	
4.1.2.3	D	6.2.1.2	Transmitted data on pole 2	c2	
4.1.2.4	D	6.2.1.2	Received data on pole 3	c3	
4.1.2.5	D	6.2.1.2	Request to send on pole 4	c4	
4.1.2.6	D	6.2.1.2	Ready for sending on pole 5	c5	
4.1.2.7	D	6.2.1.2	Data set ready on pole 6	c6	
4.1.2.8	D	6.2.1.2	Connect data set to line on pole 20	c7	
4.1.2.9	D	6.2.1.2	Data channel received line signal detector on pole 8	c8	
4.1.2.10	D	6.2.1.2	Transmit signal element timing (DCE) on pole 15	c9	
4.1.2.11	D	6.2.1.2	Receiver signal element timing (DCE) on pole 17	c10	
4.1.2.12	D	6.2.1.2	Loopback/Maintenance on pole 21	c11	
4.1.2.13	D	6.2.1.2	Local loop back on pole 18	c12	
4.1.2.14	D	6.2.1.2	Test indicator on pole 25	c13	

c1: IF 4.1.1.1 THEN m ELSE x
c2: IF 4.1.1.2 THEN m ELSE x
c3: IF 4.1.1.3 THEN m ELSE x
c4: IF 4.1.1.4 THEN m ELSE x
c5: IF 4.1.1.5 THEN m ELSE x
c6: IF 4.1.1.6 THEN m ELSE x
c7: IF 4.1.1.7 THEN m ELSE x
c8: IF 4.1.1.8 THEN m ELSE x
c9: IF 4.1.1.9 THEN m ELSE x
c10: IF 4.1.1.10 THEN m ELSE x
c11: IF 4.1.1.11 THEN m ELSE x
c12: IF 4.1.1.12 THEN m ELSE x
c13: IF 4.1.1.13 THEN m ELSE x

Table A.3:
Generator electrical characteristics for DTE intended for connection to a DCE presenting CCITT Recommendation V.28 electrical characteristics on an ISO 2110 [8] (25-pole) connector

TBR Reference:					
No.	**Cat.**	**Ref.**	**TBR-R**	**Status**	**Support**
4.1.3.1	D	6.3.3.1	Generator open circuit output voltage	c14	
4.1.3.2	F	6.3.3.2	Generator terminated output voltage	c14	
4.1.3.3	F	6.3.3.3	Generator output signal transition time	c14	

c14: IF 4.1.1.2 OR 4.1.1.4 OR 4.1.1.7 OR 4.1.1.11 OR 4.1.1.12 THEN m

Table A.4:
Receiver electrical characteristics for DTE intended for connection to a DCE presenting CCITT Recommendation V.28 electrical characteristics on an ISO 2110 [8] (25-pole) connector

TBR Reference:					
No.	**Cat.**	**Ref.**	**TBR-R**	**Status**	**Support**
4.1.4	F	6.3.3.5	Receiver effective shunt capacitance	c15	
C15: IF 4.1.1.3 OR 4.1.1.5 OR 4.1.1.6 OR 4.1.1.8 OR 4.1.1.9 OR 4.1.1.10 OR 4.1.1.13 THEN m					

A.4.2 Connection to a DCE presenting an ISO/IEC 11569 (26-pole) connector

Table A.5:
Use of Interchange circuits on DTE intended for connection to a DCE presenting CCITT Recommendation V.10 or V.11 electrical characteristics on an ISO/IEC 11569 [9] (26-pole) connector

TBR Reference:					
No.	**Cat.**	**Ref.**	**TBR-R**	**Status**	**Support**
4.2.1.1	D	6.2.2.2	Circuit 102 - Signal ground or common return	o	
4.2.1.2	D	6.2.2.2	Circuit 103 -Transmitted data	o	
4.2.1.3	D	6.2.2.2	Circuit 104 - Received data	o	
4.2.1.4	D	6.2.2.2	Circuit 105 - Request to send	o	
4.2.1.5	D	6.2.2.2	Circuit 106 - Ready for sending	o	
4.2.1.6	D	6.2.2.2	Circuit 107 - Data set ready	o	
4.2.1.7	D	6.2.2.2	Circuit 108/1 - Connect data set to line or Circuit 108/2 - Data Terminal Ready	o	
4.2.1.8	D	6.2.2.2	Circuit 109 - Data channel received line signal detector	o	
4.2.1.9	D	6.2.2.2	Circuit 114 - Transmit signal element timing (DCE)	o	
4.2.1.10	D	6.2.2.2	Circuit 115 - Receiver signal element timing (DCE)	o	
4.2.1.11	D	6.2.2.2	Circuit 140 - Loopback/Maintenance	o	
4.2.1.12	D	6.2.2.2	Circuit 141 - Local loop back	o	
4.2.1.13	D	6.2.2.2	Circuit 142 - Test indicator	o	

Table A.6:
Connector type and contact number assignments for DTE intended for connection to a DCE presenting CCITT Recommendation V.10 or V.11 electrical characteristics on an ISO/IEC 11569 [9] (26-pole) connector

TBR Reference:					
No.	**Cat.**	**Ref.**	**TBR-R**	**Status**	**Support**
4.2.2.1	D	6.2.2.1	ISO/IEC 11569 connector	m	
4.2.2.2	D	6.2.2.2	DTE common return A-wire on pole 7	c16	
4.2.2.3	D	6.2.2.2	DCE common return B-wire on pole 23	c16	
4.2.2.4	D	6.2.2.2	Transmitted data A-wire on pole 2	c17	
4.2.2.5	D	6.2.2.2	Transmitted data B-wire on pole 14	c17	
4.2.2.6	D	6.2.2.2	Received data A-wire on pole 3	c18	
4.2.2.7	D	6.2.2.2	Received data B-wire on pole 16	c18	
4.2.2.8	D	6.2.2.2	Request to send A-wire on pole 4	c19	
4.2.2.9	D	6.2.2.2	Request to send B-Wire on pole 19	c19	
4.2.2.10	D	6.2.2.2	Ready for sending A-wire on pole 5	c20	
4.2.2.11	D	6.2.2.2	Ready for sending B-wire on pole 13	c20	
4.2.2.12	D	6.2.2.2	Data set ready A-wire on pole 6	c21	
4.2.2.13	D	6.2.2.2	Data set ready B-wire on pole 22	c21	
4.2.2.14	D	6.2.2.2	Connect data set to line or Data terminal ready on pole 20	c22	
4.2.2.15	D	6.2.2.2	Data channel received line signal detector A-wire on pole 8	c23	
4.2.2.16	D	6.2.2.2	Data channel received line signal detector B-wire on pole 10	c23	
4.2.2.17	D	6.2.2.2	Transmit signal element timing (DCE) A-wire on pole 15	c24	
4.2.2.18	D	6.2.2.2	Transmit signal element timing (DCE) B-wire on pole 12	c24	
4.2.2.19	D	6.2.2.2	Receiver signal element timing (DCE) A-wire on pole 17	c25	
4.2.2.20	D	6.2.2.2	Receiver signal element timing (DCE) B-wire on pole 9	c25	
4.2.2.21	D	6.2.2.2	Circuit 140 - Loopback/Maintenance on pole 21	c26	
4.2.2.22	D	6.2.2.2	Circuit 141 - Local loop back on pole 18	c27	
4.2.2.23	D	6.2.2.2	Circuit 142 - Test indicator on pole 25	c28	

c16: IF 4.2.1.1 THEN m ELSE x
c17: IF 4.2.1.2 THEN m ELSE x
c18: IF 4.2.1.3 THEN m ELSE x
c19: IF 4.2.1.4 THEN m ELSE x
c20: IF 4.2.1.5 THEN m ELSE x
c21: IF 4.2.1.6 THEN m ELSE x
c22: IF 4.2.1.7 THEN m ELSE x
c23: IF 4.2.1.8 THEN m ELSE x
c24: IF 4.2.1.9 THEN m ELSE x
c25: IF 4.2.1.10 THEN m ELSE x
c26: IF 4.2.1.11 THEN m ELSE x
c27: IF 4.2.1.12 THEN m ELSE x
c28: IF 4.2.1.13 THEN m ELSE x

Table A.7:
Generator electrical characteristics for DTE intended for connection to a DCE presenting CCITT Recommendation V.10 electrical characteristics on an ISO/IEC 11569 [9] (26-pole) connector

TBR Reference:					
No.	**Cat.**	**Ref.**	**TBR-R**	**Status**	**Support**
4.2.3.1	D	6.3.1.1	Generator output voltage limit	c29	
4.2.3.2	F	6.3.1.2	Generator terminated output voltage	c29	
4.2.3.3	F	6.3.1.3	Generator output rise time	c29	
c29: IF 4.2.1.2 OR 4.2.1.4 OR 4.2.1.7 OR 4.2.1.11 OR 4.2.1.12 THEN m					

Table A.8:
Generator electrical characteristics for DTE intended for connection to a DCE presenting CCITT Recommendation V.11 electrical characteristics on an ISO/IEC 11569 [9] (26-pole) connector

TBR Reference:					
No.	**Cat.**	**Ref.**	**TBR-R**	**Status**	**Support**
4.2.4.1	D	6.3.2.1	Generator output voltage limit	c30	
4.2.4.2	F	6.3.2.2	Generator terminated output voltage	c30	
4.2.4.3	F	6.3.2.3	Generator output rise time	c30	
c30: IF 4.2.1.2 OR 4.2.1.4 OR 4.2.1.7 OR 4.2.1.11 OR 4.2.1.12 THEN m					

Table A.9:
Use of Interchange circuits on DTE intended for connection to a DCE presenting CCITT Recommendation V.28 electrical characteristics on an ISO/IEC 11569 [9] (26-pole) connector

TBR Reference:					
No.	**Cat.**	**Ref.**	**TBR-R**	**Status**	**Support**
4.2.5.1	D	6.2.2.2	Circuit 102 - Signal ground or common return	o	
4.2.5.2	D	6.2.2.2	Circuit 103 -Transmitted data	o	
4.2.5.3	D	6.2.2.2	Circuit 104 - Received data	o	
4.2.5.4	D	6.2.2.2	Circuit 105 - Request to send	o	
4.2.5.5	D	6.2.2.2	Circuit 106 - Ready for sending	o	
4.2.5.6	D	6.2.2.2	Circuit 107 - Data set ready	o	
4.2.5.7	D	6.2.2.2	Circuit 108/1 - Connect data set to line	o	
4.2.5.8	D	6.2.2.2	Circuit 109 - Data channel received line signal detector	o	
4.2.5.9	D	6.2.2.2	Circuit 114 - Transmit signal element timing (DCE)	o	
4.2.5.10	D	6.2.2.2	Circuit 115 - Receiver signal element timing (DCE)	o	
4.2.5.11	D	6.2.2.2	Circuit 140 - Loopback/Maintenance	o	
4.2.5.12	D	6.2.2.2	Circuit 141 - Local loop back	o	
4.2.5.13	D	6.2.2.2	Circuit 142 - Test indicator	o	

Table A.10:
Connector type and contact number assignments for DTE intended for connection to a DCE presenting CCITT Recommendation V.28 electrical characteristics on an ISO/IEC 11569 [9] (26-pole) connector.

TBR Reference:					
No.	**Cat.**	**Ref.**	**TBR-R**	**Status**	**Support**
4.2.6.1	D	6.2.2.1	ISO/IEC 11569 connector	m	
4.2.6.2	D	6.2.2.2	Signal ground or common return on pole 7	c31	
4.2.6.3	D	6.2.2.2	Transmitted data on pole 2	c32	
4.2.6.4	D	6.2.2.2	Received data on pole 3	c33	
4.2.6.5	D	6.2.2.2	Request to send on pole 4	c34	
4.2.6.6	D	6.2.2.2	Ready for sending on pole 5	c35	
4.2.6.7	D	6.2.2.2	Data set ready on pole 6	c36	
4.2.6.8	D	6.2.2.2	Connect data set to line on pole 20	c37	
4.2.6.9	D	6.2.2.2	Data channel received line signal detector on pole 8	c38	
4.2.6.10	D	6.2.2.2	Transmitter signal element timing (DCE) on pole 15	c39	
4.2.6.11	D	6.2.2.2	Receiver signal element timing (DCE) on pole 17	c40	
4.2.6.12	D	6.2.2.2	Loopback/Maintenance on pole 21	c41	
4.2.6.13	D	6.2.2.2	Local loop back on pole 18	c42	
4.2.6.14	D	6.2.2.2	Test indicator on pole 25	c43	
c31: IF 4.2.5.1 THEN m ELSE x c33: IF 4.2.5.3 THEN m ELSE x c35: IF 4.2.5.5 THEN m ELSE x c37: IF 4.2.5.7 THEN m ELSE x c39: IF 4.2.5.9 THEN m ELSE x c41: IF 4.2.5.11 THEN m ELSE x c43: IF 4.2.5.13 THEN m ELSE x			c32: IF 4.2.5.2 THEN m ELSE x c34: IF 4.2.5.4 THEN m ELSE x c36: IF 4.2.5.6 THEN m ELSE x c38: IF 4.2.5.8 THEN m ELSE x c40: IF 4.2.5.10 THEN m ELSE x c42: IF 4.2.5.12 THEN m ELSE x		

Table A.11:
Generator electrical characteristics for DTE intended for connection to a DCE presenting CCITT Recommendation V.28 electrical characteristics on an ISO/IEC 11569 [9] (26-pole) connector

TBR Reference:					
No.	**Cat.**	**Ref.**	**TBR-R**	**Status**	**Support**
4.2.7.1	D	6.3.3.1	Generator open circuit output voltage	c44	
4.2.7.2	F	6.3.3.2	Generator terminated output voltage	c44	
4.2.7.3	F	6.3.3.3	Generator output signal transition time	c44	
c44: IF 4.2.6.3 OR 4.2.6.5 OR 4.2.6.8 OR 4.2.6.12 OR 4.2.6.13 THEN m					

Table A.12:
Receiver electrical characteristics for DTE intended for connection to a DCE presenting CCITT Recommendation V.28 electrical characteristics on an ISO/IEC 11569 [9] (26-pole) connector

TBR Reference:					
No.	**Cat.**	**Ref.**	**TBR-R**	**Status**	**Support**
4.2.8.1	F	6.3.3.5	Receiver effective shunt capacitance	c45	
c45: IF 4.2.6.4 OR 4.2.6.6 OR 4.2.6.7 OR 4.2.6.9 OR 4.2.6.10 OR 4.2.6.11 OR 4.2.6.14 THEN m					

A.4.3 Connection to a DCE presenting an ISO 4902 (37-pole) connector

Table A.13:
Use of Interchange circuits on DTE intended for connection to a DCE presenting CCITT Recommendation V.10 or V.11 electrical characteristics on an ISO 4902 [10] (37-pole) connector

TBR Reference:					
No.	**Cat.**	**Ref.**	**TBR-R**	**Status**	**Support**
4.3.1.1	D	6.2.3.2	Circuit 102 - Signal ground or common return	o	
4.3.1.2	D	6.2.3.2	Circuit 102A/B - DTE/DCE common return	o	
4.3.1.3	D	6.2.3.2	Circuit 103 -Transmitted data	o	
4.3.1.4	D	6.2.3.2	Circuit 104 - Received data	o	
4.3.1.5	D	6.2.3.2	Circuit 105 - Request to send	o	
4.3.1.6	D	6.2.3.2	Circuit 106 - Ready for sending	o	
4.3.1.7	D	6.2.3.2	Circuit 107 - Data set ready	o	
4.3.1.8	D	6.2.3.2	Circuit 108/1 - Connect data set to line	o	
4.3.1.9	D	6.2.3.2	Circuit 109 - Data channel received line signal detector	o	
4.3.1.10	D	6.2.3.2	Circuit 114 - Transmit signal element timing (DCE)	o	
4.3.1.11	D	6.2.3.2	Circuit 115 - Receiver signal element timing (DCE)	o	
4.3.1.12	D	6.2.3.2	Circuit 140 - Loopback/Maintenance	o	
4.3.1.13	D	6.2.3.2	Circuit 141 - Local loop back	o	
4.3.1.14	D	6.2.3.2	Circuit 142 - Test indicator	o	

Table A.14:
Connector type and contact number assignments for DTE intended for connection to a DCE presenting CCITT Recommendation V.10 or V.11 electrical characteristics on an ISO/IEC 11569 [9] (37-pole) connector.

TBR Reference:					
No.	**Cat.**	**Ref.**	**TBR-R**	**Status**	**Support**
4.3.2.1	D	6.2.3.1	ISO 4902 connector	m	
4.3.2.2	D	6.2.3.2	Signal ground or common return (CT102) on pole 19	c46	
4.3.2.3	D	6.2.3.2	DTE common return (CT102a) on pole 37	c47	
4.3.2.4	D	6.2.3.2	DCE common return (CT102b) on pole 20	c47	
4.3.2.5	D	6.2.3.2	Transmitted data A-wire on pole 4	c48	
4.3.2.6	D	6.2.3.2	Transmitted data B-wire on pole 22	c48	
4.3.2.7	D	6.2.3.2	Received data A-wire on pole 6	c49	
4.3.2.8	D	6.2.3.2	Received data B-wire on pole 24	c49	
4.3.2.9	D	6.2.3.2	Request to send A-wire on pole 8	c50	
4.3.2.10	D	6.2.3.2	Request to send B-wire on pole 25	c50	
4.3.2.11	D	6.2.3.2	Ready for sending A-wire on pole 9	c51	
4.3.2.12	D	6.2.3.2	Ready for sending B-wire on pole 28	c51	
4.3.2.13	D	6.2.3.2	Data set ready A-wire on pole 11	c52	
4.3.2.14	D	6.2.3.2	Data set ready BA-wire on pole 29	c52	
4.3.2.15	D	6.2.3.2	Connect data set to line A-wire on pole 12	c53	
4.3.2.16	D	6.2.3.2	Connect data set to line B-wire on pole 30	c53	
4.3.2.17	D	6.2.3.2	Data channel received line signal detector A-wire on pole 13	c54	
4.3.2.18	D	6.2.3.2	Data channel received line signal detector B-wire on pole 31	c54	
4.3.2.19	D	6.2.3.2	Transmit signal element timing (DCE) A-wire on pole 5	c55	
4.3.2.20	D	6.2.3.2	Transmit signal element timing (DCE) B-wire on pole 23	c55	
4.3.2.21	D	6.2.3.2	Receiver signal element timing (DCE) A-wire on pole 8	c56	
4.3.2.22	D	6.2.3.2	Receiver signal element timing (DCE) B-wire on pole 26	c56	
4.3.2.23	D	6.2.3.2	Loopback/Maintenance on pole 14	c57	
4.3.2.24	D	6.2.3.2	Local loop back on pole 10	c58	
4.3.2.25	D	6.2.3.2	Test indicator on pole 18	c59	

c46: IF 4.3.1.1 THEN m ELSE x	c47: IF 4.3.1.2 THEN m ELSE x
c48: IF 4.3.1.3 THEN m ELSE x	c49: IF 4.3.1.4 THEN m ELSE x
c50: IF 4.3.1.5 THEN m ELSE x	c51: IF 4.3.1.6 THEN m ELSE x
c52: IF 4.3.1.7 THEN m ELSE x	c53: IF 4.3.1.8 THEN m ELSE x
c54: IF 4.3.1.9 THEN m ELSE x	c55: IF 4.3.1.10 THEN m ELSE x
c56: IF 4.3.1.11 THEN m ELSE x	c57: IF 4.3.1.12 THEN m ELSE x
c58: IF 4.3.1.13 THEN m ELSE x	c59: IF 4.3.1.14 THEN m ELSE x

Table A.15:
Generator electrical characteristics for DTE intended for connection to a DCE presenting CCITT Recommendation V.11 electrical characteristics on an ISO 4902 [10] (37-pole) connector

TBR Reference:					
No.	**Cat.**	**Ref.**	**TBR-R**	**Status**	**Support**
4.3.3.1	D	6.3.2.1	Generator output voltage limit	c60	
4.3.3.2	F	6.3.2.2	Generator terminated output voltage	c60	
4.3.3.3	F	6.3.2.3	Generator output rise time	c60	
c60: IF 4.3.1.3. OR 4.3.1.5 OR 4.3.1.8 OR 4.3.1.12 OR 4.3.1.13 THEN m					

Table A.16:
Generator electrical characteristics for DTE intended for connection to a DCE presenting CCITT Recommendation V.10 electrical characteristics on an ISO 4902 [10] (37-pole) connector

TBR Reference:					
No.	**Cat.**	**Ref.**	**TBR-R**	**Status**	**Support**
4.3.3.1	D	6.3.1.1	Generator output voltage limit	c61	
4.3.3.2	F	6.3.1.2	Generator terminated output voltage	c61	
4.3.3.3	F	6.3.1.3	Generator output rise time	c61	
c61: IF 4.3.1.3 OR 4.3.1.5 OR 4.3.1.8 OR 4.3.1.12 OR 4.3.1.13 THEN m					

A.4.4 Connection to a DCE presenting an ISO 2593 (34-pole) connector

Table A.17:
Use of Interchange circuits on DTE intended for connection to a DCE presenting CCITT Recommendation V.10, V.28, V.11, or V.35 electrical characteristics on an ISO 2593 [11] (34-pole) connector

TBR Reference:					
No.	**Cat.**	**Ref.**	**TBR-R**	**Status**	**Support**
4.4.1.1	D	6.2.4.2	Circuit 102 - Signal ground or common return	o	
4.4.1.2	D	6.2.4.2	Circuit 103 -Transmitted data	o	
4.4.1.3	D	6.2.4.2	Circuit 104 - Received data	o	
4.4.1.4	D	6.2.4.2	Circuit 105 - Request to send	o	
4.4.1.5	D	6.2.4.2	Circuit 106 - Ready for sending	o	
4.4.1.6	D	6.2.4.2	Circuit 107 - Data set ready	o	
4.4.1.7	D	6.2.4.2	Circuit 108/1 - Connect data set to line	o	
4.4.1.8	D	6.2.4.2	Circuit 109 - Data channel received line signal detector	o	
4.4.1.9	D	6.2.4.2	Circuit 114 - Transmit signal element timing (DCE)	o	
4.4.1.10	D	6.2.4.2	Circuit 115 - Receiver signal element timing (DCE)	o	
4.4.1.11	D	6.2.4.2	Circuit 140 - Loopback/Maintenance	o	
4.4.1.12	D	6.2.4.2	Circuit 141 - Local loop back	o	
4.4.1.13	D	6.2.4.2	Circuit 142 - Test indicator	o	

Table A.18:
Connector type and contact number assignments for DTE intended for connection to a DCE presenting CCITT Recommendation V.10, V.28, V.11 or V.35 electrical characteristics on an ISO 2593 [11] (34-pole) connector

TBR Reference:					
No.	**Cat.**	**Ref.**	**TBR-R**	**Status**	**Support**
4.4.2.1	D	6. 2.4.1	ISO 2593 connector	m	
4.4.2.2	D	6.2.4.2	Signal ground or common return on pole B	c62	
4.4.2.3	D	6.2.4.2	Transmitted data A-wire on pole P	c63	
4.4.2.4	D	6.2.4.2	Transmitted data B-wire on pole S	c63	
4.4.2.5	D	6.2.4.2	Received data A-wire on pole R	c64	
4.4.2.6	D	6.2.4.2	Received data B-wire on pole T	c64	
4.4.2.7	D	6.2.4.2	Request to send on pole C	c65	
4.4.2.8	D	6.2.4.2	Ready for sending on pole D	c66	
4.4.2.9	D	6.2.4.2	Data set ready on pole E	c67	
4.4.2.10	D	6.2.4.2	Connect data set to line on pole H	c68	
4.4.2.11	D	6.2.4.2	Data channel received line signal detector on pole F	c69	
4.4.2.12	D	6.2.4.2	Transmit signal element timing (DCE) A-wire on pole Y	c70	
4.4.2.13	D	6.2.4.2	Transmit signal element timing (DCE) B-wire on pole AA	c70	
4.4.2.14	D	6.2.4.2	Receiver signal element timing (DCE) A-wire on pole V	c71	
4.4.2.15	D	6.2.4.2	Receiver signal element timing (DCE) B-wire on pole X	c71	
4.4.2.16	D	6.2.4.2	Loopback/Maintenance on pole N	c72	
4.4.2.17	D	6.2.4.2	Local loop back on pole L	c73	
4.4.2.18	D	6.2.4.2	Test indicator on pole NN	c74	
c62: IF 4.4.1.1 THEN m ELSE x c63: IF 4.4.1.2 THEN m ELSE x c64: IF 4.4.1.3 THEN m ELSE x c65: IF 4.4.1.4 THEN m ELSE x c66: IF 4.4.1.5 THEN m ELSE x c67: IF 4.4.1.6 THEN m ELSE x c68: IF 4.4.1.7 THEN m ELSE x			c69: IF 4.4.1.8 THEN m ELSE x c70: IF 4.4.1.9 THEN m ELSE x c71: IF 4.4.1.10 THEN m ELSE x c72: IF 4.4.1.11 THEN m ELSE x c73: IF 4.4.1.12 THEN m ELSE x c74: IF 4.4.1.13 THEN m ELSE x		

Table A.19:
Generator electrical characteristics for DTE intended for connection to a DCE presenting CCITT Recommendation V.11 electrical characteristics on an ISO 2593 [11] (34-pole) connector

TBR Reference:					
No.	**Cat.**	**Ref.**	**TBR-R**	**Status**	**Support**
4.4.3.1	D	6.3.2.1	Generator output voltage limit	c75	
4.4.3.2	F	6.3.2.2	Generator terminated output voltage	c75	
4.4.3.3	F	6.3.2.3	Generator output rise time	c75	
c75: IF 4.4.1.2 THEN m					

Table A.20:
Generator electrical characteristics for DTE intended for connection to a DCE presenting CCITT Recommendation V.10 electrical characteristics on an ISO 2593 [11] (34-pole) connector

TBR Reference:					
No.	**Cat.**	**Ref.**	**TBR-R**	**Status**	**Support**
4.4.4.1	D	6.3.1.1	Generator output voltage limit	c76	
4.4.4.2	F	6.3.1.2	Generator terminated output voltage	c76	
4.4.4.3	F	6.3.1.3	Generator output rise time	c76	
c76: IF 4.4.1.4 OR 4.4.1.7 OR 4.4.1.11 OR 4.4.1.12 THEN m					

Table A.21:
Generator electrical characteristics for DTE intended for connection to a DCE presenting CCITT Recommendation V.35 electrical characteristics on an ISO 2593 [11] (34-pole) connector

TBR Reference:					
No.	**Cat.**	**Ref.**	**TBR-R**	**Status**	**Support**
4.4.5.1	D	6.3.4.1	Generator output voltage limit	c77	
4.4.5.2	F	6.3.4.2	Generator terminated output voltage	c77	
4.4.5.3	F	6.3.4.3	Generator output rise time	c77	
c77: IF 4.4.1.2 THEN m					

Table A.22:
Generator electrical characteristics for DTE intended for connection to a DCE presenting CCITT Recommendation V.28 electrical characteristics on an ISO 2593 [11] (34-pole) connector

TBR Reference:					
No.	**Cat.**	**Ref.**	**TBR-R**	**Status**	**Support**
4.4.6.1	D	6.3.3.1	Generator open circuit output voltage	c78	
4.4.6.2	F	6.3.3.2	Generator terminated output voltage	c78	
4.4.6.3	F	6.3.3.3	Generator output signal transition time	c78	
c78: IF 4.4.1.4 OR 4.4.1.7 OR 4.4.1.11 OR 4.4.1.12 THEN m					

Table A.23:
Receiver electrical characteristics for DTE intended for connection to a DCE presenting CCITT Recommendation V.28 electrical characteristics on an ISO 2593 [11] (34-pole) connector

TBR Reference:					
No.	**Cat.**	**Ref.**	**TBR-R**	**Status**	**Support**
4.4.7.1	F	6.3.3.5	Receiver effective shunt capacitance	c79	
c79: IF 4.4.1.5 OR 4.4.1.6 OR 4.4.1.8 OR 4.4.1.13 THEN m					

A.4.5 Connection to a DCE presenting an ISO 4903 [12] (15-pole) connector

Table A.24:
Use of Interchange circuits on DTE intended for connection to a DCE presenting CCITT Recommendation V.10 or V.11 electrical characteristics on an ISO 4903 [12] (15-pole) connector

TBR Reference:					
No.	**Cat.**	**Ref.**	**TBR-R**	**Status**	**Support**
4.5.1.1	D	6.2.5.2	Circuit G - Signal ground or common return	o	
4.5.1.2	D	6.2.5.2	Circuit T - Transmit	o	
4.5.1.3	D	6.2.5.2	Circuit R - Receive	o	
4.5.1.4	D	6.2.5.2	Circuit C - Control	o	
4.5.1.5	D	6.2.5.2	Circuit I - Indication	o	
4.5.1.6	D	6.2.5.2	Circuit S - Signal Element Timing	o	
4.5.1.7	D	6.2.5.2	Circuit B - Byte Timing	o.1	
4.5.1.8	D	6.2.5.2	Circuit X - DTE Transmit Signal Element Timing	o.1	
NOTE: o.1: Only one of these options may be implemented and active at the same time.					

Table A.25:
Connector type and contact number assignments for DTE intended for connection to a DCE presenting CCITT Recommendation V.10 or V.11 electrical characteristics on an ISO 4903 [12] (15-pole) connector

TBR Reference:					
No.	**Cat.**	**Ref.**	**TBR-R**	**Status**	**Support**
4.5.2.1	D	6.2.5.1	ISO 4903 connector	m	
4.5.2.2	D	6.2.5.2	Signal ground or common return on pole 8	c80	
4.5.2.3	D	6.2.5.2	Transmit A- wire on pole 2	c81	
4.5.2.4	D	6.2.5.2	Transmit B- wire on pole 9	c81	
4.5.2.5	D	6.2.5.2	Receive A-wire on pole 4	c82	
4.5.2.6	D	6.2.5.2	Receive B-wire on pole 11	c82	
4.5.2.7	D	6.2.5.2	Control A-wire on pole 3	c83	
4.5.2.8	D	6.2.5.2	Control B-wire on pole 10	c83	
4.5.2.9	D	6.2.5.2	Indication A-wire on pole 5	c84	
4.5.2.10	D	6.2.5.2	Indication B-wire on pole 12	c84	
4.5.2.11	D	6.2.5.2	Signal Element Timing A-wire on pole 6	c85	
4.5.2.12	D	6.2.5.2	Signal Element Timing B-wire on pole 13	c85	
4.5.2.13	D	6.2.5.2	Byte Timing or DTE Transmit Signal Element Timing on A-wire on pole 8	c86	
4.5.2.14	D	6.2.5.2	Byte Timing or DTE Transmit Signal Element Timing on B-wire on pole 15	c86	
c80: IF 4.5.1.1 THEN m ELSE x c81: IF 4.5.1.2 THEN m ELSE x c82: IF 4.5.1.3 THEN m ELSE x c83: IF 4.5.1.4 THEN m ELSE x			c84: IF 4.5.1.5 THEN m ELSE x c85: IF 4.5.1.6 THEN m ELSE x c86: IF 4.5.1.7 OR 4.5.1.8 THEN m ELSE x		

Table A.26:
Generator electrical characteristics for DTE intended for connection to a DCE presenting CCITT Recommendation V.11 electrical characteristics on an ISO 4903 [12] (15-pole) connector

TBR Reference:					
No.	**Cat.**	**Ref.**	**TBR-R**	**Status**	**Support**
4.5.3.1	D	6.3.2.1	Generator output voltage limit	c87	
4.5.3.2	F	6.3.2.2	Generator terminated output voltage	c87	
4.5.3.3	F	6.3.2.3	Generator output rise time	c87	
c87: IF 4.5.1.2 OR 4.5.1.4 OR 4.5.1.8 THEN m					

Table A.27:
Generator electrical characteristics for DTE intended for connection to a DCE presenting CCITT Recommendation V.10 electrical characteristics on an ISO 4903 [12] (15-pole) connector

TBR Reference:					
No.	**Cat.**	**Ref.**	**TBR-R**	**Status**	**Support**
4.5.4.1	D	6.3.1.1	Generator output voltage limit	c88	
4.5.4.2	F	6.3.1.2	Generator terminated output voltage	c88	
4.5.4.3	F	6.3.1.3	Generator output rise time	c88	
c88: IF 4.5.1.2 OR 4.5.1.4 OR 4.5.1.8 THEN m					

Annex B (normative): Physical layer implementation extra information for testing (PIXIT)

Users of this specification may freely reproduce the PIXIT proforma in this annex so that it can be used for its intended purpose and may further publish the completed PIXIT.

Table B.1: Generators that are held in a steady state in normal operation

Generators that are held in a steady state				
Item No.	**Ref. to TBR-RT**	**Interface connector type**	**Pin No.**	**Comment**

Table B.2: Client's additional information on interface circuits

Client's additional information on interface circuits	
Item No.	**List of appended information (e.g. circuit diagrams, component specifications, identically implemented interchange circuits.)**

Table B.3: Client's additional general information

Client's additional general information		
Item No.		**Justifications, statements, clarifications etc.**

Table B.4: Data Signalling Rate

TBR Reference:				
			Maximum Range	
Ref.	**TBR-R**	**Support**	**Allowed**	**Support**

Annex C (informative): Explanatory note to TBR

This informative annex is included to explain the background to the contents of this prTBR and the reasons for some of the principles adopted. It is not intended that this annex will form part of the final TBR.

C.1 Purpose of TBR 2

TBR 2 is intended to form the basis of CTR 2 which will replace NET 2 (and interim CTR 2) as the harmonised European standard to be used for the type approval of terminal equipment for connection to PSPDNs using CCITT Recommendations X.25 [1], [2], and [3] interface and using CCITT Recommendations X.21 [7] and X.21 bis [6] access interfaces at signalling rates of up to 1 920 kbit/s.

This version of TBR 2 is not a check for compliance of terminals to CCITT Recommendations X.25 [1], [2], and [3]. The contents of this TBR are in accordance with the NTRAC decision and ACTE Opinion that the verification of compliance with the Essential Requirements of Directive 91/263/EEC shall be confined to Layer 1 only.

C.2 Title and scope

The current scope has changed from that originally supplied by ACTE in order to align with the decision to restrict the requirements to be applied to Layer 1 only.

C.3 Relationship to NET 2

This draft prTBR has been derived from NET 2. NET 2 and the interim CTR 2 derived from it, contain the current mandatory European type approval requirements for terminals to be connected to CCITT Recommendation X.25 PSPDNs.

C.4 NET to TBR conversion process

The requirements of NET 2 have been filtered for relevance to the essential requirements of Directive 91/263/EEC and to take account of NTRAC decisions and ACTE Opinions. As a consequence, this prTBR now contains only Layer 1 requirements.

Account has been taken of the advice provided to ETSI STC TE5 that, as far as possible, there should be no requirements in the TBR that were not in the NET. This principle is aimed at ensuring a smooth transition to a CTR based upon this TBR.

C.5 Means of connection to the DCE

This term is used instead of referring to a terminal equipment to DCE cable. This accommodates all implementations, for instance the case where there is no cable because the interchange connector is an integral part of the terminal equipment.

Annex D (informative): Bibliography

For the purposes of this TBR, the following informative references have been given:

- NET 2, First edition (1988): "Approval requirements for data terminal equipment to connect to packet switched public data networks using CCITT Recommendation X.25 [1], [2] and [3] interface".

- EC Council Directive 73/23/EEC: "On the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits".

- CCITT Recommendation V.11 (1988): "Electrical characteristics for balanced double-current interchange circuits for general use with integrated circuit equipment in the field of data communications".

- CCITT Recommendation V.10 (1988): "Electrical characteristics for unbalanced double-current interchange circuits for general use with integrated circuit equipment in the field of data communications".

- CCITT Recommendation V.28 (1988): "Electrical characteristics for unbalanced double-current interchange circuits".

- CCITT Recommendation V.35 (1984): "Data transmission at 48 kilobits per second using 60-108 kHz group band circuits - Appendix II Electrical characteristics for balanced double-current interchange circuits".

- EN 60950 (1992): "Safety of information technology equipment including electrical business equipment".

- CCITT Recommendation X.1 (1988): "International user classes of service in public data network and integrated services digital networks (ISDNs)".

- EC Council Directive 91/263/EEC: "Approximation of the laws of the Member States concerning telecommunications terminal equipment, including the mutual recognition of their conformity".

- EC Council Directive 89/336/EEC: "Approximation of the laws of the Member States relating to electromagnetic compatibility".

- TBR 1, First edition (1995): "Attachment requirements for terminal equipment to be connected to circuit switched data networks and leased circuits using a CCITT Recommendation X.21 interface, or at an interface physically, functionally and electrically compatible with CCITT Recommendation X.21 but operating at any data signalling rate up to, and including, 1 984 kbit/s".

History

Document history			
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