



TECHNICAL
BASIS for
REGULATION

TBR 1

October 1995

Source: ETSI TC-TE

Reference: DTBR/TE-05001

ICS: 33.040.60

Key words: X.21

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

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Contents

Foreword	5
Introduction	5
1 Scope	7
2 Normative references	7
3 Abbreviations	8
4 TBR-Requirements	8
4.1 Safety	8
4.2 Electro-Magnetic Compatibility (EMC)	8
4.3 Physical layer requirements	8
4.3.1 General characteristics	8
4.3.1.1 Types of operation	8
4.3.1.2 Data signalling rate	8
4.3.2 Connector characteristics and contact number assignments	9
4.3.2.1 Connector	9
4.3.2.2 Contact number assignments	9
4.3.3 Generator characteristics	9
4.3.3.1 Generator circuit output voltage	9
5 TBR test specification	10
5.1 Conditions of test	10
5.1.1 Environment for tests	10
5.1.2 Power supply limitations	10
5.1.3 Test state	10
5.1.4 Test point	10
5.1.5 Bit patterns	11
5.1.6 Signal element timing	11
5.1.7 Interchange circuits presentation	11
5.1.8 Physical layer tests	11
5.1.8.1 Verification of the electrical characteristics	11
5.1.8.2 Identically implemented circuits	11
5.1.8.3 Fixed state generators	12
5.2 Test descriptions	12
5.2.1 Connector characteristics and contact number assignments	12
5.2.1.1 Connector characteristics	12
5.2.1.2 Contact number assignments	12
5.2.2 Generator characteristics	12
5.2.2.1 Generator circuit output voltage	12
5.3 TBR 1 Test Case Selection Expression Definition Table	13
5.4 Test case index	14
Annex A (normative): The TBR Requirements Table (TBR-RT)	15
A.1 Introduction to the TBR-RT	15
A.2 Format of the tables	15
A.3 Notations used in the TBR-RT	15
A.3.1 Status notations	15
A.3.2 Support answer notations	16
A.4 The TBR Requirement Tables (TBR-RTs)	16

Annex B (normative):	Physical layer Implementation eXtra Information for Testing (PIXIT).....	18
Annex C (informative):	Bibliography	20
History		21

Foreword

This Technical Basis for Regulation (TBR) has been produced by the Terminal Equipment (TE) Technical Committee of the European Telecommunications Standards Institute (ETSI).

Introduction

The physical layer requirements contained in this TBR are equivalent to the physical layer requirements contained in TBR 2 which relate to the connection of a terminal to a Packet Switched Public Data Network (PSPDN) using CCITT Recommendation X.25 and offering the interface specified in CCITT Recommendation X.21 [2]. It is recommended that a demonstration of compliance with these requirements be accepted as a demonstration of compliance with the relevant parts of TBR 2 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 terminal equipment to be connected to Circuit Switched Public Data Networks (CSPDNs) and leased circuits presented at a CCITT Recommendation X.21 [2] interface, or at an interface physically, functionally and electrically compatible with CCITT Recommendation X.21 [2] but operating at any data signalling rate up to, and including, 1 984 kbit/s. The objective of this TBR is to ensure that no disturbance occurs to the public network.

This TBR contains the minimum set of requirements derived from CCITT Recommendation X.21 [2], in accordance with prior European harmonization documents (NET 1). These include circuit switched service and leased circuits for point-to-point connection for various user classes of service.

NOTE 1: Not all applicable user classes and services are available in all countries.

The multipoint service is not included in the minimum set. Not all optional features and facilities defined in CCITT Recommendation X.21 [2] are included in the minimum set.

A test is given for each requirement in this TBR, including measurement methods. Requirements apply at the public network interface of the terminal equipment, which may be stimulated to perform the tests by additional equipment if necessary.

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

Terminal equipment may be subject to additional or alternative requirements in other Common Technical Regulations (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.

NOTE 2: Although this TBR provides a means of approving terminal equipment for connection to public networks operating at any data signalling rate in a continuous range up to 1 984 kbit/s, the choice of data signalling rates within this range offered by a particular public network is determined by the operator of that network.

2 Normative references

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

- [1] ISO 4903, Second edition (1989): "Information technology - Data communication - 15-pole DTE/DCE interface connector and contact number assignments".
- [2] CCITT Recommendation X.21 (1988): "Interface between data terminal equipment (DTE) and data circuit-terminating equipment (DCE) for synchronous operation on public data networks".

3 Abbreviations

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

CTR	Common Technical Regulation
DCE	Data Circuit-terminating Equipment
DTE	Data Terminal Equipment
EMC	Electro-Magnetic Compatibility
TBR	Technical Basis for Regulation
IUT	Implementation Under Test
PIXIT	Physical layer implementation eXtra Information for Testing
TBR-RT	TBR Requirements Table

4 TBR-Requirements

4.1 Safety

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.

4.2 Electro-Magnetic Compatibility (EMC)

There are no EMC requirements under this TBR.

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

4.3 Physical layer requirements

NOTE 1: Since the Data Circuit-terminating Equipment (DCE) presents the same electrical interface to the terminal equipment regardless of whether the terminal equipment makes use of balanced or unbalanced interchange circuits, this TBR contains a single set of physical layer requirements applicable to the terminal equipment for connection to that interface, and makes no distinction between balanced and unbalanced circuits.

NOTE 2: Interchange circuits meeting the requirements of CCITT Recommendation V.11 will normally meet the electrical characteristics defined in this TBR. Interchange circuits meeting the requirements of CCITT Recommendation V.10 may meet the electrical characteristics defined in this TBR.

4.3.1 General characteristics

4.3.1.1 Types of operation

This TBR is applicable for the following types of operation:

- circuit switched operation;
- leased circuit operation.

4.3.1.2 Data signalling rate

This TBR is applicable for data signalling rates within the range of 0 to 1 984 kbit/s for leased line and circuit switched services.

4.3.2 Connector characteristics and contact number assignments

4.3.2.1 Connector

The means of connection to the DCE shall be a male connector conforming to ISO 4903 [1].

NOTE: This requirement is based upon subclause 2.2 of CCITT Recommendation X.21 [2].

Compliance shall be checked by the test given in subclause 5.2.1.1.

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

4.3.2.2 Contact number assignments

On the means of connection to the DCE, the presentation of the interchange circuits shall be in accordance with annex A, table A.1 for both Leased Circuit operation and Circuit Switched operation.

NOTE: This requirement is based upon subclause 2.2 of CCITT Recommendation X.21 [2] and ISO 4903 [1].

Compliance shall be checked as described in subclause 5.2.1.2.

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

4.3.3 Generator characteristics

The following requirements apply to the interchange circuits as presented on the means of connection to the DCE.

For a particular terminal implementation, the requirements of this subclause 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.

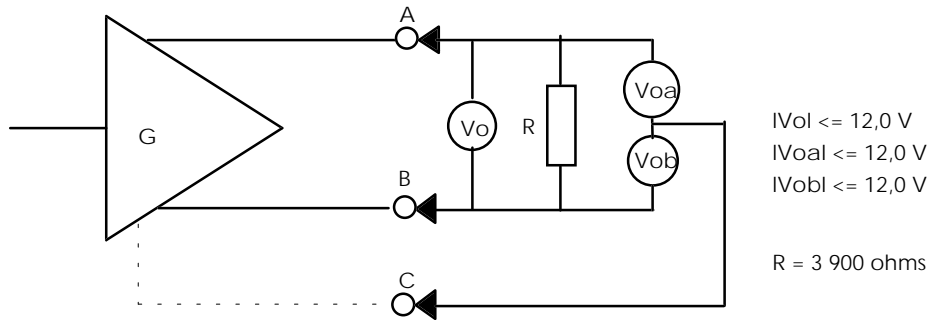
In this subclause, points A and B are defined as the two physical connections, on the means provided for connection to the DCE, to which the output of a terminal generator is connected, and point C is the physical connection (contact number 8) to which the terminal equipment signal ground may optionally be connected (see figure 1).

4.3.3.1 Generator circuit output voltage

See figure 1.

When a 3 900 ohm non-reactive impedance is connected between points A and B, for each binary state:

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



NOTE: This requirement is based upon subclauses 5.2.1 and 6.3 of CCITT Recommendation V.11 (1988) and subclauses 5.2.1 and 6.3 of CCITT Recommendation V.10 (1988).

Figure 1

Compliance shall be checked by the test in subclause 5.2.2.

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

5 TBR test specification

5.1 Conditions of test

5.1.1 Environment for tests

All tests shall be performed at:

- an ambient temperature in the range 15° C to 35° C;
- a relative humidity in the range 5 % to 75 %;

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

5.1.2 Power supply limitations

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

If apparatus is powered by other means and those means are not supplied as part of 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 $\pm 4\%$ of the stated frequency as stated by the client.

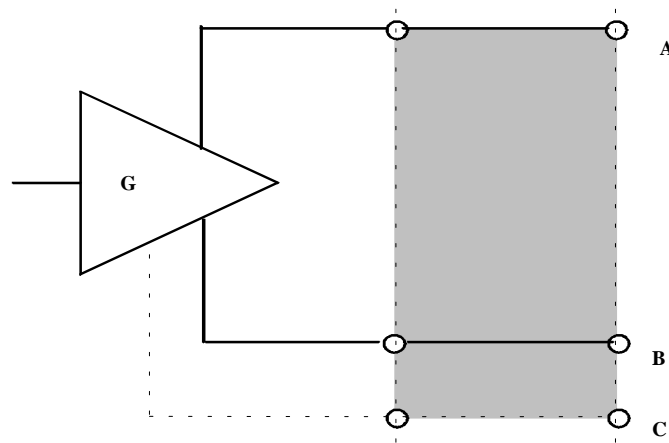
5.1.3 Test state

All requirements apply and tests shall be carried out with the terminal in the power on state unless otherwise stated.

5.1.4 Test point

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

In this subclause, 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 (contact number 8) to which the terminal equipment signal ground may optionally be connected (see figure 1).



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

Figure 2

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.

5.1.5 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 client shall inform the test laboratory of such cases and specify the nature of the bit patterns to be sent.

5.1.6 Signal element timing

The Implementation Under Test (IUT) shall be supplied with Signal Element Timing as defined in CCITT Recommendation X.21 [2] at the data signalling rate at which a test is to be performed. For some terminal equipment it may be necessary to provide Signal Element Timing in order to carry out tests under static conditions.

5.1.7 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 specified in figure 2.

5.1.8 Physical layer tests

5.1.8.1 Verification of the electrical characteristics

Verification of the electrical characteristics shall be based upon either:

- a) the tests described in subclause 5.2 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.

5.1.8.2 Identically implemented circuits

Where, for the purposes 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 table B.2 of annex B.

5.1.8.3 Fixed state generators

Where, for a particular terminal equipment, a particular generator output state is not relevant 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 table B.1 of annex B.

5.2 Test descriptions

5.2.1 Connector characteristics and contact number assignments

5.2.1.1 Connector characteristics

An attempt is made to mate the connector provided by the terminal equipment for connecting it to a DCE with an ISO 4903 [1] compliant connector with female contacts.

Successful mechanical mating shall occur.

5.2.1.2 Contact number assignments

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

- a) Circuits shown in annex A, table A.1 as mandatory (m) shall be declared as implemented.
- b) It is also permitted for circuits shown in annex A, table A.1 as optional (o) to be declared as implemented.

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

5.2.2 Generator characteristics

5.2.2.1 Generator circuit output voltage

Test purpose:

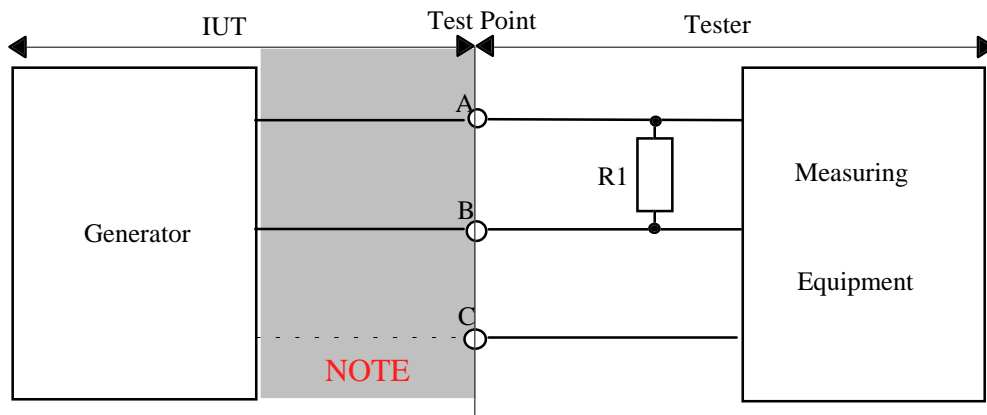
This test is to demonstrate compliance with the requirements of subclause 4.3.3.1.

Test considerations:

Where, for the purpose of testing, two or more circuits are identically implemented, the test need only be carried out on one of them. Where, for a particular terminal equipment, a particular generator output state is not relevant for a specific interchange circuit, there is no requirement for that generator output state to be tested in respect of that interchange circuit. This test is most easily performed using signals that do not make transitions from one binary state to the other whilst measurement is in progress. However, this test may be carried out using signal patterns which the terminal is capable of generating but, in this case, the effects of transient signal conditions shall be disregarded.

Test configuration:

- a) A 3 900 ohm non-reactive impedance (R_1) is connected between points A and B. A device for measuring d.c. voltage (V_o) is connected between points A and B.
- b) A 3 900 ohm non-reactive impedance (R_1) is connected between points A and B. A device for measuring d.c. voltage (V_{oa}) is connected between points A and C.
- c) A 3 900 ohm non-reactive impedance (R_1) is connected between points A and B. A device for measuring d.c. voltage (V_{ob}) is connected between points B and C.



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

Figure 3

IUT interface state:

The Implementation Under Test (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 shall be 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:

- points A and B (V_o);
- points A and C (V_{oa});
- points B and C (V_{ob});

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

5.3 TBR 1 Test Case Selection Expression Definition Table

The TBR 1 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 1.

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 Requirement Table (TBR-RT) entries, expressed by the relevant entry number.

Table 1: TBR 1 Test Case Selection Expression Definitions

TBR 1 Test Case Selection Expression Definitions		
Expression Name	Selection Expression	Comments
All	TRUE	All types if DTEs

5.4 Test case index

Table 2: TBR 1 Test Case Index Table

TBR 1 Test Case Index Table			
Test Group Reference	Test Case Id.	Selection Ref.	Description
Connector characteristics and Contact Number Assignments	5.2.1.1	All	Mating Connector
	5.2.1.2	All	Contact number assignments
Generator Characteristics	5.2.2.1	All	Generator Output Voltage Limit

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 further 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. The only valid entry used in this TBR-RT is D, corresponding to "Protection of public networks".

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

In the "TBR-requirement" 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, shall be implemented under all circumstances; |
| o = | Optional; may be provided, but if provided shall 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 shall be 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. Entries may be:

Yes (or Y or y): Indicating that the implementation claims to fully implement the TBR-requirement 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 fully support of the TBR-requirement 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 (TBR-RTs)

Table A.1: Use of interchange circuits

TBR Reference:					
No.	Cat.	Ref.	TBR-Requirement	Status	Support
1.1	D	4.3.2.2	Signal ground	o	
1.2	D	4.3.2.2	Transmit	o	
1.3	D	4.3.2.2	Receive	o	
1.4	D	4.3.2.2	Control	o	
1.5	D	4.3.2.2	Indication	o	
1.6	D	4.3.2.2	Signal Element Timing	o	
1.7	D	4.3.2.2	Byte Timing	o.1	
1.8	D	4.3.2.2	DTE Transmit Signal Element Timing	o.1	
o.1:			Only one of these options may be implemented and active at the same time.		

Table A.2: Connector type and contact number assignments

TBR Reference:					
No.	Cat.	Ref.	TBR-Requirement	Status	Support
2.1	D	4.3.2.1	ISO 4903 [1] connector	m	
2.2	D	4.3.2.1	Signal ground on pin 8	c1	
2.3	D	4.3.2.1	Transmit A- wire on pin 2	c2	
2.4	D	4.3.2.1	Transmit B- wire on pin 9	c2	
2.5	D	4.3.2.1	Receive A-wire on pin 4	c3	
2.6	D	4.3.2.1	Receive B-wire on pin 11	c3	
2.7	D	4.3.2.1	Control on A-wire on pin 3	c4	
2.8	D	4.3.2.1	Control on B-wire on pin 10	c4	
2.9	D	4.3.2.1	Indication on A-wire on pin 5	c5	
2.10	D	4.3.2.1	Indication on B-wire on pin 12	c5	
2.11	D	4.3.2.1	Signal Element Timing on A-wire on pin 6	c6	
2.12	D	4.3.2.1	Signal Element Timing on B-wire on pin 13	c6	
2.13	D	4.3.2.1	Byte Timing or DTE Transmit Signal Element Timing on A-wire on pin 7	c7	
2.14	D	4.3.2.1	Byte Timing or DTE Transmit Signal Element Timing on B-wire on pin 14	c7	
c1:		IF 1.1 THEN m ELSE x.			
c2:		IF 1.2 THEN m ELSE x.			
c3:		IF 1.3 THEN m ELSE x.			
c4:		IF 1.4 THEN m ELSE x.			
c5:		IF 1.5 THEN m ELSE x.			
c6:		IF 1.6 THEN m ELSE x.			
c7:		IF 1.7 OR 1.8 THEN m ELSE x.			

Table A.3: Generator characteristics

TBR Reference:					
No.	Cat.	Ref.	TBR-Requirement	Status	Support
3.1	D	4.3.3.1.	Generator Circuit Output Voltage	c8	
c8:		IF 1.2 OR 1.4 OR 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:			
Ref.	TBR-Requirement	Maximum Range	
		Allowed	Support
4.3.1.2	What speed do you support?	[0 ..1 984] kbit/s	

Annex C (informative): Bibliography

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

- NET 1, First edition (1988): "Approval requirements for data terminal equipment to connect to circuit-switched public data networks and leased circuits using CCITT Recommendation X.21 [2] interface", including amendments 1 and 2 adopted by TRAC October 1991 and October 1992.
- EC Council Directive 73/23/EEC: "On the harmonization 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".
- 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".
- 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".
- TBR 2: "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 utilizing interfaces derived from CCITT Recommendations X.21 and X.21bis".

History

Document history	
October 1995	First Edition
February 1996	Converted into Adobe Acrobat Portable Document Format (PDF)