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**B**ASIS for  
**R**EGULATION

**FINAL DRAFT**  
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**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 and electrically compatible with CCITT Recommendation X.21 but operating at any data signalling rate up to, and including, 1 984 kbits/s**

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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 Telecommunications 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 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 final draft 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 final draft TBR is to ensure that no disturbance occurs to the public network.

This final draft 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 final draft 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 final draft 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 final draft 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

## **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.4 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.

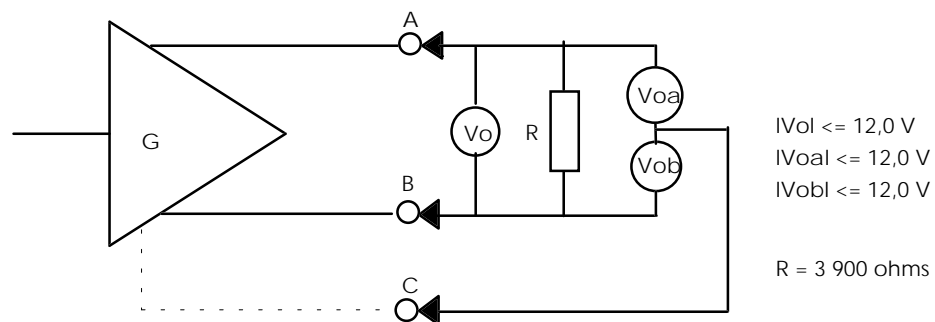
In this subclause, points A and B are defined as the two physical connections, on the means provided for connection to the DCE, to which the output of a terminal generator is connected, and point C is the physical connection (contact number 8) to which the terminal equipment signal ground may optionally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

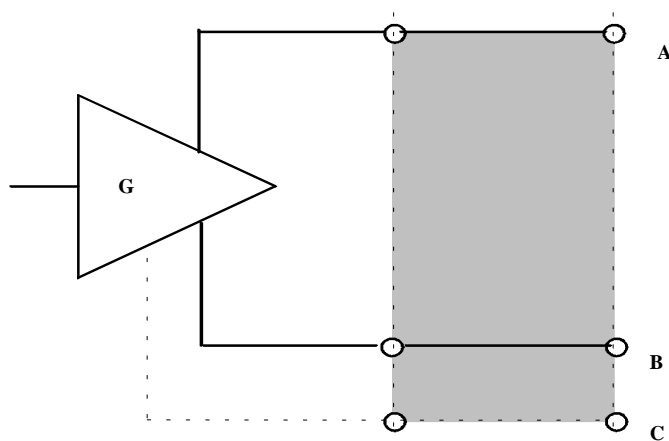
#### 5.1.3 Test state

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 tester 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:

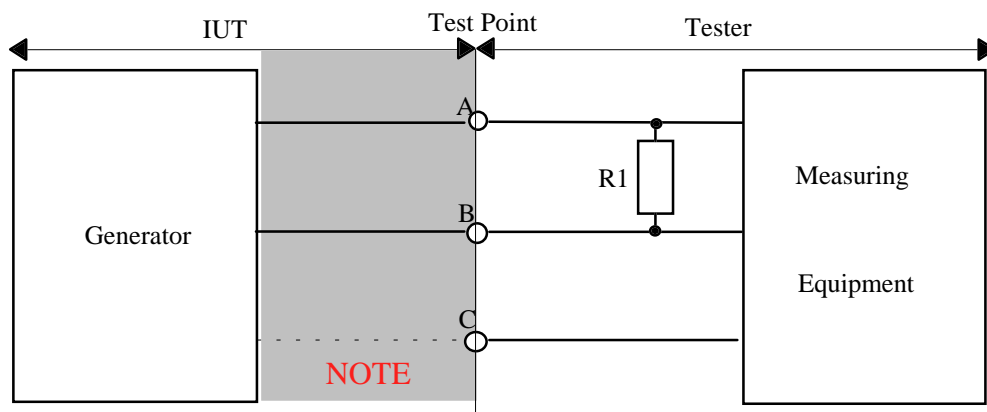
This test is to demonstrate compliance with the requirements of subclause 4.3.3.1.

##### 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 (Vo);
- points A and C (Voa);
- points B and C (Vob);

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	5.2.1.1	All	Mating Connector
Contact Number Assignments	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**

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

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

<b>Client's additional information on interface circuits</b>	
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): Explanatory note to TBR**

This informative annex is included to explain the background to the contents of this final draft TBR 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 1**

TBR 1 is intended to form the basis of CTR 1 which will replace NET 1 as the harmonized European standard to be used for the type approval of terminal equipment for connection to public leased circuits and circuit switched services which present CCITT Recommendation X.21 [2] interfaces. At the request of NTRAC, the upper data signalling rate has been extended compared to NET 1 to include all signalling rates in the continuous range up to 1 984 kbit/s.

TBR 1 is not a check for compliance of terminals with CCITT Recommendation X.21 [2], but is restricted to the essential requirements elaborated in Directive 91/263/EEC. However, a terminal which complies with CCITT Recommendation X.21 [2] should meet the requirements of this TBR.

### **C.2 Title and scope**

Although NTRAC requested TBR 1 to cover data signalling rates up to 2 048 kbit/s, this final draft has been restricted to 1 984 kbit/s at the request of certain public network operators who are concerned that there should be no implication that services should be made available at 2 048 kbit/s.

The current wording is intended to encompass both "true" CCITT Recommendation X.21 [2] interfaces and also interfaces which could be classified as X.21 were it not that they operate at data signalling rates not referenced for this purpose in CCITT Recommendation X.1.

### **C.3 Relationship to NET 1**

This final draft prTBR has been derived from NET 1. NET 1 has for some time been the mandatory harmonized European standard for type approval of terminals for connection to X.21 public networks. It was amended in 1991 to take account of problems with its application, and a minor correction was made during 1992. Since there are no outstanding problems with its use that have been notified via ETSI, it has been assumed that the contents of NET 1 are entirely sufficient for their purpose.

Usefully, NET 1 already forms the basis of national type approval requirements for a number of X.21-like services operating at speeds up to 1 984 kbit/s. This has led to an assumption that no additions are required in order to incorporate the requirements for these higher speed services.

### **C.4 NET to TBR conversion process**

The requirements of NET 1 have been filtered for relevance to the essential requirements of Directive 91/263/EEC.

The requirements and tests of NET 1 have been reformatted as a generally self-contained set of requirements and associated compliance tests. Where relevant and practicable the origin in a CCITT Recommendation of each requirement has been identified in a note accompanying the requirement.

Account has been taken of the advice to ETSI that, in the case of leased line operation, the provision of good data to a leased line is not an essential requirement within the meaning of Directive 91/263/EEC.

A conscious attempt has been made to follow the advice provided so 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 from the NET to the CTR regime, when CTR 1 replaces NET 1.

This final draft prTBR contains no safety or EMC requirements, in line with Directive 91/263/EEC. It does however provide guidance as to the safety status of the public network termination.

### **C.5 Combining of requirements and tests for balanced and unbalanced interchange circuits**

During the drafting of this final draft TBR it was noted that an X.21 DCE presented the same interface to a terminal regardless of whether the terminal used balanced or unbalanced interchange circuits. The essential requirements of the network were, therefore, presumed to be independent of the type of interchange circuits used by terminal equipment.

It was therefore decided to draft a single set of requirements for the terminal equipment which would accommodate both types of implementation without distinction. In doing so all reference to the terminal interchange circuits being to either CCITT Recommendation V.10 or CCITT Recommendation V.11 was removed.

### **C.6 Means of connection to the DCE**

This new 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.

### **C.7 General for this version of the TBR**

At the 25th ACTE meeting of Monday 7 November 1994 the Commission confirmed the decision taken by ACTE that TBR 1 should cover layer 1 only in respect of the access protocol.

As a consequence of the deletion of the protocol part in this TBR there are also some layer 1 requirements which have been deleted.

## Annex D (informative): Bibliography

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

- 1) 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.
- 2) 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".
- 3) 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".
- 4) 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".
- 5) CCITT Recommendation X.1 (1988): "International user classes of service in public data network and integrated services digital networks (ISDNs)".
- 6) 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".
- 7) EC Council Directive 89/336/EEC: "Approximation of the laws of the Member States relating to electromagnetic compatibility".
- 8) 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".
- 9) 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

<b>Document history</b>	
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