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**Integrated Services Digital Network (ISDN);  
Attachment requirements for packet mode terminal equipment  
to connect to an ISDN using ISDN primary rate access**

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## Foreword

This Technical Basis for Regulation (TBR) has been produced by the Signalling Protocols and Switching (SPS) Technical Committee of the European Telecommunications Standards Institute (ETSI).

This TBR resulted from a mandate from the Commission of the European Community (CEC) to provide harmonized standards for the support of the Council Directive 91/263/EEC ("The Terminal Equipment Directive").

Annex F provides information relating to the articles of the Directive 91/263/EEC.

Annexes A, B, C, D, E and G are normative whereas annexes F, H and J are informative.

### Overview of the Abstract Test Suites (ATs)

This TBR is accompanied by the following ATs (see annexes C and D):

- T34L2\_3 (layer 2);
- T34L3\_5 (layer 3).

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## 1 Scope

This Technical Basis for Regulation (TBR) specifies the technical requirements under Articles 4 (c) to 4 (f) of Council Directive 91/263/EEC ("The Terminal Equipment Directive") for Terminal Equipment (TE) to be attached to the pan-European Integrated Services Digital Network (ISDN) at an interface at the T reference point or coincident S and T reference point for a primary rate access. These requirements are taken from TBR 4 [8], TBR 13 [9], ETS 300 007 [10], ETS 300 046-3 [12], ETS 300 011 [11], ETS 300 102-1 [13] and ETS 300 125 [14]. This TBR does not contain the essential requirements of Article 4 (g) for interworking via the public network, and so does not provide any guarantee of correct terminal-to-terminal operation.

NOTE 1: Although this TBR provides the technical attachment requirements, it does not contain the full specification of the user side of the ISDN user-network interface. Important information necessary for correct working can be found only in the base standards mentioned above.

This TBR specifies these requirements for TE that:

- a) access Packet Handler (PH) of an ISDN through either on-demand B- or D-channel mode or semi-permanent B-channel mode basic services (case B of X.31) and those related supplementary services that are specified in annex G; and
- b) is capable of handling either incoming calls only, outgoing calls only or both incoming and outgoing calls.

This TBR applies to all TE that is intended for connection to the forms of ISDN access referred to above, irrespective of whether the TE provides additional interfaces, telecommunications services or functions for which other TBRs or national approval requirements apply.

This TBR does not specify the requirements for a packet mode TE that uses on-demand B-Channel circuit mode access (case A of X.31); the requirements for such a TE are contained in TBR 4 [8].

NOTE 2: This TBR is not applicable to TE which may be supplied in some countries for connection to an ISDN telecommunications service corresponding to, but not compatible with, the pan-European ISDN primary rate access standards.

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

- [1] ITU-T Recommendation G.703 (1991): "Physical/electrical characteristics of hierarchical digital interfaces".
- [2] ITU-T Recommendation G.706 (1991): "Frame alignment and cyclic redundancy check (CRC) procedures relating to basic frame structures defined in Recommendation G.704".
- [3] ITU-T Recommendation I.411 (1988): "ISDN user-network interfaces - Reference configurations".
- [4] ISO/IEC 9646-1: "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 1: General Concepts".
- [5] ISO/IEC 9646-2: "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 2: Abstract Test Suite specification".

- [6] ISO/IEC 9646-3: "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 3: The Tree and Tabular Combined Notation (TTCN)".
- [7] TBR 2 (1997): "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".
- [8] TBR 4 (1995) and A1: "Integrated Services Digital Network (ISDN); Attachment requirements for terminal equipment to connect to an ISDN using ISDN primary rate access".
- [9] TBR 13 (1996): "Business TeleCommunications (BTC); 2 048 kbit/s digital structured leased lines (D2048S); Attachment requirements for terminal equipment interface".
- [10] ETS 300 007 (1991): "Integrated Services Digital Network (ISDN); Support of packet-mode terminal equipment by an ISDN".
- [11] ETS 300 011 (1992): "Integrated Services Digital Network (ISDN); Primary rate user-network interface; Layer 1 specification and test principles".
- [12] ETS 300 046-3 (1992): "Integrated Services Digital Network (ISDN); Primary rate access - safety and protection; Part 3: Interface I<sub>a</sub> - protection".
- [13] ETS 300 102-1 (1990): "Integrated Services Digital Network (ISDN); User-network interface layer 3; Specifications for basic call control".
- [14] ETS 300 125 (1991): "Integrated Services Digital Network (ISDN); User-network interface data link layer specification, Application of CCITT Recommendations Q.920/I.440 and Q.921/I.441".

### 3 Definitions and abbreviations

#### 3.1 Definitions

For the purposes of this TBR, the following definitions, together with those given in ITU-T Recommendation I.411 [3] and TBR 4 [8] apply:

**access connection:** Used instead of *call* in situations where interchanging with *virtual call* should be prevented (the term access being derived from "packet handler access").

**call:** Call establishment according to ETS 300 102-1 [13] procedures.

**conditional notification class:** Class of methods to inform a user of an incoming virtual call, where the network can use ETS 300 102-1 [13] procedures to activate or provide a channel for the delivery of the virtual call (applicable to the use of the D-channel or of a B-channel).

**notification class:** Class of methods to inform a user of an incoming virtual call and provide a channel for that call.

**no notification class:** Class of methods to inform a user of an incoming virtual call, where the network requires that an access connection (use of B-channel) or a data link with SAPI=16 (use of D-channel) is currently established between the TE and the PH (if none of the conditions is fulfilled, the network will not inform the user of the incoming call).

**on-demand B-channel:** Case where a B-channel is established as a result of D-channel signalling procedures (as opposite to semi-permanent B-channel).

**on-demand layer 1:** Case where the physical layer is activated/deactivated as a result from requests from layer 2.

**semi-permanent:** Case where a B-channel is semi-permanently established at installation or subscription time and is kept activated semi-permanently.

**semi-permanent layer 1:** Case where the physical layer is activated (established) at installation or subscription time and is kept activated semi-permanently.

**semi-permanent layer 2:** Case where the data link is kept established independently of an active call or virtual call.

**virtual call:** Call according to the procedures of X.25 layer 3.

### 3.2 Abbreviations

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

ADPCM	Adaptive Differential Pulse Code Modulation
AFI	Authority and Format Identifier
AMI	Alternate Mark Inversion
ATS	Abstract Test Suite
BCD	Binary Coded Decimal
C/R	Command/Response field bit
CRC	Cyclic Redundancy Check
DISC	DISConnect
DM	Disconnected Mode
DSP	Domain Specific Part
DSS1	Digital Subscriber Signalling System No. one
DTE	Data Terminating Equipment
EA	Address field Extension bit
EMC	Electro-Magnetic Compatibility
FCS	Frame Check Sequence
HDLC	High level Data Link Control
I <sub>a</sub>	Interface point a
I <sub>b</sub>	Interface point b
IDI	Initial Domain Identifier
ISDN	Integrated Services Digital Network
IUT	Implementation Under Test
LAN	Local Area Network
LAPB	Link Access Procedure - Balanced
LAPD	Link Access Procedure on the D-channel
MFAS	Multi-Frame Alignment Signal
NSAP	Network Service Access Point
NT	Network Termination
PCO	Point of Control and Observation
PH	Packet Handler
PICS	Protocol Implementation Conformance Statement
PIXIT	Protocol Implementation eXtra Information for Testing
PLL	Pre-allocated Logical Link (former: Permanent Logical Link)

NOTE: The terms PLL and Long-term-PLL have been defined in ETS 300 049 second edition. The option of accessing the PH over the D-channel using PLL or Long-term-PLL is covered by this TBR, although the terms themselves are not further used.

ppm	parts per million
PSPDN	Public Switched Packet Data Network
REJ	REJect
Ri	Reference number
RNR	Receive Not Ready
RR	Receive Ready
Rx	Receive
SABME	Set Asynchronous Balanced Mode Extended
SAP	Service Access Point
SAPI	Service Access Point Identifier

TA	Terminal Adaptor
TBR	Technical Basis for Regulation
TBR-RT	TBR Requirements Table
TE	Terminal Equipment
TEI	Terminal Endpoint Identifier
TS0	Time-Slot 0 (zero)
TTCN	Tree and Tabular Combined Notation
UA	Unnumbered Acknowledgement
UI	Unnumbered Information (layer 2)

## 4 General

Each requirement in this TBR is either applicable to all TE within the scope of this TBR, or only applicable to certain TE, depending on the functions implemented within the TE. Annex A specifies the relationship between the requirements and the terminal. The supplier shall provide information on the functions implemented in the terminal and this information shall be used to determine which requirements apply and the manner in which the tests are performed. This information may be provided in the form of a complete TBR-RT proforma (a blank TBR-RT proforma is provided in annex A).

This TBR contains references to communications, called primitive procedures, between adjacent layers and between layers and their associated layer management entities. These primitive procedures are conceptual and allow the description of interactions between functions dedicated to different layers within the TE. Primitive procedures do not constrain implementation, are system internal and therefore cannot be tested in isolation. However, as seen from the Point of Control and Observation (PCO), the behaviour of the TE shall be such that the sequence of events is consistent with the primitives being implemented as described in this TBR.

The user-network interface at the T reference point, or coincident S and T reference point, provides the only test access for the purpose of performing attachment tests. However, actions at other ports or interfaces of the Implementation Under Test (IUT) (e.g. at the man-machine interface, execution of higher layer processes, at the interface at the S reference point in the case of NT2s or at the R reference point in the case of Terminal Adaptors) shall be used as specified by the supplier to invoke actions at layers 1, 2 and 3 of the D-channel protocol within the IUT.

Since the verification of a layer protocol normally depends on the proper operation of lower layer services needed for those functions, the verification tests should be performed in a sequential order beginning with the lowest layer. However, this general strategy does not preclude higher layer functions from being essential for the stimulation of lower layer functions under test. Thus, at least, basic functions of each layer in the IUT may be required in order to perform an attachment test for a particular lower layer.

This TBR does not require more than one set of tests to be made on more than one of each type of basic access.

### 4.1 General requirements for the access of the PH

#### 4.1.1 Channel used for the access of the PH

**Reference:** ETS 300 007 [10], subclause 4.2.

**General requirement:**

To access the PH, the TE shall support the use of:

- a) one or more B-channels; or
- b) the D-channel; or
- c) both.

**NOTE:** For a given virtual call, only the use of either the D-channel or a particular B-channel is applicable.

#### 4.1.2 Requirements for layer 1

##### 4.1.2.1 Requirements for complete layer 1 (comprising D-channel and B-channels as a whole)

**Reference:** ETS 300 007 [10], clause 7.

**General requirement:**

The use of ISDN layer 1 shall be:

- a) semi-permanent; or
- b) on-demand.

NOTE: For primary rate access, semi-permanent layer 1 is assumed.

##### 4.1.2.2 Requirements for layer 1 with respect to the selected channel

**Reference:** ETS 300 007 [10], clause 7.

**General requirement:**

If the only channel supported by the TE to access the PH is the D-channel, then there are no further requirements for layer 1, than those of subclause 4.1.2.1.

If the TE supports the access of the PH over a B-channel, then the TE shall support:

- a) on-demand B-channel access; or
- b) semi-permanent B-channel access; or
- c) both.

NOTE 1: On-demand B-channel access can be accomplished via outgoing and via incoming calls (see subclauses 4.1.5.1 and 4.1.5.2).

NOTE 2: Semi-permanent B-channel access may need a special agreement with the network. The layer 1 characteristics are conforming to TBR 13 [9] in this case.

#### 4.1.3 Requirements for layer 2 of the D-channel

##### 4.1.3.1 Requirements for data link connections with SAPI 0

**Reference:** ETS 300 007 [10], clause 7.

**General requirement:**

If the TE supports outgoing or incoming calls (see subclause 11.5.1), then the TE shall support the requirements of clause 10 for data links with SAPI 0 and shall further support (for SAPI 0):

- a) TE demand data link establishment; or
- b) network demand data link establishment; or
- c) both.

In cases a) and c), the TE shall support data link establishment initiation (see subclause 10.6.1.2.1) and the transmission of SABME and receipt of UA frames (see subclause 10.2.6.1).

In cases b) and c), the TE shall support data link establishment response (see subclause 10.6.1.2.2) and the receipt of SABME and transmission of UA frames (see subclause 10.2.6.1).

NOTE: Independently of the support of case a), b) or c), the data link connection can be established semi-permanently or on a per-call base (see also subclause 4.1.5.3).

The TE may implement TEIs in the automatic and in the non-automatic range.

#### 4.1.3.2 Requirements for data link connections with SAPI 16

For the purposes of this TBR, there are no requirements for data link connections with SAPI 16.

#### 4.1.4 Notification classes

**Reference:** ETS 300 007 [10], subclause 4.2.3.

**General requirement:**

If the TE supports incoming virtual calls, it shall support one of the following notification classes:

NOTE 1: The selection of the notification class depend on whether an agreement has been made with the network for the notification of the TE in case of an incoming virtual call. The notification classes have not been defined to restrict terminal implementations, but to provide further classification to select appropriate requirements.

- a) No notification class.  
No agreement has been made with the network, or the agreement of "No notification" has been made (see note 2).
- b) Conditional notification class.  
An agreement has been made with the network, that the network informs the TE on incoming virtual calls, packet-switched call control procedures for an incoming call may be used for this purpose (see subclause 11.4.2).

There is no specific requirement for case a).

NOTE 2: In case a), if the TE supports access of the PH only over the D-channel, a data link connection with SAPI 16 should be established semi-permanently (see the note of subclause 4.1.3.2). Otherwise the TE would not be informed of incoming virtual calls. If the TE supports access of the PH only over a B-channel, either a semi-permanent B-channel should be established between the TE and the PH, or the TE should establish an on-demand B-channel connection, following the procedures of subclause 4.1.5.2.

In case b), the TE shall support the requirements of subclause 4.1.5.2 (incoming calls), except if there is an agreement between the network provider and the user, that each incoming virtual call is provided to the user over a semi-permanent B-channel or an established D-channel link (see subclause 7.2.2.3.3 of ETS 300 007 [10]).

#### 4.1.5 Requirements for layer 3 of the D-channel

##### 4.1.5.1 Outgoing calls

**Reference:** ETS 300 007 [10], subclause 7.1.2.

**General requirement:** Outgoing calls shall be used by the TE to initiate establishment of on-demand B-channel connections between the TE and the PH.

A TE supporting outgoing calls shall support the requirements of clause 11 applicable to outgoing call establishment and release.



#### 4.1.5.2 Incoming calls

**Reference:** ETS 300 007 [10], subclause 7.2.2.

**General requirement:** Incoming calls shall be used by the TE to receive notification of an incoming virtual call, or to complete the establishment of a B-channel connections between the TE and the PH initiated by the PH (as result of an incoming virtual call to be awarded on a B-channel).

**NOTE:** Incoming call is only applicable if the TE supports the conditional notification class (see subclause 4.1.4). It is applicable to TEs using the D-channel and to TEs using a B-channel to access the PH (see also subclause 11.4.3.4.2).

A TE supporting incoming calls shall support the requirements of clause 11 applicable to incoming call establishment and release.

#### 4.1.5.3 Use of outgoing and incoming calls to support access of the PH

**Reference:** ETS 300 007 [10], clause 7.

**General requirement:** If the TE supports outgoing **virtual** calls and supports on-demand B-channel connections to access the PH, then the TE shall support outgoing calls (see subclause 4.1.5.1).

In this case, if the data link connection using SAPI 0 is not semi-permanent (under the control of the network), the TE shall support case a) or case c) of subclause 4.1.3.1 (initiation of data link establishment for SAPI 0). Otherwise, the TE shall support case b) or case c) of subclause 4.1.3.1.

If the TE supports incoming **virtual** calls and also supports the conditional notification class, then the TE shall support incoming calls (see subclause 4.1.5.2).

In this case, if the data link connection using SAPI 0 is not semi-permanent (under the control of the TE), the TE shall support case b) or case c) of subclause 4.1.3.1 (response to data link establishment request for SAPI 0). Otherwise, the TE shall support case a) or case c) of subclause 4.1.3.1.

### 5 Definitions of primitives

**Reference:** ETS 300 125 [14], Part 2, subclause 4.1.

**General Definition:** See TBR 4 [8], clause 5.

### 6 Safety requirements

See clause 6 of TBR 4 [8].

### 7 Electro-Magnetic Compatibility (EMC) requirements

See clause 7 of TBR 4 [8].

## **8 Overvoltage protection requirements**

### **8.1 Impulse transfer from mains, common mode**

**Requirement:** See subclause 8.1 of TBR 4 [8].

**Test:** The test shall be conducted according to subclause 5.7.1 of ETS 300 046-3 [12].

### **8.2 Impulse transfer from mains, transverse mode**

**Requirement:** See subclause 8.2 of TBR 4 [8].

**Test:** The test shall be conducted according to subclause 5.7.1 of ETS 300 046-3 [12].

### **8.3 Conversion of common mode to transverse mode**

**Requirement:** See subclause 8.3 of TBR 4 [8].

**Test:** The test shall be conducted according to subclause 5.7.3 of ETS 300 046-3 [12].

## **9 Layer 1 requirements**

Layer 1 requirements are split into two main cases:

- 1) On-demand access to packet handler either in the B-channel or in the D-channel;
- 2) Semi-permanent access to packet handler.

Requirements for 1) are contained in subclauses of subclauses 9.1, 9.2, 9.3, 9.4 and 9.5 below.

Requirements for 2) are contained in subclause 9.6.

### **9.1 Physical characteristics (on-demand access)**

See subclause 9.1 of TBR 4 [8].

### **9.2 Specification at the output port**

See subclause 9.2 of TBR 4 [8].

### **9.3 Specification at the input port**

See subclause 9.3 of TBR 4 [8].

### **9.4 Frame structure**

See subclause 9.4 of TBR 4 [8].

### **9.5 Operational functions**

See subclause 9.5 of TBR 4 [8].

### **9.6 Semi-permanent B-channel access**

The definitions, requirements and tests of TBR 13 [9] apply.

## 10 Layer 2 D-channel requirements

The following clauses contain elements of procedure that are expressed in the form of definitions. These elements of procedure do not form requirements in their own right and, therefore, do not have associated conformance tests. However, these elements are used as components for procedures that are requirements.

Several configurations of accessing the PH by a TE have been identified in the scope and in clause 4 (e.g. use of B- or D-channel, use of semi-permanent B-channel and others). These configurations have associated items in the general requirements tables of annex A. Not all elements and components of procedures of this clause are requirements for all possible configurations. Requirements tables of annex A following the general requirements tables express the applicability of the elements and procedures by giving them a conditional status, depending on these items.

To ensure that the applicable requirements are satisfied, it is necessary for a TE to implement these elements of procedure in the manner specified within the associated definition. The tests for requirements implicitly test the elements associated with a definition.

Subclause 10.2.3.3 specifies the Service Access Point Identifiers (SAPI) applicable to this TBR. When there are differences in the elements with respect to the use of the SAPI, this is expressed in the text of the element. Differences in the applicability of the elements are expressed in clause 4 and in the requirements tables of annex A.

**Reference:** ETS 300 102-1 [13], subclause 4.6.

**Requirement:** Before the procedures of this clause are invoked, a physical layer connection shall be activated between the TE and the network. All layer 2 frames shall be sent to the physical layer using a PH-DATA request primitive.

NOTE 1: Apart from the TEI management procedures of subclause 10.5, the elements of this clause are applicable to SAPI=0 (call control procedures) and SAPI=16 (packet communication conforming to X.25 level 3 procedures).

NOTE 2: The reception of a PH-DI primitive by layer 2 implies the discarding of all outstanding PH-DATA requests and all LAPD frames in queue.

**Test:** The requirement is implicitly verified by the tests in annex B.

### 10.1 Frame structure for peer-to-peer communication

#### 10.1.1 General

See subclause 10.1.1 of TBR 4 [8].

#### 10.1.2 Flag sequence

See subclause 10.1.2 of TBR 4 [8].

#### 10.1.3 Address field

See subclause 10.1.3 of TBR 4 [8].

#### 10.1.4 Control field

See subclause 10.1.4 of TBR 4 [8].

### 10.1.5 Information field

**Reference:** ETS 300 125 [14], Part 2, subclause 2.5.

**Definition:** The information field of a frame, when present, follows the control field (see subclause 10.1.4 and table 10.1 of TBR 4 [8]) and precedes the FCS (see subclause 10.1.7). The contents of the information field consists of an integer number of octets.

The maximum number of octets in the information field is defined in subclause 10.10.3.

### 10.1.6 Transparency

See subclause 10.1.6 of TBR 4 [8].

### 10.1.7 Frame Check Sequence (FCS) field

See subclause 10.1.7 of TBR 4 [8].

### 10.1.8 Format convention

#### 10.1.8.1 Numbering convention

See subclause 10.1.8.1 of TBR 4 [8].

#### 10.1.8.2 Order of bit transmission

See subclause 10.1.8.2 of TBR 4 [8].

#### 10.1.8.3 Field mapping convention

See subclause 10.1.8.3 of TBR 4 [8].

### 10.1.9 Invalid or incompatible frames

**Reference:** ETS 300 125 [14], Part 2, subclause 2.9.

**Definition:** An invalid or incompatible frame is a frame which:

- a) is not properly bounded by two flags; or
- b) contains a FCS error; or
- c) contains a single octet address field; or
- d) contains a SAPI (see subclause 10.2.3.3) which is not supported by the receiver; or
- e) contains a TEI not assigned to the TE.

## 10.2 Elements of procedures and formats of fields for data link layer peer-to-peer communication

### 10.2.1 General

See subclause 10.2.1 of TBR 4 [8].

### 10.2.2 Address field format

See subclause 10.2.2 of TBR 4 [8].

### 10.2.3 Address field variables

#### 10.2.3.1 Address field extension bit (EA)

See subclause 10.2.3.1 of TBR 4 [8].

### 10.2.3.2 Command/Response field bit (C/R)

See subclause 10.2.3.2 of TBR 4 [8].

### 10.2.3.3 Service Access Point Identifier (SAPI)

**Reference:** ETS 300 125 [14], Part 2, subclause 3.3.3, ETS 300 007 [10], subclause 4.2.2.

**Definition:** The SAPI identifies a point at which data link layer services are provided by a data link layer entity to a layer 3 or management entity. Consequently, the SAPI specifies a data link layer entity that should process a data link layer frame and also a layer 3 or management entity which is to receive information carried by the data link layer frame. The SAPI allows 64 SAPs to be specified, where bit 3 of the address field octet containing the SAPI is the least significant binary digit and bit 8 is the most significant. The SAPI values are allocated as shown in table 10.1.

**Table 10.1: SAPI values**

SAPI value	Related layer 3 or layer management entity
0	Call control procedures
16	Packet communication conforming to X.25 level 3 procedures
63	Layer 2 management procedures
All others	Reserved for future standardization

### 10.2.3.4 Terminal Endpoint Identifier (TEI)

See subclause 10.2.3.4 of TBR 4 [8].

#### 10.2.3.4.1 TEI for broadcast data link connection

See subclause 10.2.3.4.1 of TBR 4 [8].

#### 10.2.3.4.2 TEI for point-to-point data link connection

See subclause 10.2.3.4.2 of TBR 4 [8].

### 10.2.4 Control field formats

See subclause 10.2.4 of TBR 4 [8].

#### 10.2.4.1 Information transfer (I) format

See subclause 10.2.4.1 of TBR 4 [8].

#### 10.2.4.2 Supervisory (S) format

See subclause 10.2.4.2 of TBR 4 [8].

#### 10.2.4.3 Unnumbered (U) format

See subclause 10.2.4.3 of TBR 4 [8].

## 10.2.5 Control field parameters and associated state variables

### 10.2.5.1 Poll/Final bit

See subclause 10.2.5.1 of TBR 4 [8].

### 10.2.5.2 Multiple frame operation - variables and sequence numbers

#### 10.2.5.2.1 Modulus

See subclause 10.2.5.2.1 of TBR 4 [8].

#### 10.2.5.2.2 Send state variable V(S)

**Reference:** ETS 300 125 [14], Part 2, subclause 3.5.2.2.

**Definition:** Each point-to-point data link connection endpoint has an associated V(S) when using I-frame commands. V(S) denotes the sequence number of the next I-frame to be transmitted. V(S) can take on the value 0 through n minus 1. The value of V(S) is incremented by 1 with each successive I-frame transmission, and shall not exceed V(A) by more than the maximum number of outstanding I-frames, k (see subclause 10.10.5.). The value of k may be in the range  $1 \leq k \leq 127$ .

#### 10.2.5.2.3 Acknowledge state variable V(A)

See subclause 10.2.5.2.3 of TBR 4 [8].

#### 10.2.5.2.4 Send sequence number N(S)

See subclause 10.2.5.2.4 of TBR 4 [8].

#### 10.2.5.2.5 Receive state variable V(R)

See subclause 10.2.5.2.5 of TBR 4 [8].

#### 10.2.5.2.6 Receive sequence number N(R)

See subclause 10.2.5.2.6 of TBR 4 [8].

## 10.2.6 Frame types

### 10.2.6.1 Commands and responses

**Reference:** ETS 300 125 [14], Part 2, subclause 3.6.1.

**Definition:** The following commands and responses are used by either the user or the network data link layer entities and are represented in table 10.2. The frame types associated with each of the two applications are identified in table 10.2. Each data link connection supports the full set of commands and responses for each application implemented, except possibly for those having a note in table 10.2.

**NOTE:** It is not generally required from a TE conforming to this TBR, to be able to initiate data link setup by sending a SABME command frame or to respond to a received SABME frame (see also subclause 10.6.1.2). It is required however, that the TE supports at least one of the two procedures. It is also not generally required from a TE conforming to this TBR to be able to send or receive a DISC command frame.

For purposes of the LAPD procedures in each application, those frame types not identified in table 10.2 are identified as undefined command and/or response control fields.

Table 10.2: Commands and responses - modulo 128

Application	Format	Commands	Responses	Encoding							Octet			
				8	7	6	5	4	3	2		1		
Unacknowledged and Multiple Frame acknowledged Information Transfer	Information transfer	I (Information)		N(S)						0	4			
				N(R)						P	5			
	Supervisory	RR (Receiver Ready)	RR (Receiver Ready)		0	0	0	0	0	0	0	1	4	
					N(R)						P/F	5		
					0	0	0	0	0	1	0	1	4	
					N(R)						P/F	5		
	Unnumbered	REJ (Reject)	REJ (Reject)		0	0	0	0	1	0	0	1	4	
					N(R)						P/F	5		
					0	1	1		P	1	1	1	1	4
					SABME (Set Asynchronous Balanced Mode Extended) (see note 1)								4	
	Unnumbered	DM (Disconnected Mode)			0	0	0		F	1	1	1	1	4
					UI (Unnumbered Information) (see note 2)								4	
				0	0	0		P	0	0	1	1	4	
				DISC (Disconnect) (see note 3)								4		
Unnumbered	UA (Unnumbered Acknowledgement)			0	1	1		F	0	0	1	1	4	
				UI (Unnumbered Information) (see note 2)								4		

NOTE 1: The support of sending **and** receiving an SABME command frame is not required from a TE, however it shall support at least one of the features.

NOTE 2: Sending and receiving UI frames is only required to support the Terminal Endpoint Identifier (TEI) management procedures (see subclause 10.5) and the receipt of SETUP messages on point-to-multipoint connections.

NOTE 3: The support of sending a DISC command frame is not required from a TE.

The commands and responses of table 10.2 are defined in subclauses 10.2.6.2 to 10.2.6.10.

**10.2.6.2 Information (I) command**

See subclause 10.2.6.2 of TBR 4 [8].

**10.2.6.3 Set Asynchronous Balanced Mode Extended (SABME) command**

See subclause 10.2.6.3 of TBR 4 [8].

**10.2.6.4 DISConnect (DISC) command**

See subclause 10.2.6.4 of TBR 4 [8].

**10.2.6.5 Unnumbered Information (UI) command**

See subclause 10.2.6.5 of TBR 4 [8].

#### 10.2.6.6 Receive Ready (RR) command/response

**Reference:** ETS 300 125 [14], Part 2, subclause 3.6.6.

**Definition:** The RR supervisory frame is used by a data link layer entity to:

- a) indicate it is ready to receive an I-frame;
- b) acknowledge previously received I-frames numbered up to and including  $N(R)-1$  (as defined in subclause 10.2.5); and
- c) clear a busy condition that was indicated by the earlier transmission of an RNR frame by that same data link layer entity.

In addition to indicating the status of a data link layer entity, the RR command with the P bit set to 1 may be used by the data link layer entity to ask for the status of its peer data link layer entity.

#### 10.2.6.7 REJect (REJ) command/response

See subclause 10.2.6.7 of TBR 4 [8].

#### 10.2.6.8 Receive Not Ready (RNR) command/response

See subclause 10.2.6.8 of TBR 4 [8].

#### 10.2.6.9 Unnumbered Acknowledgement (UA) response

See subclause 10.2.6.9 of TBR 4 [8].

#### 10.2.6.10 Disconnected Mode (DM) response

See subclause 10.2.6.10 of TBR 4 [8].

### 10.3 Provision of point-to-point signalling connections

**Reference and Requirement:** See subclause 10.3 of TBR 4 [8].

**Test:** No direct testing shall be required.

### 10.4 Procedures for unacknowledged information transfer

#### 10.4.1 Transmission of unacknowledged information

**Reference and Requirement:** See subclause 10.4.1 of TBR 4 [8].

**Test:** The test shall be conducted according to annex C, TTCN test case TC14001.

#### 10.4.2 Receipt of unacknowledged information

**Reference and Requirement:** See subclause 10.4.2 of TBR 4 [8].

**Test:** The test shall be conducted according to annex C, TTCN test cases TC14001, and test preamble PR37004.



## **10.5 Terminal Endpoint Identifier (TEI) management procedures**

### **10.5.1 General**

See subclause 10.5.1 of TBR 4 [8].

### **10.5.2 TEI assignment procedure**

**Reference and Requirement:** See subclause 10.5.2 of TBR 4 [8].

**Test:** The test shall be conducted according to annex C, TTCN test case TC13014 and test preamble PR37004.

#### **10.5.2.1 Expiry of timer T202**

**Reference and Requirement:** See subclause 10.5.2.1 of TBR 4 [8].

**Test:** The test shall be conducted according to annex C, TTCN test cases TC13008 and TC13010.

### **10.5.3 TEI check procedure**

**Reference and Requirement:** See subclause 10.5.3 of TBR 4 [8].

**Test:** The test shall be conducted according to annex C, TTCN test cases TC14001 and TC14002.

### **10.5.4 TEI removal procedure**

#### **10.5.4.1 Action taken by the data link layer entity receiving the MDL-REMOVE-REQUEST primitive**

**Reference and Requirement:** See subclause 10.5.4.1 of TBR 4 [8].

**Test:** The test shall be conducted according to annex C, TTCN test preamble PR31401.

#### **10.5.4.2 Conditions for TEI removal**

**Reference and Requirement:** See subclause 10.5.4.2 of TBR 4 [8].

**Test:** The test shall be conducted according to annex C, TTCN test cases TC24007, TC27031 and test preamble PR31401.

### **10.5.5 TEI identity verify procedure**

#### **10.5.5.1 General**

See subclause 10.5.5.1 of TBR 4 [8].

#### **10.5.5.2 Operation of the TEI identity verify procedure**

**Reference and Requirement:** See subclause 10.5.5.2 of TBR 4 [8].

**Test:** The test shall be conducted according to annex C, TTCN test case TC24007 and TC27031.

### **10.5.6 Formats and codes**

See subclause 10.5.6 of TBR 4 [8].

## 10.6 Procedures for establishment and release of multiple frame operation

### 10.6.1 Establishment of multiple frame operation

#### 10.6.1.1 General

**Reference and Requirement:** See subclause 10.6.1.1 of TBR 4 [8].

**Test:** The test shall be conducted according to annex C, test preamble PR37004.

#### 10.6.1.2 Establishment procedures

##### 10.6.1.2.1 Establishment initiation

**Reference:** ETS 300 125 [14], Part 2, subclause 5.5.1.2.

**Requirement:** A data link layer entity shall initiate a request for the multiple frame operation to be set by transmitting the SABME command. All existing exception conditions shall be cleared, the retransmission counter shall be reset, and timer T200 shall then be started. All mode setting commands shall be transmitted with the P bit set to 1.

NOTE: Layer 3 initiated establishment procedures imply the discard of all outstanding DL-DATA-REQUEST primitives and all I-frames in queue.

Upon reception of the UA response with the F bit set to 1, the originator of the SABME command shall:

- reset timer T200;
- set V(S), V(R), and V(A) to 0; and
- enter the *multiple-frame-established* state and inform layer 3 using the DL-ESTABLISH CONFIRM primitive.

Upon reception of a DM response with the F bit set to 1, the originator of the SABME command shall indicate this to layer 3 by means of the DL-RELEASE-INDICATION primitive, and reset timer T200. It shall then enter the *TEI-assigned* state.

**Test:** The test shall be conducted according to annex C, TTCN test cases TC24004 and TC25002.

##### 10.6.1.2.2 Establishment response

**Reference:** ETS 300 125 [14], Part 2, subclause 5.5.1.2.

A data link layer entity receiving an SABME command, if it is able to enter the *multiple-frame-established* state, shall:

- respond with an UA response with the F bit set to the same binary value as the P bit in the received SABME command;
- set V(S), V(R) and V(A) to 0;
- enter the *multiple-frame-established* state and inform layer 3 using the DL-ESTABLISH-INDICATION primitive;
- clear all existing exception conditions; and
- clear any existing peer receiver busy condition.

**Test:** The test shall be conducted according to annex C, TTCN test case TC240x1.

### 10.6.1.3 Procedure on expiry of timer T200

**Reference and Requirement:** See subclause 10.6.1.3 of TBR 4 [8].

**Test:** The test shall be conducted according to annex C, TTCN test case TC25005.

### 10.6.2 Termination of multiple frame operation

**Reference and Requirement:** See subclause 10.6.2 of TBR 4 [8].

**Test:** The test shall be conducted according to annex C, TTCN test case TC27012.

## 10.7 Procedures for information transfer in multiple frame operation

See subclause 10.7 of TBR 4 [8].

### 10.7.1 Transmitting I-frames

**Reference:** ETS 300 125 [14], Part 2, subclause 5.6.1.

**Requirement:** Information received by the data link layer entity from layer 3 by means of a DL-DATA-REQUEST primitive shall be transmitted in an I-frame with the P bit set to 0. The control field parameters N(S) and N(R) shall be assigned the values V(S) and V(R), respectively. V(S) shall be incremented by 1 at the end of the transmission of the I-frame.

If timer T200 is not running at the time of transmission of an I-frame, it shall be started. If V(S) is equal to V(A) plus k (where k is the maximum number of outstanding I-frames - see subclause 10.10.5), the data link layer entity shall not transmit any new I-frames, but may retransmit an I-frame as a result of the error recovery procedures as described in subclauses 10.7.4 and 10.7.6.

**Test:** The test shall be conducted according to annex C, TTCN test case TC27003.

### 10.7.2 Receiving I-frames

**Reference and Requirement:** See subclause 10.7.2 of TBR 4 [8].

**Test:** The test shall be conducted according to annex C, TTCN test cases TC27003, TC28012 and TC28406.

#### 10.7.2.1 P bit set to 1

**Reference and Requirement:** See subclause 10.7.2.1 of TBR 4 [8].

**Test:** The test shall be conducted according to annex C, TTCN test step CS57101.

#### 10.7.2.2 P bit set to 0

**Reference:** ETS 300 125 [14], Part 2, subclause 5.6.2.2.

**Requirement:** If the P bit of the received I-frame was set to 0 and:

- a) if the data link layer entity is still not in an own receiver busy condition:
  - if no frame is available for transmission or if an I-frame is available for transmission but a peer receiver busy condition exists, the data link layer entity shall transmit an RR response with the F bit set to 0; or
  - if an I-frame is available for transmission and no peer receiver busy condition exists, the data link layer entity shall transmit the I-frame with the value of N(R) set to the current value of V(R) as defined in subclause 10.7.1.

- b) if, on receipt of this I-frame, the data link layer entity is now in an own receiver busy condition, it shall transmit an RNR response with the F bit set to 0.

**Test:** The test shall be conducted according to annex C, TTCN test case TC27003.

### 10.7.3 Receiving acknowledgements

**Reference:** ETS 300 125 [14], Part 2, subclause 5.6.3.2.

**Requirement:** On receipt of a valid I-frame or supervisory frame (RR, RNR, or REJ), even in the own receiver busy, or timer recovery conditions, the data link layer entity shall treat the N(R) contained in this frame as an acknowledgement for all the I-frames it has transmitted with an N(S) up to and including the received N(R)-1. V(A) shall be set to N(R). The data link layer entity shall reset the timer T200 on receipt of a valid I-frame or supervisory frame with the N(R) higher than V(A) (actually acknowledging some I-frames), or an REJ frame with an N(R) equal to V(A).

If a supervisory frame with the P bit set to 1 has been transmitted and not acknowledged, timer T200 shall not be reset.

Upon receipt of a valid I-frame, timer T200 shall not be reset if the data link layer entity is in the peer receiver busy condition.

If timer T200 has been reset by the receipt of an I, RR, or RNR frame, and if there are outstanding I-frames still unacknowledged, the data link layer entity shall restart timer T200. If timer T200 then expires, the data link layer entity shall follow the recovery procedure as defined in subclause 10.7.6 with respect to the unacknowledged I-frames.

**Test:** The test shall be conducted according to annex C, TTCN test cases TC27003 and TC27004.

### 10.7.4 Receiving REJ frames

**Reference:** ETS 300 125 [14], Part 2, subclause 5.6.4.

**Requirement:** On receipt of a valid REJ frame, the data link layer entity shall act as follows:

- a) if it is not in the timer recovery condition:
- clear an existing peer receiver busy condition;
  - set its V(S) and its V(A) to the value of N(R) contained in the REJ frame control field;
  - stop timer T200;
  - if it was an REJ command frame with the P bit set to 1, transmit an appropriate supervisory response frame with the F bit set to 1 (see subclause 10.7.5);
  - transmit the corresponding I-frame as soon as possible, as defined in subclause 10.7.1;
- b) if it is in the timer recovery condition and it was an REJ response frame with the F bit set to 1:
- clear an existing peer receiver busy condition;
  - set its V(S) and its V(A) to the value of N(R) contained in the REJ frame control field;
  - stop timer T200;
  - enter the multiple-frame-established state; and
  - transmit the corresponding I-frame as soon as possible, as defined in subclause 10.2.6.2;

- c) if it is in the timer recovery condition and it was an REJ frame other than an REJ response frame with the F bit set to 1:
- clear an existing peer receiver busy condition;
  - set its V(A) to the value of the N(R) contained in the REJ frame control field; and
  - if it was an REJ command frame with the P bit set to 1, transmit an appropriate supervisory response frame with the F bit set to 1.

All outstanding unacknowledged I-frames, commencing with the I-frame identified in the received REJ frame shall be transmitted.

**Test:** The test shall be conducted according to annex C, TTCN test cases TC27011, TC28005 and TC28424.

### 10.7.5 Receiving RNR frames

See subclause 10.7.5 of TBR 4 [8].

#### 10.7.5.1 Receiving a valid RNR command or response

**Requirement:** After receiving a valid RNR command or response, if the data link layer entity is not engaged in a mode-setting operation, it shall set a peer receiver busy condition and then:

- if it was an RNR command with the P bit set to 1, it shall transmit an appropriate supervisory response (see subclause 10.7.5.5) with the F bit set to 1; and
- if it was an RNR response with the F bit set to 1, an existing timer recovery condition shall be cleared.

The data link layer entity shall take note of the peer receiver busy condition and not transmit any I-frames to the peer which has indicated the busy condition.

**Test:** The test shall be conducted according to annex C, TTCN test case TC27404.

#### 10.7.5.2 Expiry of timer T200 during "peer receiver busy"

**Requirement:** If timer T200 expires, the data link layer entity shall:

- if it is not yet in a timer recovery condition, enter the timer recovery condition and reset the retransmission count variable; or
- if it is already in a timer recovery condition, add one to its retransmission count variable.

The data link layer entity shall then:

- a) if the value of the retransmission count variable is less than N200:
- transmit an appropriate supervisory command (see subclause 10.7.5.5) with a P bit set to 1;
  - restart timer T200; and
- b) if the value of the retransmission count variable is equal to N200, initiate a re-establishment procedure as defined in subclause 10.8, and indicate this by means of the MDL-ERROR-INDICATION primitive to the connection management entity.

**Test:** The test shall be conducted according to annex C test cases TC27411 and TC27417.

### 10.7.5.3 Receiving a valid RNR command or response during "peer receiver busy"

**Requirement:** See subclause 10.7.5.3 of TBR 4 [8].

**Test:** The test shall be conducted according to annex C, TTCN test case TC27414.

### 10.7.5.4 Receiving a valid RR or REJ command or response during "peer receiver busy"

**Requirement 1:** The data link layer entity receiving and RR or REJ supervisory command frame with the P bit set to 1 shall respond, within a time less than the limit specified in subclause 10.10.7, with an appropriate supervisory response frame (see subclause 10.7.5.5) with the F bit set to 1 and clear the peer receiver busy condition.

Upon receipt of an RR or REJ response with the F bit set to 1, the data link layer entity shall reset timer T200, and clear the peer receiver busy condition.

**Test:** The test shall be conducted according to annex C, TTCN test cases TC27404 and TC27412.

**Requirement 2:** The data link layer entity receiving an RR or REJ supervisory frame with the P/F bit set to 0 shall clear the peer receiver busy condition.

After clearing the peer receiver busy condition the data link layer entity may transmit new I-frames or retransmit I-frames as defined in subclause 10.7.1 or subclause 10.7.4 respectively.

**Test:** The test shall be conducted according to annex C, TTCN test cases TC27011 and TC27413.

### 10.7.5.5 Appropriate supervisory response frame

**Requirement:** In subclauses 10.7.1 to 10.7.4, if the data link layer entity is not in an own receiver busy condition and is in a reject exception condition (that is, an N(S) sequence error has been received, and an REJ frame has been transmitted, but the requested I-frame has not been received), the appropriate supervisory frame shall be the RR frame.

If the data link layer entity is not in an own receiver busy condition but is in an N(S) sequence error exception condition (that is, an N(S) sequence error has been received but an REJ frame has not been transmitted), the appropriate supervisory frame shall be the REJ frame.

If the data link layer entity is in its own receiver busy condition, the appropriate supervisory frame shall be the RNR frame.

Otherwise, the appropriate supervisory frame shall be the RR frame.

**NOTE:** It is not possible to replicate the conditions required to bring the IUT into the state required to perform a test, and therefore no test is specified.

### 10.7.6 Waiting acknowledgement

**Reference:** ETS 300 125 [14], Part 2, subclause 5.6.7.

**Requirement:** The data link layer entity shall maintain an internal retransmission count variable.

If timer T200 expires, the data link layer entity shall:

- if it is not yet in the timer recovery condition, enter the timer recovery condition and reset the retransmission count variable; or
- if it is already in the timer recovery condition, add one to its retransmission count variable.

The data link layer entity shall then:

- a) if the value of the retransmission count variable is less than N200:
  - restart timer T200; and either
  - transmit an appropriate supervisory command with the P bit set to 1; or
  - retransmit the last transmitted I-frame (V(S)-1) with the P bit set to 1; or
- b) if the value of the retransmission count variable is equal to N200, initiate a re-establishment procedure as defined in subclause 10.8.

The timer recovery condition is cleared when the data link layer entity receives a valid supervisory frame response with the F bit set to 1. If the received supervisory frame N(R) is within the range from its current V(A) to its current V(S) inclusive, it shall set its V(S) to the value of the received N(R). Timer T200 shall be reset if the received supervisory frame response is an RR or REJ response, and then the data link layer entity shall resume with I-frame transmission or retransmission, as appropriate. Timer T200 shall be reset and restarted if the received supervisory response is an RNR response, to proceed with the enquiry process according to subclause 10.7.5.

**Test:** The test shall be conducted according to annex C, TTCN test cases TC27015, TC27019, TC27411, TC27417 and TC28005.

### 10.8 Re-establishment of multiple frame operation

**Reference:** ETS 300 125 [14], Part 2, subclause 5.7.2.

**Requirement:** In all re-establishment situations, the data link layer entity shall follow the procedures defined in subclause 10.6.1.

If the data link layer entity supports transmission of an SABME command frame (see subclause 10.2.6.1), all locally generated conditions for re-establishment shall cause the transmission of the SABME.

If the data link layer entity does not support transmission of an SABME command frame (see subclause 10.2.6.1), the data link layer entity shall perform no action until the peer entity initiates re-establishment of the data link.

In the case of data link layer and peer initiated re-establishment, the data link layer entity shall also:

- if  $V(S) > V(A)$  prior to re-establishment discard all I queues.

**Test:** The test shall be conducted according to annex C, TTCN test case TC27022.

## 10.9 Exception condition reporting and recovery

### 10.9.1 N(S) sequence error

**Reference and Requirement:** See subclause 10.9.1 of TBR 4 [8].

**Test:** The test shall be conducted according to annex C, TTCN test cases TC27027 and TC27028.

### 10.9.2 Invalid frame condition

**Reference:** ETS 300 125 [14], Part 2, subclause 5.8.4.

**Requirement:** Any frame received which is invalid or incompatible (as defined in subclause 10.1.9) shall be discarded, and no action shall be taken as a result of that frame.

**Test:** The test shall be conducted according to annex C, TTCN test cases TC27058 and TC24020.

### 10.9.3 Frame rejection condition

**Reference:** ETS 300 125 [14], Part 2, subclause 5.8.5.

**Requirement:** A frame rejection condition results from the receipt of an invalid N(R).

Upon occurrence of a frame rejection condition whilst in the multiple frame operation, the data link layer entity, if it supports transmission of an SABME command frame (see subclause 10.2.6.1), shall initiate re-establishment (see subclause 10.8).

If the data link layer entity does not support transmission of an SABME command frame, it shall perform no action until the peer entity initiates re-establishment of the data link.

**Test:** The test shall be conducted according to annex C, TTCN test cases TC27040, TC27043 and TC27046.

### 10.9.4 Multiple-assignment of TEI value

**Reference:** ETS 300 125 [14], Part 2, subclause 5.8.8.

**Requirement:** A data link layer entity shall assume multiple-assignment of a TEI value and initiate recovery as specified below by:

- a) the receipt of a UA response frame whilst in the *multiple-frame-established* state;
- b) the receipt of a UA response frame whilst in the *timer recovery* state;
- c) the receipt of a UA response frame whilst in the *TEI-assigned* state.

A data link layer entity, after assuming multiple-assignment of a TEI value shall inform the connection management entity by means of the MDL-ERROR-INDICATION primitive.

**Test:** The test shall be conducted according to annex C, TTCN test case TC27031.



## 10.10 List of system parameters

**Reference:** ETS 300 125 [14], Part 2, subclause 5.9.

**Definition:** The system parameters listed below are associated with each individual SAP.

### 10.10.1 Timer T200

See subclause 10.10.1 of TBR 4 [8].

### 10.10.2 Maximum number of retransmissions (N200)

See subclause 10.10.2 of TBR 4 [8].

### 10.10.3 Maximum number of octets in an information field (N201)

**Reference:** ETS 300 125 [14], Part 2, subclause 5.9.3.

**Definition:** The maximum number of octets in an information field (N201) is a system parameter:

- for a SAP supporting signalling (SAPI=0), the value shall be 260 octets.

**Test:** No specific test is provided for this requirement.

### 10.10.4 Maximum number of transmission of the TEI identity request message (N202)

See subclause 10.10.4 of TBR 4 [8].

### 10.10.5 Maximum number of outstanding I-frames (k)

**Reference:** ETS 300 125 [14], Part 2, subclause 5.9.5.

**Definition:** The maximum number (k) of sequentially numbered I-frames that may be outstanding (that is, unacknowledged) at any given time is a system parameter, which shall be in the range between 1 and 127 (inclusive) for extended (modulo 128) operation:

- for an SAP supporting basic access (64 kbit/sec) signalling, the value is 7;
- for an SAP supporting Packet communication, no specific value is required.

NOTE: In subclause 5.9.5 of ETS 300 125 [14] a value of 3 is recommended.

### 10.10.6 Timer T202

See subclause 10.10.6 of TBR 4 [8].

### 10.10.7 Layer 2 response time

**Reference and Requirement:** See subclause 10.10.7 of TBR 4 [8].

**Test:** The requirement is tested implicitly by all the test cases in the layer 2 test suite.

## 11 Layer 3 D-channel requirements

The following clauses contain elements of procedure that are expressed in the form of definitions. These elements of procedure do not form requirements in their own right and, therefore, do not have associated conformance tests. However, these elements are used as components for procedures that are requirements.

Several configurations of accessing the PH by a TE, using the layer 3 D-channel protocol, have been identified in the scope and in clause 4 (e.g. use of B- or D-channel, use of semi-permanent B-channel and others). These configurations have associated items in the general requirements tables of annex A. The elements and components of procedures of this clause need not be requirements or need not be requirements in total for a given access configuration. Requirements tables of annex A express the applicability of the elements and procedures by giving them a conditional status, depending on these items.

To ensure that the applicable requirements are satisfied, it is necessary for a TE to implement these elements of procedure in the manner specified within the associated definition. The tests for requirements implicitly test the elements associated with a definition.

The requirements of the various subclauses of clause 11 (excluding subclause 11.4.6) apply only to messages that carry the protocol discriminator coded as "Q.931 (I.451) user-network call control message" and that pass the requirements defined in subclause 11.4.6.

NOTE: The elements of this clause are only defined to be used for the access of the PH (packet mode bearer service). Different use of the layer 3 D-channel protocol, e.g. for other bearer services, is not precluded.

### 11.1 Overview of call control

Unless otherwise noted, the following state definitions are equal to the corresponding state definitions of TBR 4 [8]. However, some of the state definitions of TBR 4 [8] have been deleted, because they are not applicable to the call control for the access of the PH.

#### 11.1.1 Call states at the user side of the interface

##### 11.1.1.1 Null state (U0)

**Reference:** ETS 300 102-1 [13], subclause 2.1.1.1.

**Definition:** See subclause 11.1.1.1 of TBR 4 [8]. No call exists.

##### 11.1.1.2 Call initiated (U1)

**Reference:** ETS 300 102-1 [13], subclause 2.1.1.2.

**Definition:** See subclause 11.1.1.2 of TBR 4 [8].

##### 11.1.1.3 Outgoing call proceeding (U3)

**Reference:** ETS 300 102-1 [13], subclause 2.1.1.4.

**Definition:** See subclause 11.1.1.4 of TBR 4 [8].

##### 11.1.1.4 Call present (U6)

**Reference:** ETS 300 102-1 [13], subclause 2.1.1.6.

**Definition:** See subclause 11.1.1.6 of TBR 4 [8].

**11.1.1.5 Call received (U7)**

**Reference:** ETS 300 102-1 [13], subclause 2.1.1.7.

**Definition:** See subclause 11.1.1.7 of TBR 4 [8].

**11.1.1.6 Connect request (U8)**

**Reference:** ETS 300 102-1 [13], subclause 2.1.1.8.

**Definition:** See subclause 11.1.1.8 of TBR 4 [8].

**11.1.1.7 Incoming call proceeding (U9)**

**Reference:** ETS 300 102-1 [13], subclause 2.1.1.9.

**Definition:** See subclause 11.1.1.9 of TBR 4 [8].

**11.1.1.8 Active (U10)**

**Reference:** ETS 300 102-1 [13], subclause 2.1.1.10.

**Definition:** See subclause 11.1.1.10 of TBR 4 [8].

**11.1.1.9 Disconnect request (U11)**

**Reference:** ETS 300 102-1 [13], subclause 2.1.1.11.

**Definition:** See subclause 11.1.1.11 of TBR 4 [8].

**11.1.1.10 Disconnect indication (U12)**

**Reference:** ETS 300 102-1 [13], subclause 2.1.1.12.

**Definition:** See subclause 11.1.1.12 of TBR 4 [8].

**11.1.1.11 Release request (U19)**

**Reference:** ETS 300 102-1 [13], subclause 2.1.1.15.

**Definition:** See subclause 11.1.1.15 of TBR 4 [8].

**11.1.2 Network call states**

**11.1.2.1 Null state (N0)**

**Reference:** ETS 300 102-1 [13], subclause 2.1.2.1.

**Definition:** See subclause 11.1.2.1 of TBR 4 [8].

**11.1.2.2 Call initiated (N1)**

**Reference:** ETS 300 102-1 [13], subclause 2.1.2.2.

**Definition:** See subclause 11.1.2.2 of TBR 4 [8].

**11.1.2.3 Outgoing call proceeding (N3)**

**Reference:** ETS 300 102-1 [13], subclause 2.1.2.4.

**Definition:** See subclause 11.1.2.4 of TBR 4 [8].

**11.1.2.4 Call present (N6)**

**Reference:** ETS 300 102-1 [13], subclause 2.1.2.6.

**Definition:** See subclause 11.1.2.6 of TBR 4 [8].

**11.1.2.5 Call received (N7)**

**Reference:** ETS 300 102-1 [13], subclause 2.1.2.7.

**Definition:** See subclause 11.1.2.7 of TBR 4 [8].

**11.1.2.6 Connect request (N8)**

**Reference:** ETS 300 102-1 [13], subclause 2.1.2.8.

**Definition:** See subclause 11.1.2.8 of TBR 4 [8].

**11.1.2.7 Incoming call proceeding (N9)**

**Reference:** ETS 300 102-1 [13], subclause 2.1.2.9.

**Definition:** See subclause 11.1.2.9 of TBR 4 [8].

**11.1.2.8 Active (N10)**

**Reference:** ETS 300 102-1 [13], subclause 2.1.2.10.

**Definition:** See subclause 11.1.2.10 of TBR 4 [8].

**11.1.2.9 Disconnect request (N11)**

**Reference:** ETS 300 102-1 [13], subclause 2.1.2.11.

**Definition:** See subclause 11.1.2.11 of TBR 4 [8].

**11.1.2.10 Disconnect indication (N12)**

**Reference:** ETS 300 102-1 [13], subclause 2.1.2.12.

**Definition:** See subclause 11.1.2.12 of TBR 4 [8].

**11.1.2.11 Release request (N19)**

**Reference:** ETS 300 102-1 [13], subclause 2.1.2.15.

**Definition:** See subclause 11.1.2.15 of TBR 4 [8].

### 11.1.3 States associated with the global call reference

#### 11.1.3.1 Call states at the user side of the interface

##### 11.1.3.1.1 Null (Rest 0)

**Reference:** ETS 300 102-1 [13], subclause 2.4.1.1.

**Definition:** See subclause 11.1.3.1.1 of TBR 4 [8].

##### 11.1.3.1.2 Restart (Rest 2)

**Reference:** ETS 300 102-1 [13], subclause 2.4.1.3.

**Definition:** See subclause 11.1.3.1.2 of TBR 4 [8].

#### 11.1.3.2 Call states at the network side of the interface

The states which may exist on the network side of the user-network interface.

##### 11.1.3.2.1 Null (Rest 0)

**Reference:** ETS 300 102-1 [13], subclause 2.4.2.1.

**Definition:** See subclause 11.1.3.2.1 of TBR 4 [8]. No transaction exists.

##### 11.1.3.2.2 Restart request (Rest 1)

**Reference:** ETS 300 102-1 [13], subclause 2.4.2.2.

**Definition:** See subclause 11.1.3.2.2 of TBR 4 [8].

### 11.2 Message functional definitions and content

**Reference:** ETS 300 102-1 [13], clause 3, ETS 300 007 [10], annex B.

This provides an overview of the layer 3 message structure. Each definition includes:

- a) a brief description of the message direction and use. All messages have local significance, i.e. relevant only in the originating or terminating access.
- b) a table listing the codeset 0 information elements in the order of their appearance in the message (same relative order for all Message types). For each information element the table indicates:
  - 1) the direction which it may be sent; i.e. user-to-network ("u → n"), network-to-user ("n → u"), or both;
  - 2) whether inclusion is mandatory ("M") or optional ("O") with a reference to notes explaining the circumstances under which the information element is included;
  - 3) the length of the information element (or permissible range of lengths), in octets, where "\*" denotes an undefined maximum length, which may be network or service dependent.

**NOTE 1:** All messages may contain information elements from codesets 5, 6 and 7 and corresponding locking and non-locking shift information elements which comply with the coding rules specified in subclauses 11.3.5.2 to 11.3.5.4 of TBR 4 [8]. None of these information elements, however, are listed in any of the tables in subclause 11.2 of this TBR.

c) further explanatory notes, as necessary.

NOTE 2: Table 11.1 summarizes the messages for packet mode connection control that are part of the requirements of this TBR.

NOTE 3: It is strongly recommended that manufacturers use other messages or information elements only in accordance with definitions and procedures in national, European and international standards. Terminals that use messages or information elements that result in violations of the essential requirements are liable to be disconnected or required to be withdrawn from the market. The use of certain other messages or information elements may be the subject of specific requirements in other TBRs or national approval requirements.

**Table 11.1: Messages for packet mode connection control**

Message type	Reference
Call establishment messages:	
ALERTING	11.2.1
CALL PROCEEDING	11.2.2
CONNECT	11.2.3
CONNECT ACKNOWLEDGE	11.2.4
SETUP	11.2.8
Call clearing messages:	
DISCONNECT	11.2.5
RELEASE	11.2.6
RELEASE COMPLETE	11.2.7
Miscellaneous messages:	
STATUS	11.2.9
STATUS ENQUIRY	11.2.10

### 11.2.1 Alerting

**Reference:** ETS 300 102-1 [13], subclause 3.1.1, ETS 300 007 [10], clause B.1.

**Definition:** This message may be sent by the called user to the network to indicate that called user alerting has been initiated. See table 11.2.

**Table 11.2: ALERTING message content**

Message type: ALERTING  
Significance: local  
Direction: user to network

Information Element	Direction	Type	Length
Protocol discriminator	u > n	M	1
Call reference	u > n	M	2
Message type	u > n	M	1
Channel identification	u > n	O (see note)	2 - 5
NOTE:	Mandatory if this message is the first message in response to SETUP, unless the user accepts the B-channel indicated in the SETUP message.		

### 11.2.2 Call proceeding

**Reference:** ETS 300 102-1 [13], subclause 3.1.2, ETS 300 007 [10], clause B.2.

**Definition:** This message is sent by the called user to the network or by the network to the calling user to indicate that the requested call establishment has been initiated. See table 11.3.

**Table 11.3: Call proceeding message content**

Message type: CALL PROCEEDING  
Significance: local  
Direction: both

Information Element	Direction	Type	Length
Protocol discriminator	both	M	1
Call reference	both	M	2
Message type	both	M	1
Channel identification	both	O (see note)	2 - 5
NOTE:	Mandatory in the network-to-user direction if this message is the first message in response to SETUP. Mandatory in the user-to-network direction if this message is the first message in response to SETUP, unless the user accepts the B-channel indicated in the SETUP message.		

### 11.2.3 Connect

**Reference:** ETS 300 102-1 [13], subclause 3.1.4, ETS 300 007 [10], clause B.3.

**Definition:** This message is sent by the called user to the network and by the network to the calling user to indicate acceptance of the call. See table 11.4.

**Table 11.4: Connect message content**

Message type: CONNECT  
Significance: local  
Direction: both

Information Element	Direction	Type	Length
Protocol discriminator	both	M	1
Call reference	both	M	2
Message type	both	M	1
Channel identification	both	O (see note)	2 - 5
NOTE:	Mandatory in the network-to-user direction if this message is the first message in response to SETUP. Mandatory in the user-to-network direction if this message is the first message in response to SETUP, unless the user accepts the B-channel indicated in the SETUP message.		

### 11.2.4 Connect acknowledge

**Reference:** ETS 300 102-1 [13], subclause 3.1.5, ETS 300 007 [10], clause B.4.

**Definition:** This message is sent by the network to the called user to indicate the user has been awarded the call. It may also be sent by the calling user to the network to allow symmetrical call control procedures. See table 11.5.

**Table 11.5: Connect acknowledge message content**

Message type: CONNECT ACKNOWLEDGE  
Significance: local  
Direction: both

Information Element	Direction	Type	Length
Protocol discriminator	both	M	1
Call reference	both	M	2
Message type	both	M	1

### 11.2.5 Disconnect

**Reference:** ETS 300 102-1 [13], subclause 3.1.6, ETS 300 007 [10], clause B.5.

**Definition:** This message is sent by the user to request the network to clear a call or is sent by the network to indicate that the call clearing has been initiated. See table 11.6.

**Table 11.6: Disconnect message content**

Message type: DISCONNECT  
Significance: local  
Direction: both

Information Element	Direction	Type	Length
Protocol discriminator	both	M	1
Call reference	both	M	2
Message type	both	M	1
Cause	both	M	4 - 32



### 11.2.6 Release

**Reference:** ETS 300 102-1 [13], subclause 3.1.11, ETS 300 007 [10], clause B.7.

**Definition:** This message is sent by the user or the network to indicate that the equipment sending the message has disconnected the channel (if any) and intends to release the channel and the Call reference, and that the receiving equipment should release the channel and prepare to release the Call reference after sending RELEASE COMPLETE message. This message is also sent by the network to the called user to indicate that the call is awarded on either the D-channel or an existing channel and that the network intends to release the call reference. See table 11.7.

**Table 11.7: Release message content**

Message type: RELEASE  
Significance: local (see note 1)  
Direction: both

Information Element	Direction	Type	Length
Protocol discriminator	both	M	1
Call reference	both	M	2
Message type	both	M	1
Cause	both	O (see note 2)	2 - 32
NOTE 1:	This message has a local significance; however, it may carry information of global significance when used as the first call clearing message.		
NOTE 2:	Mandatory in the first call clearing message, including when the RELEASE message is sent as a result of an error handling condition.		

### 11.2.7 Release complete

**Reference:** ETS 300 102-1 [13], subclause 3.1.12, ETS 300 007 [10], clause B.8.

**Definition:** This message is sent by the user or the network to indicate that the equipment sending the message has released the channel (if any) and call reference, the channel is available for re-use and the receiving equipment shall release the call reference. See table 11.8.

**Table 11.8: Release complete message content**

Message type: RELEASE COMPLETE  
Significance: local (see note 1)  
Direction: both

Information Element	Direction	Type	Length
Protocol discriminator	both	M	1
Call reference	both	M	2
Message type	both	M	1
Cause	both	O (see note 2)	2 - 32
NOTE 1:	This message has a local significance; however, it may carry information of global significance when used as the first call clearing message.		
NOTE 2:	Mandatory in the first call clearing message, including when the RELEASE COMPLETE message is sent as a result of an error handling condition.		

11.2.8 Setup

**Reference:** ETS 300 102-1 [13], subclause 3.1.16, ETS 300 007 [10], clause B.9.

**Definition:** This message is sent by the calling user to the network and by the network to the called user to initiate call establishment. See table 11.9.

**Table 11.9: Setup message content**

Message type: SETUP  
Significance: local  
Direction: both

Information Element	Direction	Type	Length
Protocol discriminator	both	M	1
Call reference	both	M	2
Message type	both	M	1
Bearer capability	both	M (see note 1)	6
Channel identification	both	O (see note 2)	2 - 5
Calling party number	both	O (see note 3)	2 - 24
Calling party subaddress	both	O (see note 4)	2 - 23
Called party number	n > u	O (see note 5)	2 - 23
Called party subaddress	n > u	O (see note 6)	2 - 23
NOTE 1:	Used to identify the ISDN packet mode bearer capability.		
NOTE 2:	Mandatory in the network-to-user direction. Included in the user-to-network direction when the user wants to indicate a channel. If not included, its absence is interpreted as "any channel acceptable".		
NOTE 3:	Included in the user-to-network direction depending on the user/network identification requirements. Included in the network-to-user direction, if the network implements CCITT X.25/ETS 300 102-1 [13] information element mapping and provides indication to the called user of the calling party number.		
NOTE 4:	Included in the user-to-network direction depending on the user/network identification requirements. Included in the network-to-user direction, if the network implements CCITT X.25/ETS 300 102-1 [13] information element mapping and provides indication to the called user of the calling party subaddress.		
NOTE 5:	Included in the network-to-user direction, if the network implements CCITT X.25/ETS 300 102-1 [13] information element mapping and provides indication to the called user of the called party number.		
NOTE 6:	Included in the network-to-user direction, if the network implements CCITT X.25/ETS 300 102-1 [13] information element mapping and provides indication to the called user of the called party subaddress. Ignored by the network, if included in the user-to-network direction.		

### 11.2.9 Status

**Reference:** ETS 300 102-1 [13], subclause 3.1.18, ETS 300 007 [10], clause B.10.

**Definition:** This message is sent by the user or the network in response to a STATUS ENQUIRY message or at any time to report certain error conditions listed in subclause 5.8 of ETS 300 102-1 [13]. See table 11.10.

**Table 11.10: Status message content**

Message type: STATUS  
Significance: local  
Direction: both

Information Element	Direction	Type	Length
Protocol discriminator	both	M	1
Call reference	both	M	2
Message type	both	M	1
Cause	both	M	4 - 32
Call state	both	M	3

### 11.2.10 Status enquiry

**Reference:** ETS 300 102-1 [13], subclause 3.1.19, ETS 300 007 [10], clause B.11.

**Definition:** This message is sent by the user or the network at any time to solicit a STATUS message from the peer layer 3 entity. Sending a STATUS message in response to a STATUS ENQUIRY message is mandatory. See table 11.11.

**Table 11.11: Status enquiry message content**

Message type: STATUS ENQUIRY  
Significance: local  
Direction: both

Information Element	Direction	Type	Length
Protocol discriminator	both	M	1
Call reference	both	M	2
Message type	both	M	1

### 11.2.11 Messages used with the global call reference

See subclause 11.2.21 of TBR 4 [8].

#### 11.2.11.1 Restart

See subclause 11.2.21.1 of TBR 4 [8].

#### 11.2.11.2 Restart acknowledge

See subclause 11.2.21.2 of TBR 4 [8].

### 11.3 General message format and information elements coding

The figures and text in this subclause describe message contents. Within each octet, the bit designated "bit 1" is transmitted first, followed by bits 2, 3, 4, etc. Similarly, the octet shown at the top of each figure is sent first.

#### 11.3.1 Overview

See subclause 11.3.1 of TBR 4 [8].

#### 11.3.2 Protocol discriminator

See subclause 11.3.2 of TBR 4 [8].

#### 11.3.3 Call reference

See subclause 11.3.3 of TBR 4 [8].

#### 11.3.4 Message type

**Reference:** ETS 300 102-1 [13], subclause 4.4, ETS 300 007 [10], clause C.3.

**Definition:** The purpose of the Message type is to identify the function of the message being sent.

The Message type is the third part of every message. The Message type is coded as shown in figure 11.1 and table 11.12.

Bit 8 is reserved for possible future use as an extension bit.

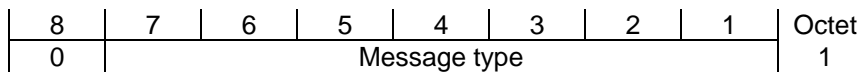


Figure 11.1: Message type

Table 11.12: Message types

Bits								
8	7	6	5	4	3	2	1	
0	0	0	0	0	0	0	0	Escape to nationally specific Message type (see note).
0	0	0	-	-	-	-	-	<b>Call establishment messages:</b>
			0	0	0	0	1	ALERTING
			0	0	0	1	0	CALL PROCEEDING
			0	0	1	1	1	CONNECT
			0	1	1	1	1	CONNECT ACKNOWLEDGE
			0	0	1	0	1	SETUP
0	1	0	-	-	-	-	-	<b>Call clearing messages:</b>
			0	0	1	0	1	DISCONNECT
			0	1	1	0	1	RELEASE
			1	1	0	1	0	RELEASE COMPLETE
			0	0	1	1	0	RESTART
			0	1	1	1	0	RESTART ACKNOWLEDGE
0	1	1	-	-	-	-	-	<b>Miscellaneous messages:</b>
			1	1	1	0	1	STATUS
			1	0	1	0	1	STATUS ENQUIRY
NOTE:		When allocating codes for national Message types the following principle is applied for the first octet following the escape to nationally specific type:						
			1	0	X	X	XXXX:	National standard
			1	1	X	X	XXXX:	ETSI standard

11.3.5 Other information elements

11.3.5.1 Coding rules

See subclause 11.3.5.1 of TBR 4 [8].

11.3.5.1.1 Codeset 0

**Reference:** ETS 300 102-1 [13], subclause 4.5.1.1, ETS 300 007 [10], clause C.4.

**Definition:** The information elements belonging to codeset 0 are listed in table 11.13, which also gives the coding of the information identifier bits.

**Table 11.13: Information element identifier coding**

Bits								Maximum length octets (see note 1)
8	7	6	5	4	3	2	1	
1	:	:	:	-	-	-	-	<b>Single octet information elements:</b>
0	0	0	0	-	-	-	-	Reserved
0	0	1	-	-	-	-	-	Shift (see note 2)
0	:	:	:	:	:	:	:	<b>Variable length information elements:</b>
0	0	0	0	1	0	0	0	Bearer capability
0	0	0	1	0	0	0	0	Cause (see note 2)
0	0	1	0	1	0	0	0	Call state
0	0	1	1	0	0	0	0	Channel identification (see note 2)
1	1	0	1	1	0	0	0	Calling party number
1	1	0	1	1	0	1	1	Calling party subaddress
1	1	1	0	0	0	0	0	Called party number
1	1	1	0	0	0	1	1	Called party subaddress
1	1	1	1	0	0	1	1	Restart indicator
1	1	1	1	1	1	1	1	Escape for extension (see note 3)
All other values are reserved (see note 4).								
NOTE 1: The length limits described for the variable length information elements below take into account only the present CCITT standardized coding values. Future enhancements and expansions to this TBR will not be restricted to these limits.								
NOTE 2: This information element may be repeated.								
NOTE 3: This escape mechanism is limited to codesets 5, 6 and 7 (see subclause 11.3.5.2 of TBR 4 [8]). When the escape for extension is used, the information element identifier is contained in octet group 3 and the content of the information element follows in the subsequent octets as shown in figure 11.2.								
NOTE 4: The reserved values with bits 5-8 coded "0 0 0 0" are for future information elements for which comprehension by the receiver is required (see subclause 11.4.6.5.1).								

8	7	6	5	4	3	2	1	Octet
Protocol discriminator								
0	1	1	1	1	1	1	1	1
Length of information element contents								2
1 ext	Information element identifier							3
Contents of information element								4 etc.

Figure 11.2: Information element format using escape for extension

**11.3.5.2 Extensions of codesets**

See subclause 11.3.5.2 of TBR 4 [8].

**11.3.5.3 Locking shift procedure**

See subclause 11.3.5.3 of TBR 4 [8].

**11.3.5.4 Non-locking shift procedure**

See subclause 11.3.5.4 of TBR 4 [8].

**11.3.5.5 Bearer capability**

**Reference:** ETS 300 102-1 [13], subclause 4.5.5, ETS 300 007 [10], subclauses 7.1.2.1 and 7.2.2.3.1.

**Definition:** The purpose of the Bearer capability information element is to indicate a requested CCITT Recommendation I.231 bearer service to be provided by the network. It contains only information which may be used by the network.

The Bearer capability information element is coded as shown in figure 11.3 and table 11.14.

No default Bearer capability may be assumed by the absence of this information element.

The maximum length of this information element is 6 octets when CCITT recommended coding is used.

8	7	6	5	4	3	2	1	Octet
Bearer capability								
0	0	0	0	0	1	0	0	1
Information element identifier								
Length of the Bearer capability contents								2
1 ext	coding standard		information transfer capability					3
0/1 ext	transfer mode		information transfer rate					4
1 ext	1	0	user information layer 2 protocol					6
	layer 2 ident.							
1 ext	1	1	user information layer 3 protocol					7
	layer 3 ident.							

NOTE 1: The indicated octets shall always be present.

NOTE 2: In TBR 4 [8], additional octets for the Bearer capability information element are defined (octets 4a, 4b, 5, 5a, 5b, 5c and 5d). The inclusion of these octets is not recommended. However, for the purposes of this TBR, the presence of these octets is not considered to be essential.

Figure 11.3: Bearer capability information element

Table 11.14: Bearer capability information element

<p><b>Coding Standard (octet 3)</b></p> <p>Bits  <b>7 6</b>  0 0                    CCITT recommended coding</p> <p>All other values are reserved.</p>
<p><b>Information transfer capability (octet 3)</b></p> <p>Bits  <b>5 4 3 2 1</b>  0 1 0 0 0            unrestricted digital information</p> <p>All other values are reserved.</p>
<p><b>Transfer mode (octet 4)</b></p> <p>Bits  <b>7 6</b>  1 0                    packet mode</p> <p>All other values are reserved.</p>
<p><b>Information transfer rate (octet 4 bits 5 to 1)</b></p> <p>Bits  <b>5 4 3 2 1</b>  0 0 0 0 0            packet-mode calls</p> <p>All other values are reserved.</p>
<p><b>User information layer 2 protocol (octet 6)</b></p> <p>Bits  <b>5 4 3 2 1</b>  0 0 0 1 0            CCITT Recommendation Q.921 (I.441).    (see note 1)  0 0 1 1 0            CCITT Recommendation X.25, link level.    (see note 2)</p> <p>All other values are reserved.</p> <p>NOTE 1:    This value will be used by the network in the incoming SETUP message, if the incoming virtual call can only be established on the D-channel.</p> <p>NOTE 2:    This value shall be used by the TE in the outgoing SETUP message. The value will be used by the network in all cases where note 1 does not apply.</p>
<p><b>User information layer 3 protocol (octet 7)</b></p> <p>Bits  <b>5 4 3 2 1</b>  0 0 1 1 0 CCITT Recommendation X.25, packet layer.</p> <p>All other values are reserved.</p>



**11.3.5.6 Call state**

See subclause 11.3.5.7 of TBR 4 [8].

**11.3.5.7 Called party number**

See subclause 11.3.5.8 of TBR 4 [8].

**11.3.5.8 Called party subaddress**

See subclause 11.3.5.9 of TBR 4 [8].

**11.3.5.9 Calling party number**

**Reference:** ETS 300 102-1 [13], subclause 4.5.10.

**Definition:** The purpose of the Calling party number information element is to identify the calling party of a call.

The Calling party number information element is coded as shown in figure 11.4 and table 11.15.

The maximum length of this information element is 24 octets.

8	7	6	5	4	3	2	1	Octet
Calling party number								
0	1	1	0	1	1	0	0	1
Information element identifier								
Length of Calling party number contents								2
0/1 ext	Type of number			Numbering plan identification				3
1 ext	Presentation indicator	0 0 0 Spare			Screening indicator			3a
0	Number digits (IA5 characters, see note)							4 etc.

**NOTE:** The number digits appear in multiple octets 4, in the same order in which they would be entered, that is, the number digit which would be entered first is located in the first octet.

**Figure 11.4: Calling party number information element**

**Table 11.15: Calling party number information element**

<b>Type of number (octet 3) (see note 1)</b>	
Bits	
<b>7 6 5</b>	
0 0 0	Unknown (see note 2).
0 0 1	International number (see note 3).
0 1 0	National number (see note 3).
0 1 1	Network specific number (see note 4).
1 0 0	Subscriber number (see note 3).
1 1 0	Abbreviated number (see note 5).
1 1 1	Reserved for extension.
All other values are reserved.	
NOTE 1: For the definition of international, national and subscriber number, see CCITT Recommendation I.330.	
NOTE 2: The type of number "unknown" is used when the user or the network has no knowledge of the type of number, e.g. international number, national number, etc. In this case the number digits field is organized according to the network dialling plan; e.g. prefix or escape digits might be present.	
NOTE 3: Prefix or escape digits are not included.	
NOTE 4: The type of number "network specific number" is used to indicate administration/service number specific to the serving network, e.g. used to access an operator.	
NOTE 5: The support of this code is network dependent. The number provided in this information element presents a shorthand representation of the complete number in the specified numbering plan as supported by the network.	
<b>Numbering plan identification (octet 3)</b>	
<b>Numbering plan (applies for type of number = 000, 001, 010 and 100)</b>	
Bits	
<b>4 3 2 1</b>	
0 0 0 0	Unknown (see note 6).
0 0 0 1	ISDN/Telephony numbering plan (CCITT Recommendation E.164/E.163).
0 0 1 1	Data numbering plan (CCITT Recommendation X.121).
0 1 0 0	Telex numbering plan (CCITT Recommendation F.69).
1 0 0 0	National standard numbering plan.
1 0 0 1	Private numbering plan.
1 1 1 1	Reserved for extension.
All other values are reserved.	
NOTE 6: The numbering plan "unknown" is used when the user or the network has no knowledge of the numbering plan. In this case the number digits field is organized according to the network dialling plan; e.g. prefix or escape digits may be present.	
(continued)	

Table 11.15 (concluded): Calling party number information element

<p><b>Presentation indicator (octet 3a) (see note 7)</b></p> <p>Bits  <b>7 6</b>  0 0 presentation allowed  0 1 presentation restricted  1 0 number not available due to interworking  1 1 reserved</p> <p>NOTE 7: At the originating user-network interface, the presentation indicator is used for indicating the intention of the calling user for the presentation of the calling party number to the called user. This may also be requested on a subscription basis. If octet 3a is omitted, and the network does not support subscription information for the calling party number information restrictions, the value "00 - presentation allowed" is assumed.</p>	
<p><b>Screening indicator (octet 3a) (see note 8)</b></p> <p>Bits  <b>2 1</b>  0 0 user-provided, not screened  0 1 user-provided, verified and passed  1 0 user-provided, verified and failed (see note 9)  1 1 network-provided</p> <p>NOTE 8: If octet 3a is omitted, "00 - user-provided - not screened" is assumed.  NOTE 9: The support of this code is network dependent.</p>	
<p><b>Number digits (octets 4 etc.)</b></p> <p>This field is coded with IA5 characters, according to the formats specified in the appropriate numbering/dialling plan.</p>	

**11.3.5.10 Calling party subaddress**

**Reference:** ETS 300 102-1 [13], subclause 4.5.11.

**Definition:** The purpose of the Calling party subaddress is to identify the subaddress of the Calling party of a call. For the definition of subaddress see CCITT Recommendation I.330.

The Calling party subaddress is coded as shown in figure 11.5 and table 11.16.

The maximum length of this information element is 23 octets.

8	7	6	5	4	3	2	1	Octet
Calling party subaddress								1
0	1	1	0	1	1	0	1	
Information element identifier								
Length of the Calling party subaddress content								2
1	Type of subaddress			odd/ even ind.	0	0	0	3
ext					spare			
Subaddress information								4 etc.

Figure 11.5: Calling party subaddress information element

**Table 11.16: Calling party subaddress information element**

<b>Type of subaddress (octet 3)</b>	
Bits	
<b>7 6 5</b>	
0 0 0	NSAP (CCITT Recommendation X.213/ISO 8348 AD2).
0 1 0	User specified.
All other values are reserved.	
<b>Odd/even indicator (octet 3)</b>	
Bit	
<b>4</b>	
0	Even number or address signals.
1	Odd number or address signals.
NOTE 1: The odd/even indicator is used when the type of subaddress is "user specified" and the coding is BCD.	
<b>Subaddress information (octet 4, etc.)</b>	
The Network Service Access Point (NSAP) CCITT Recommendation X.213/ISO 8348 AD2 address, is formatted as specified by octet 4 which contains the Authority and Format Identifier (AFI). The encoding is made according to the "preferred binary encoding" as defined in CCITT Recommendation X.213/ISO 8348 AD2. For the definition of this type of subaddress, see CCITT Recommendation I.334.	
For user specified subaddress, this field is encoded according to the user specification, subject to a maximum length of 20 octets. When interworking with X.25 networks BCD coding should be applied.	
NOTE 2: It is recommended that users apply the NSAP subaddress type since this subaddress type allows the use of decimal, binary and IA5 syntaxes in a standardized manner.	
NOTE 3: It is recommended that users apply the local IDI format when the subaddress is used for terminal selection purposes. In this case the IA5 character syntax using only digits 0 to 9 is used for the Domain Specific Part (DSP).	

**11.3.5.11 Cause**

See subclause 11.3.5.10 of TBR 4 [8].

**11.3.5.12 Channel identification**

See subclause 11.3.5.11 of TBR 4 [8].

**11.3.5.13 Restart indicator**

See subclause 11.3.5.16 of TBR 4 [8].

## 11.4 Call control procedures for the control of packet-mode access of the PH

**Reference:** ETS 300 102-1 [13], clause 5, ETS 300 007 [10] clause 7.

The following procedures apply to TEs having implemented the access of the PH via on-demand B-channel connections or having implemented the access of the PH via D-channel, supporting the conditional notification class for incoming calls, or both.

### 11.4.1 Call establishment at the originating interface

**Reference:** ETS 300 102-1 [13], subclause 5.1, ETS 300 007 [10] clause 7.

**Requirement:** Before these procedures are invoked, a reliable data link connection shall be established between the TE and the network. All layer 3 messages shall be sent to the data link layer using a DL-DATA-REQUEST primitive. The data link services described in clause 10 for SAPI=0 are assumed.

**Test:** This requirement shall be tested according to the procedures of annex D, test preamble PR30001.

#### 11.4.1.1 Call request

**Reference:** ETS 300 102-1 [13], subclause 5.1.1, ETS 300 007 [10], subclause 7.1.2.

**Requirement:** A TE shall initiate call establishment by transferring a SETUP message across the user-network interface. Following the transmission of the SETUP message, the call shall be considered by the TE to be in the Call initiated state.

NOTE: Initiation of a call by the TE may require stimulation of the TE at some other point (e.g. the man-machine interface). The PIXIT in annex E requests information concerning the manner in which an outgoing call can be set up.

**Test:** This requirement shall be tested according to the procedures of annex D, test case TC20002.

#### 11.4.1.2 Overlap sending

**Reference:** ETS 300 102-1 [13], subclauses 5.1.2 and 5.1.3, ETS 300 007 [10], subclause 7.1.2.1.

**Requirement:** The calling TE shall not use the overlap sending procedure.

NOTE: No called party address or called party subaddress is required to be sent to the network at all (see subclause 11.2.8).

**Test:** This requirement is implicitly tested by other test cases, no test case provided.

#### 11.4.1.3 Call proceeding

**Reference:** ETS 300 102-1 [13], subclauses 5.1.2 and 5.1.5, ETS 300 007 [10], subclause 7.1.2.1.

**Requirement:** If the TE receives the CALL PROCEEDING message when in the Call initiated state, the TE shall enter the Outgoing call proceeding state. The TE may attach to the B-channel.

**Test:** This requirement shall be tested according to the procedures of annex D, test case TC10101.

#### 11.4.1.4 Call confirmation indication

**Reference:** ETS 300 102-1 [13], subclauses 5.1.2 and 5.1.7.

**Requirement:** N/A.

**NOTE:** The ALERTING message will not be sent by the network (see subclause 11.2.1).

**Test:** There is no test.

#### 11.4.1.5 Call connected

**Reference:** ETS 300 102-1 [13], subclauses 5.1.2 and 5.1.8, ETS 300 007 [10], subclause 7.1.2.1.

**Requirement:** On receipt of the CONNECT message, the TE may send a CONNECT ACKNOWLEDGE message. The TE shall attach to the B-channel (if it has not already done so) and shall enter the Active state.

**Test:** This requirement shall be tested according to the procedures of annex D, test case TC10302.

#### 11.4.2 Call establishment at the destination interface

**Reference:** ETS 300 102-1 [13], subclause 5.2, ETS 300 007 [10], subclauses 4.2.2.1.2 and 4.2.2.2.2.

**Requirement:** Before responding to a SETUP message, a reliable point-to-point data link connection shall be established between the TE and the network. All layer 3 messages shall be sent to the data link layer using a DL-DATA-REQUEST primitive. The data link services described in clause 10 for SAPI 0 are assumed.

**Test:** This requirement is tested implicitly by all the incoming call handling tests.

##### 11.4.2.1 Incoming call

**Reference:** ETS 300 102-1 [13], subclause 5.2.1, ETS 300 007 [10], subclause 7.2.2.

**Requirement:** Upon receipt of a SETUP message on a point-to-point data link, the TE shall enter the Call present state.

The Compatibility checking procedure (see subclause 11.4.2.2) shall follow.

**Test:** This requirement shall be tested according to the procedures of annex D, test case TC10005.

##### 11.4.2.2 Compatibility checking

**Reference:** ETS 300 102-1 [13], subclause 5.2.2.

**Requirement:** If the TE is capable of being incompatible with the Bearer capability information element contents, it shall perform compatibility checking as appropriate on receipt of a SETUP message before responding to that SETUP message.

**NOTE:** It is for the user to determine, on whatever basis it chooses, whether it is compatible with the contents of the Bearer capability information element in the received SETUP message. The PIXIT in annex E contains questions concerning the contents of this information element the TE responds to as compatible and incompatible.

When the SETUP message is delivered via a point-to-point data link, an incompatible TE shall respond with a RELEASE COMPLETE message, and enter the Null state.

**Test:** This requirement shall be tested according to the procedures of annex D, test case TC10008.

### 11.4.2.3 Channel selection-destination

**Reference:** ETS 300 102-1 [13], subclause 5.2.3, ETS 300 007 [10], subclause 7.2.2.1, table 4.

**Requirement:** When the SETUP message delivered by the network contains channel selection information according to columns 1-3 of table 11.17, the compatible TE shall select the channel according to column 4 of table 11.17, if one of the indicated channels is supported and available.

If the network does not provide channel selection information according to columns 1-3 of table 11.17 or none of the indicated channels is supported or available, the TE shall follow the procedures of subclause 11.4.3.2 (exception conditions).

**Table 11.17: Channel selection by the called TE**

Channel indicated in the SETUP message sent by the network			Allowable user response
Information channel selection	Preferred/exclusive	D-channel indicator	
B <sub>i</sub>	Exclusive	Not D-channel	B <sub>i</sub>
		D-channel	B <sub>i</sub> , D
B <sub>i</sub>	Preferred	Not D-channel	B <sub>i</sub> , B <sub>i'</sub> , B <sub>j</sub>
		D-channel	B <sub>i</sub> , B <sub>i'</sub> , B <sub>j</sub> , D
No channel	Preferred	Not D-channel	B <sub>i</sub>
		D-channel	B <sub>j</sub> , D
	Exclusive	D-channel	D
<b>Key:</b>			
B <sub>i</sub> indicated idle B-channel			
B <sub>i'</sub> any other idle B-channel			
B <sub>j</sub> an established B-channel under user control			
D the D-channel			

**Test:** This requirement shall be tested according to the procedures of annex D, test preamble PR30801, test cases TC100x2, TC100x3, TC100x4, TC100x5, TC100x6, TC100x7, TC100x8 and TC100x9.

### 11.4.2.4 Overlap receiving

**Reference:** ETS 300 102-1 [13], subclause 5.2.4, ETS 300 007 [10], subclause 7.2.2.1.

**Requirement:** The TE shall not use overlap receiving on receipt of a SETUP message from the network.

The TE shall not send a SETUP ACKNOWLEDGE message to the network.

**NOTE:** The network will provide all available addressing and compatibility information in the SETUP message.

**Test:** The requirement is implicitly tested by all test cases performing an incoming call to the IUT. If the IUT responds to the incoming SETUP message with a SETUP ACKNOWLEDGE message, then the test fails.

### 11.4.2.5 Call confirmation

**Reference:** ETS 300 102-1 [13], subclause 5.2.5.1, ETS 300 007 [10], subclause 7.2.2.1.

**Requirement:** When the TE determines that any compatibility requirements have been satisfied according to subclause 11.4.2.2, the TE shall respond with either a CALL PROCEEDING, ALERTING, or CONNECT message, and enter the Incoming call proceeding, Call received or Connect request state, respectively.

**Test:** This requirement shall be tested according to the procedures of annex D, test case TC10005.

#### 11.4.2.6 Call accept

**Reference and Requirement:** See subclause 11.4.2.6 of TBR 4 [8].

**Test:** This requirement shall be tested according to the procedures of annex D, test preamble PR30801.

#### 11.4.2.7 Active indication

**Reference:** ETS 300 102-1 [13], subclause 5.2.8.

**Requirement:** Upon receipt of the CONNECT ACKNOWLEDGE message the TE shall enter the Active state.

NOTE 1: Only the TE that is awarded the call receives the CONNECT ACKNOWLEDGE message.

NOTE 2: The CONNECT ACKNOWLEDGE message will only be sent to the TE, if the selected user has requested that the incoming virtual call is awarded over a new B-channel.

**Test:** This requirement shall be tested according to the procedures of annex D, test case TC10801.

### 11.4.3 Call clearing

#### 11.4.3.1 Terminology

**Reference:** ETS 300 102-1 [13], subclause 5.3.1.

**Definition:** The following terms are used in this TBR in the description of clearing procedures:

A channel is "released" when the channel is not part of an ISDN connection and is available for use in a new connection. Similarly, a Call reference that is "released" is available for re-use.

#### 11.4.3.2 Exception conditions

**Reference:** ETS 300 102-1 [13], subclause 5.3.2.

**Requirement:** Except as described in this subclause, call clearing shall be initiated when the TE sends a DISCONNECT message and follows the procedures defined in subclause 1.4.3.4. The only exceptions to the above rule are as follows:

- a) in response to a SETUP message, the TE may reject a call (e.g. because of the unavailability of a suitable channel) by responding with a RELEASE COMPLETE message provided no other response has previously been sent (e.g. the CALL PROCEEDING message); releasing the Call reference; and enter the Null state;
- b) unsuccessful termination of the channel selection procedure by the side offering the call shall be accomplished by sending a RELEASE message as described in subclauses 11.4.3.3 and 11.4.3.4.

**Test:** There is no test.

#### 11.4.3.3 Clearing initiated by the user

**Reference and Requirement:** See subclause 11.4.3.3 of TBR 4 [8].

**Test:** This requirement shall be tested according to the procedures of annex D, test cases TC11105, TC20301 and TC21003.



#### 11.4.3.4 Clearing initiated by the network

##### 11.4.3.4.1 Clearing when tones/announcements provided

**Reference:** ETS 300 102-1 [13], subclause 5.3.4.1, ETS 300 007 [10], subclause 7.4.1.

**Requirement:** N/A.

NOTE: Tones are not provided for packet mode calls.

##### 11.4.3.4.2 Clearing when tones/announcements not provided

**Reference:** ETS 300 102-1 [13], subclause 5.3.4.2, ETS 300 007 [10], subclauses 7.2.2.3.1 and 7.4.1.

**Requirement:** On the receipt of the DISCONNECT message, the TE shall send a RELEASE message, start timer T308, enter the Release request state and follow the procedures of subclause 11.4.3.4.3.

If, for an incoming call, the TE has selected an established B-channel according to subclause 11.4.2.3, and has sent the CONNECT message to the network, the network, if it accepts the connection, will send a RELEASE message containing cause #7 "call awarded and being awarded in an established channel".

Upon receipt of the RELEASE message containing the indicated cause, the TE shall send a RELEASE COMPLETE message and remain in the active state.

If, for an incoming call, the TE has selected the D-channel according to subclause 11.4.2.3, and has sent the CONNECT message to the network, the network, if it accepts the connection, will send a RELEASE message containing cause #7 "call awarded and being awarded in an established channel".

Upon receipt of the RELEASE message containing the indicated cause, the TE shall send a RELEASE COMPLETE message, release the call reference and enter the Null state.

NOTE: There is no time significance between the receipt of the RELEASE message containing cause #7 and the receipt of the Incoming Call packet on the indicated channel, i.e. either may occur first.

**Test:** This requirement shall be tested according to the procedures of annex D, test cases TC10303, TC10701, TC10802, TC108x1, TC108x2 and TC10901.

##### 11.4.3.4.3 Completion of clearing

**Reference and Requirement:** See subclause 11.4.3.4.3 of TBR 4 [8].

**Test:** This requirement shall be tested according to the procedures of annex D, test case TC11903.

##### 11.4.3.5 Clear collision

**Reference and Requirement:** See subclause 11.4.3.5 of TBR 4 [8].

**Test:** This requirement shall be tested according to the procedures of annex D, test cases TC11101 and TC11904.

#### 11.4.4 Call rearrangements

**Reference:** ETS 300 102-1 [13], subclause 5.6, ETS 300 007 [10] table 11.1.

**Requirement:** The procedure shall not be used by the TE.

**Test:** There is no test.

#### 11.4.5 Call collisions

See subclause 11.4.5 of TBR 4 [8].

#### 11.4.6 Handling of error conditions

See first paragraph of subclause 11.4.6 in TBR 4 [8].

Subclauses 11.4.6.1 through 11.4.6.7 are listed in order of precedence.

The term "Ignore" in the following subclauses means to do nothing, as if the message had never been received.

##### 11.4.6.1 Call reference procedural errors

**Reference and Requirement:** See subclause 11.4.6.1 of TBR 4 [8].

**Test:** This requirement shall be tested according to the procedures of annex D, test cases TC10002, TC10010, TC10011 and TC10125.

##### 11.4.6.2 Message type or message sequence errors

**Reference and Requirement:** See subclause 11.4.6.2 of TBR 4 [8].

**Test:** This requirement shall be tested according to the procedures of annex D, test cases TC10102, TC10103, TC10107, TC10120, TC11004, TC11005, TC11008, TC11021, TC11908 and TC11909.

##### 11.4.6.3 Duplicated information elements

**Reference and Requirement:** See subclause 11.4.6.3 of TBR 4 [8].

**Test:** This requirement shall be tested according to the procedures of annex D, test cases TC10024, TC11908 and TC11909.

##### 11.4.6.4 Mandatory information element errors

###### 11.4.6.4.1 Mandatory information element missing

**Reference:** ETS 300 102-1 [13], subclause 5.8.6.1.

**Requirement:**

When a SETUP or RELEASE message is received which has one or more mandatory information elements missing, a RELEASE COMPLETE message shall be returned.

**Test:** This requirement shall be tested according to the procedures of annex D, test case TC10015.

#### 11.4.6.5 Non-mandatory information element errors

**Reference:** ETS 300 102-1 [13], subclause 5.8.7.

The following subclauses identify actions on information elements not recognized as mandatory.

##### 11.4.6.5.1 Unrecognized information element

**Reference:** ETS 300 102-1 [13], subclause 5.8.7.1.

**Requirement:** When a message is received which has one or more unrecognized information elements, the TE shall check whether any are encoded to indicate "comprehension required" (refer to table 11.13 for information element identifiers reserved with this meaning). If any unrecognized information element is encoded to indicate "comprehension required", then the procedures in subclause 11.4.6.4.1 are followed; i.e. as if a "missing mandatory information element" error condition had occurred. If all unrecognized information elements are not encoded to indicate "comprehension required", then the TE shall proceed as follows.

Action shall be taken on the message and those information elements which are recognized and have valid content. When the received message is other than DISCONNECT, RELEASE or RELEASE COMPLETE, a STATUS message may be returned containing one Cause information element. The STATUS message shall indicate the Call state of the receiver after taking action on the message. The Cause information element shall contain Cause #99 "information element non-existent or not implemented", and the diagnostic field, if present, shall contain the information element identifier for each information element which was unrecognized.

Subsequent actions are determined by the sender of the unrecognized information elements. If a clearing message contains one or more unrecognized information elements, the error is reported to the local TE in the following manner:

- when a RELEASE message is received which has one or more unrecognized information elements, a RELEASE COMPLETE shall be returned.

**Test:** This requirement shall be tested according to the procedures of annex D, test cases TC10027, TC10028 and TC11118.

##### 11.4.6.5.2 Non-mandatory information element content error

**Reference:** ETS 300 102-1 [13], subclause 5.8.7.2.

**Requirement:** When a message is received which has one or more non-mandatory information elements with invalid content, action shall be taken on the message and those information elements which are recognized and have valid content. A STATUS message may be returned containing one Cause information element. The STATUS message indicates the Call state of the receiver after taking action on the message. The Cause information element shall contain Cause #100 "invalid information element contents", and the diagnostic field, if present, shall contain the information element identifier for each information element which has invalid contents.

Information elements with a length exceeding the maximum length (given in subclause 11.2) shall be treated as an information element with content error with the exception of:

- other access information elements (i.e. a user-to-user information or subaddress information element) may be truncated and processed.

Also, for access information elements treated as information elements with content error, Cause #43 "access information discarded" shall be used instead of Cause #100 "invalid information element contents" in the STATUS message.

**NOTE:** As an option of a TE (e.g. NT2) Cause values, location codes, and diagnostics which are not understood by the NT2 may be accepted, or in the case of an NT2, passed on to another entity (e.g. user or NT2) instead of ignoring the Cause information element contents and optionally sending a STATUS message with Cause #100 "invalid information element contents". This option is intended to aid the TE to be compatible with future additions of Cause values, location codes, and diagnostics to this TBR.

**Test:** This requirement shall be tested according to the procedures of annex D, test cases TC10029 and TC100x1.

#### 11.4.6.6 Status enquiry procedure

**Reference:** ETS 300 102-1 [13], subclause 5.8.10.

**Requirement:** When the TE is required to perform the procedures of this subclause, and a STATUS ENQUIRY message has not already been sent, a STATUS ENQUIRY message shall be sent. The TE shall treat any responding STATUS message according to the procedures of subclause 11.4.6.7.

Upon receipt of a STATUS ENQUIRY message, the receiver shall respond with a status message reporting the current Call state.

If the STATUS ENQUIRY message specifies a call reference which is not related to an active call or to a call in progress, then the receiver shall either respond with a STATUS message reporting the current call state, or the procedures of subclause 11.4.6.1 shall be followed.

**Test:** This requirement shall be tested according to the procedures of annex D, test case TC11107 and postamble CS59901.

#### 11.4.6.7 Receiving a STATUS message

**Reference:** ETS 300 102-1 [13], subclause 5.8.11.

**Requirement:**

- a) If a STATUS message indicating any Call state except the Null state is received in the Null state, then the receiving entity shall either:
  - 1) send a RELEASE message; and then follow the procedures of subclause 11.4.3; or
  - 2) send a RELEASE COMPLETE message; and remain in the Null state.
- b) If a STATUS message indicating any Call state except the Null state is received in the Release request state, no action shall be taken.
- c) If a STATUS message, indicating the Null state, is received in any state except the Null state, the receiver shall release all resources and move into the Null state.

**Test:** This requirement shall be tested according to the procedures of annex D, test cases TC10004, TC10105, TC11007 and TC11906.

#### 11.4.7 User notification procedure

**Reference:** ETS 300 102-1 [13], subclause 5.9, ETS 300 007 [10], subclause 7.1.2.1.

**Requirement:** N/A.

**NOTE:** The procedure is not applicable since the network does not send a NOTIFY message.

**Test:** There is no test.

#### 11.4.8 Restart procedure

**Reference:** ETS 300 102-1 [13], subclauses 5.5 and 5.5.2.

**Requirement:** When a point-to-point configuration exists using one of the point-to-point data links according to subclause 10.3 then the TE shall implement the following procedures:

Upon receiving a RESTART message the TE shall enter the Restart state associated to the global call reference; it shall then initiate the appropriate internal actions to return the specified channels to the idle condition and Call references to the Null state. Upon completion of internal clearing and within 2 minutes of receipt of the RESTART, a RESTART ACKNOWLEDGE message shall be transmitted to the network, and the Null state entered.

**Test:** This requirement shall be tested according to the procedures of annex D, test case TC19003.

#### 11.5 TE timers

**Reference and Requirement:** See subclause 11.5 of TBR 4 [8].

**Test:** This requirement shall be tested according to the procedures of annex D, test cases TC21001 and TC21006.

## **12 X.25**

### **12.1 X.25 requirements**

There are no new requirements in this TBR not contained in TBR 2 [7].

### **12.2 X.25 procedures**

This clause is not intended to express requirements on the use of X.25 packet layer elements or procedures. It only serves as an overview and as a means to select applicable requirements on the use of the D-channel protocols, depending on which kind of virtual call is supported.

#### **12.2.1 Data link protocol supporting the X.25 packet level protocol**

When a B-channel is used for the access of the PH, the data link protocol is the LAPB protocol as defined in ITU-T Recommendation X.25 (HDLC procedures).

When the D-channel is used for the access of the PH, the data link protocol is the LAPD protocol as defined in clause 10 of this TBR for SAPI 16.

#### **12.2.2 X.25 packet level protocol**

Independently of which channel is used for the access of the PH, the layer 3 protocol is the packet layer protocol as defined in ITU-T Recommendation X.25.

#### **12.2.3 Outgoing and incoming virtual calls**

An X.25 terminal supports either:

- 1) outgoing virtual calls only; or
- 2) incoming virtual calls only; or
- 3) both.

NOTE: This is no restriction on X.25 terminal capabilities; the classification is only intended to serve for the selection of applicable requirements in other clauses of this TBR.

Annex H shows some examples of access configurations with small sets of requirements for TEs supporting only outgoing or only incoming virtual calls.

#### **12.2.4 Identification of X.25 terminals**

Some networks require identification according to procedures of X.25 terminals requesting access to the PH. However, this is out of the scope of this TBR.

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

Notwithstanding the provisions of the copyright clause related to the text of this TBR, ETSI grants that users of this TBR may freely reproduce the TBR-RT proforma in this annex so that it can be used for its intended purposes and may further publish the completed TBR-RT.

The purpose of this TBR-RT is to state the logical inter-relationship of the various requirements within this TBR, and their dependence on the implementation or non-implementation of options within particular items of TE.

The contents of this TBR-RT can also perform a similar function to that of an Implementation Conformance Statement (ICS). Therefore, in order to facilitate the provision of information by the manufacturers to test laboratories, a blank column for "Support" has been added so that the TBR-RT may be copied and used as part of an ICS proforma (additional information to identify uniquely the IUT will be needed).

It is not a requirement of this TBR that information is provided to laboratories in this way, and other methods for providing information (e.g. ICSs for the base standards identified in the Scope) may be used.

### A.1 Guidance for completion of the TBR-RT

For each layer, there are one or more tables of requirements.

The Number column, when taken with the table number, provides a unique identifier to each requirement (i.e. A6.1 is item 1 in table A.6).

The Reference column lists the subclause reference in the TBR where the requirement may be found.

The TBR requirement column gives the clause title of the relevant clause, supplemented by any additional information necessary to identify the requirement.

The Status column contains one of the following items:

- m support for the requirement is mandatory;
- cx support for the requirement is mandatory if the relevant condition is met;
- o support for the requirement is optional;
- o.n support for the requirement is optional, subject to certain options being selected according to the numbered footnote;
- n/a support for the requirement is not applicable;
- x support for the requirement is forbidden.

The outcome of a condition may be any of the other status values listed.

The Support column is blank for the user to complete.

## A.2 General classification of requirements TBR-RT

Table A.1: General type of packet-mode TE operations

No.	Reference	Type of Packet-Mode TE Operation	Status	Support (Y/N)	Comment
1	4.1.1 a), c), 4.1.2.1 a)	Is the TE able to operate with semi-permanent B-channel?	o.1		Affects layer 1 and data link requirements
2	4.1.1 a), c), 4.1.2.1 b)	Is the TE able to operate with on-demand B-channel?	o.1		Affects layer 1 and data link requirements
3	4.1.5.2	Is the TE able to operate with ISDN incoming calls?	c1		ETS 300 102-1 [13] procedures
4	4.1.5.1	Is the TE able to operate with ISDN outgoing calls ?	c2		ETS 300 102-1 [13] procedures
5	4.1.1 b), c)	Is the TE able to operate PH access over the D-channel?	o.1		
6	4.1.1 b)	Is the TE able to operate PH access over the D-channel only?	o.1		
7	12.2.3 2, 3)	Is the TE able to handle incoming virtual calls?	o.2		
8	12.2.3 1, 3)	Is the TE able to handle virtual outgoing calls?	o.2		
c1: m if A.1.7 and A.1.2 else o. c2: m if A.1.8 and A.1.2 else o. o.1: One or more options shall be chosen o.2: One or more options shall be chosen					



Table A.2: General type of packet-mode TE operations data link

No.	Reference	Type of Packet-Mode TE Operation	Status	Support (Y/N)	Comment
1	4.1.3.1	Is the TE capable of TE demand data link activation (SAPI 0)?	c1		on-demand B-channel
2	4.1.3.1	Is the TE capable of network demand data link activation (SAPI 0)?	c1		on-demand B-channel
3	4.1.3.2	Is the TE capable of semi-permanent data link operation (SAPI 16)?	c2		D-channel or D-channel only
4	4.1.3.2	Is the TE capable of TE demand data link activation (SAPI 16)?	c2		D-channel or D-channel only
5	4.1.3.2	Is the TE capable of network demand data link activation (SAPI 16)?	c2		D-channel or D-channel only
6	4.1.3.2	Does the TE implement a fixed (non-automatic) TEI for PH access over the D-channel?	c3		
7	4.1.3.2	Does the TE implement a fixed (non-automatic) TEI for PH access over the B-channel?	c4		
8	4.1.3.2 4.1.3.3	Does the TE implement a TEI in the automatic range for PH access over the B-channel?	c4		
c1 = o.1 if A.1.2 else n/a c2 = o.2 if A.3.1 else o c3 = m if A.1.5 else n/a c4 = o.3 if (not A.1.6) else n/a o.1: One or more options shall be chosen o.2: One or more options shall be chosen o.3: Only one option shall be chosen					

Table A.3: Notification classes

No.	Reference	Type of Packet-Mode TE Operation	Status	Support (Y/N)	Comment
1	4.1.4 a)	Does the TE operate with the No notification class?	c1		
2	4.1.4 b)	Does the TE of operate with the Conditional notification class?	c1		
c1: o.1 if A.1.7 else n/a o.1: Only one option shall be chosen					

### A.3 Layer 1 and overvoltage requirements TBR-RT

Table A.4: Layer 1 and overvoltage conditions

No.	Condition	Status	Support (Y/N)	Comment
1	Is TE mains powered?	o		Affects requirements in clause 8

Table A.5: Overvoltage requirements

No.	Reference	TBR Requirement	Status	Support (Y/N)
1	8.1	Impulse transfer from mains, common mode	c1	
2	8.2	Impulse transfer from mains, transverse mode	c1	
3	8.3	Conversion of common mode to transverse mode	m	

c1 = m if A.4.1 else n/a

Table A.6: On-demand B- or D-channel layer 1 physical characteristics requirements

No.	Reference [TBR 4 [8]]	TBR Requirement	Status	Support (Y/N)
1	9.1.1	Hardwiring	c1	
2	9.1.2	Alternative connection method	o	

c1 = m if A.1.2 else n/a

Table A.7: On-demand layer 1 output port electrical requirements

No.	Reference [TBR 4 [8]]	TBR Requirement	Status	Support (Y/N)
1	9.2.1	Waveform shape	c1	
2	9.2.2	Impedance towards ground	c1	
3	9.2.3	Clock accuracy	c1	
4	9.2.4a	Output jitter, input timing derived from the same primary rate access	c2	
5	9.2.4b	Output jitter, input timing derived from a different primary rate access	c2	
6	9.2.4c	Output jitter, input timing derived from a non-ISDN 2 048 kbit/s access	c2	
7	9.2.4d	Output jitter, input timing derived from internal source.	c2	
8	9.2.4e	Output jitter, input timing derived from dedicated external reference	c2	

c1 = m if A.1.2 else n/a  
c2 = o.1 if A.1.2 else n/a  
o.1: One or more options shall be chosen

**Table A.8: On-demand layer 1 input port electrical requirements**

No.	Reference [TBR 4 [8]]	TBR Requirement	Status	Support (Y/N)
1	9.3.1	Return loss	c1	
2	9.3.2	Immunity to attenuation and reflections	c1	
3	9.3.3	Jitter tolerance	c1	
4	9.3.4	Tolerable longitudinal voltage	c1	
5	9.3.5	Impedance towards ground	c1	

c1 = m If A.1.2 else n/a

**Table A.9: On-demand layer 1 frame structure requirements**

No.	Reference [TBR 4 [8]]	TBR Requirement	Status	Support (Y/N)
1	9.4.4	Allocation of bits number 1 to 8 of the frame	c1	
2	9.4.8	Use of bit 1 in 2 048 kbit/s CRC-4 multiframe	c1	
3	9.4.9	D-channel	c1	

c1 = m If A.1.2 else n/a

**Table A.10: On-demand layer 1 operational functions requirements**

No.	Reference [TBR 4 [8]]	TBR Requirement	Status	Support (Y/N)
1	9.5.4.2.1	Anomalies and defect detection	c1	
2	9.5.4.2.2	Detection of defect indication signals	c1	
3	9.5.4.2.3	Consequent actions	c1	
4	9.5.5.1	Loss of frame alignment	c1	
5	9.5.5.2	Strategy for frame alignment recovery	c1	
6	9.5.5.3	CRC multiframe alignment using information in bit 1 of the basic frame	c1	
7	9.5.5.4	CRC bit monitoring	c1	
8	9.5.5.5	Monitoring for false frame alignment	c1	

c1 = m If A.1.2 else n/a

**Table A.11: Semi-permanent B-channel layer 1 physical characteristics requirements**

No.	Reference [TBR 13 [9]]	TBR Requirement	Status	Support (Y/N)
1	4.1.1	Hardwiring	c1	
2	4.1.2	Alternative connection method	o	

c1 = m If A.1.1 else n/a

**Table A.12: Semi-permanent B-channel layer 1 output port electrical requirements**

No.	Reference [TBR 13 [9]]	TBR Requirement	Status	Support (Y/N)
1	4.2.1.1	Signal coding	c1	
2	4.2.1.2	Waveform shape	c1	
3	4.2.1.3	Output timing	c1	
4	4.2.1.4	Output jitter	c1	

c1 = m If A.1.1 else n/a

Table A.13: Semi-permanent B-channel layer 1 output structure requirements

No.	Reference [TBR 13 [9]]	TBR Requirement	Status	Support (Y/N)
1	4.2.1.5	Frame length	c1	
2	4.2.1.5	Frame repetition rate	c1	
3	4.2.1.5	Allocation of bits 1 to 8	c1	
4	4.2.1.5.1	CRC-4	c1	

c1 = m If A.1.1 else n/a

Table A.14: Semi-permanent B-channel layer 1 operational functions requirements

No.	Reference [TBR 13 [9]]	TBR Requirement	Status	Support (Y/N)
1	4.2.1.5.2	Use of the E-bits	o	
2	4.2.1.5.3	Use of the A-bit	c1	
3	4.2.1.5.4	Use of the S <sub>a</sub> -bits	o	

c1 = m If A.1.1 else n/a

## A.4 Layer 2 TBR-RT

**Table A.15: Layer 2 point-to-point configuration requirements**

No.	Reference	TBR Requirement	Status	Support (Y/N)
1	10.3	Does the TE support a (physical) point-to-point configuration using only a single data link for each of the SAPs 0 and 16 in use?	c1	
c1 = m if A.1.2 or A.1.5 else n/a				

**Table A.16: Layer 2 unacknowledged operation requirements**

No.	Reference	TBR Requirement	Status	Support (Y/N)
1	10.4.1	Transmission of unacknowledged information	c1	
2	10.4.2	Receipt of unacknowledged information	c1	
c1 = n/a if A.15.1 else m.				

**Table A.17: Layer 2 TEI management requirements**

No.	Reference	TBR Requirement	Status	Support (Y/N)
1	10.5.2	TEI assignment procedure, automatic TEIs	c1	
2	10.5.2	TEI assignment procedure, non-automatic TEIs	c5	
3	10.5.2.1	Expiry of timer T202	c2	
4	10.5.3.	Operation of the TEI check procedure	c3	
5	10.5.4.1	Action taken by the data link layer entity receiving the MDL-REMOVE-REQUEST primitive	c2	
6	10.5.4.2	Conditions for TEI removal, receipt of an identity remove message	c2	
7	10.5.4.2	Conditions for TEI removal, receipt of MDL-ERROR INDICATION indicating possible multiple TEI assignment	c2	
8	10.5.5.2	Operation of the TEI identity verify procedure	c4	
9	10.5.1	General TEI management procedures	m	
c1 = x if A.1.6 or A.15.1 else o.1 c2 = m if A.17.1 else n/a c3 = n/a if A.15.1 else m c4 = o if A.17.1 else n/a c5 = m if A.1.6 and not A.15.1 else o.1 o.1: One or more options shall be chosen o.2: One or more options shall be chosen				

**Table A.18: Layer 2 establishment and release procedures requirements table for SAPI 0**

No.	Reference	TBR Requirement	Status	Support (Y/N)
1	10.6.1.1	General	c5	
2	10.6.1.2.1	Data link establishment on TE demand on a per-call basis	c1	
3	10.6.1.2.1	Semi-permanent data link under TE responsibility	c1	
4	10.6.1.2.2	Data link establishment on network demand on a per-call basis	c2	
5	10.6.1.2.2	Semi-permanent data link under network responsibility	c2	
6	10.6.1.3	Procedure on expiry of timer T200	c3	
7	10.6.2	Receipt of DISC	c5	
8	10.6.2	Termination of multiple frame operation	c4	
c1 = o.1 if (not A.18.5) and (A.1.4 or (A.1.3 and not A.4.5)) else o c2 = o.2 if (not A.18.3) and A.1.3 and A.4.5 else o c3 = m if A.18.2 or A.18.3 else n/a c4 = m if A.18.7 else n/a c5 = m if A.1.2 else n/a o.1: Only one option shall be chosen o.2: Only one option shall be chosen				

**Table A.19: Layer 2 establishment and release procedures requirements table for SAPI 16**

No.	Reference	TBR Requirement	Status	Support (Y/N)
There are no requirements for layer 2 establishment and release procedures for SAPI 16.				

**Table A.20: Layer 2 multiple frame operation requirements table for SAPI 0**

No.	Reference	TBR Requirement	Status	Support (Y/N)
1	10.7.1	Transmitting I-frames	c1	
2	10.7.2	Receiving I-frames	c1	
3	10.7.2.1	P bit set to 1	c1	
4	10.7.2.2	P bit set to 0	c1	
5	10.7.3	Receiving acknowledgements	c1	
6	10.7.4	Receiving REJ frames	c1	
7	10.7.5.1	Receiving a valid RNR command or response	c1	
8	10.7.5.2	Expiry of timer T200 during "peer receiver busy"	c1	
9	10.7.5.3	Receiving a valid RNR command or response during "peer receiver busy"	c1	
10	10.7.5.4	Receiving a valid RR or REJ command during "peer receiver busy"	c1	
11	10.7.5.5	Appropriate supervisory response frame	c1	
12	10.7.6	Waiting acknowledgement	c1	
13	10.8	Re-establishment of multiple frame operation	c1	
c1 = m if A.1.2 else n/a.				

**Table A.21: Layer 2 multiple frame operation requirements table for SAPI 16**

No.	Reference	TBR Requirement	Status	Support (Y/N)
There are no layer 2 multiple frame operation requirements for SAPI 16.				

**Table A.22: Layer 2 exception condition requirements table for SAPI 0**

No.	Reference	TBR Requirement	Status	Support (Y/N)
1	10.9.1	N(S) sequence error	c2	
2	10.9.2	Invalid frame condition	c2	
3	10.9.3	Frame rejection condition	c2	
4	10.9.4	Multiple-assignment of TEI value	c1	
c1 = m if A.1.2 and A.17.1 else n/a c2 = m if A.1.2 else n/a				

**Table A.23: Layer 2 exception condition requirements table for SAPI 16**

No.	Reference	TBR Requirement	Status	Support (Y/N)
There are no layer 2 exception condition requirements for SAPI 16.				

**Table A.24: Layer 2 system parameters requirements**

No.	Reference	TBR Requirement	Status	Support (Y/N)
1	10.10.3	Maximum number of octets in an information field.	c1	
2	10.10.7	Layer 2 response time, TE not operating in accordance with subclause 10.3 (200 ms).	c1	
3	10.10.7	Layer 2 response time, TE operating in accordance with subclause 10.3 (500 ms).	c2	
c1 = n/a if (A.1.2 or A.1.5) and A.15.1 else m c2 = m if (A.1.2 or A.1.5) and A.15.1 else n/a				

### A.5 Layer 3 TBR-RT

**Table A.25: Layer 3 call establishment at the originating interface requirements**

No.	Reference	TBR Requirement	Status	Support (Y/N)
1	11.4.1	Call establishment at the originating interface	c1	
2	11.4.1.1	Call request	c1	
3	11.4.1.3	Call proceeding	c1	
4	11.4.1.5	Call connected	c1	

c1 = m if A.1.4 else n/a.

**Table A.26: Layer 3 call establishment at the destination interface requirements**

No.	Reference	TBR Requirement	Status	Support (Y/N)
1	11.4.2	Call establishment at the destination interface	c1	
2	11.4.2.1	Incoming call, SETUP message delivered by point-to-point data link	c2	
3	11.4.2.2	Compatibility checking on Bearer capability information element, SETUP message delivered by point-to-point data link	c2	
4	11.4.2.3	Channel selection-destination	c1	
5	11.4.2.4	Overlap receiving	c1	
6	11.4.2.5.1	Response to en-block SETUP	c1	
7	11.4.2.6	Call accept	c1	
8	11.4.2.7	Active indication	c1	

c1 = m if A.1.3 else n/a  
c2 = m if A.1.3 and A.15.1 else n/a

**Table A.27: Layer 3 call clearing requirements**

No.	Reference	TBR Requirement	Status	Support (Y/N)
1	11.4.3.2	Exception conditions	c1	
2	11.4.3.3	Clearing initiated by the user	c1	
3	11.4.3.4.2	Clearing when tones/announcements not provided	c1	
4	11.4.3.4.3	Completion of clearing	c1	
5	11.4.3.5	Clear collision	c1	

c1 = m if A.1.2 else n/a.



Table A.28: Layer 3 error conditions requirements

No.	Reference	TBR Requirement	Status	Support (Y/N)
1	11.4.6.1	Call reference procedural errors	c1	
2	11.4.6.2	Message type or message sequence errors	c1	
3	11.4.6.3	Duplicated information elements	c1	
4	11.4.6.4.1	Mandatory information element missing	c1	
5	11.4.6.5.1	Unrecognized information element	c1	
6	11.4.6.5.2	Non-mandatory information element content error	c1	
7	11.4.6.6	Status enquiry procedure	c1	
8	11.4.6.7	Receiving a STATUS message	c1	
9	11.4.7	User notification procedure	c1	
10	11.4.8	Restart procedure	c1	
11	11.5	TE timer T305	c1	
12	11.5	TE timer T308	c1	

c1 = m if A.1.2 else n/a.

**Annex B (normative):      Layer 1 tests**

If the IUT implements on-demand access of layer 1, then test selection and test execution shall be performed according to annex B of TBR 4 [8].

If the IUT implements semi-permanent access of layer 1, then the tests shall be performed according to TBR 13 [9].

## **Annex C (normative): Layer 2 tests**

This ATS has been produced using the Tree and Tabular Combined Notation (TTCN) according to ISO/IEC 9646-3 [6].

The ATS was developed on a separate TTCN software tool and therefore the TTCN tables are not completely referenced in the contents table. The ATS itself contains a test suite overview part which provides additional information and references.

For the purposes of this TBR, the layer 2 ATS shall be executed with Test Suite Parameter PX\_SAPI set to '000000'B.

NOTE: No test case will be executed for data links with SAPI 16.

### **C.1 The TTCN Graphical form (TTCN.GR)**

The TTCN.GR representation of this ATS is contained in a PDF file (T34L2\_3.PDF<sup>1)</sup>) which accompanies this ETS.

### **C.2 The TTCN Machine Processable form (TTCN.MP)**

The TTCN.MP representation corresponding to this ATS is contained in an ASCII file (T34L2\_3.MP<sup>1)</sup>) which accompanies this ETS.

NOTE: According to ISO/IEC 9646-3 [6], in case of a conflict in interpretation of the operational semantics of TTCN.GR and TTCN.MP, the operational semantics of the TTCN.GR representation takes precedence.

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<sup>1)</sup> This file is located in an archive file named 034\_B1.LZH.

## **Annex D (normative): Layer 3 tests**

This ATS has been produced using the Tree and Tabular Combined Notation (TTCN) according to ISO/IEC 9646-3 [6].

The ATS was developed on a separate TTCN software tool and therefore the TTCN tables are not completely referenced in the contents table. The ATS itself contains a test suite overview part which provides additional information and references.

### **D.1 The TTCN Graphical form (TTCN.GR)**

The TTCN.GR representation of this ATS is contained in a PDF file (T34L3\_5.PDF<sup>2)</sup>) which accompanies this ETS.

### **D.2 The TTCN Machine Processable form (TTCN.MP)**

The TTCN.MP representation corresponding to this ATS is contained in an ASCII file (T34L3\_5.MP<sup>2)</sup>) which accompanies this ETS.

NOTE: According to ISO/IEC 9646-3 [6], in case of a conflict in interpretation of the operational semantics of TTCN.GR and TTCN.MP, the operational semantics of the TTCN.GR representation takes precedence.

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<sup>2)</sup> This file is located in an archive file named 034\_B1.LZH.

## Annex E (normative): Partial Protocol Implementation eXtra Information for Testing (PIXIT) proforma

Notwithstanding the provisions of the copyright clause related to the text of this TBR, ETSI grants that users of this TBR may freely reproduce the partial PIXIT proforma in this annex so that it can be used for its intended purposes and may further publish the completed PIXIT.

### E.1 Introduction

In order to test a TE, information relating to the implementation and its testing environment in addition to that provided by the TBR-RT is needed. The form containing such extra information is called a Protocol Implementation eXtra Information for Testing (PIXIT). The PIXIT contained in this annex is intended to provide a standard layout for the provision of such information by suppliers to test laboratories. Test laboratories may choose to ask for further information or to request the information in a different format.

### E.2 References

The PIXIT item references, if any, generally are the associated TBR clause numbers.

### E.3 Proforma structure and contents

The PIXIT proformas are tables containing pre-printed text and empty table space intended to be used by the supplier for explanations, specification of details etc.

The proforma "Environmental Test Conditions" is intended to indicate the environmental conditions to be used during testing.

NOTE: If no environmental value or range is indicated by the client, the test laboratory will use a value within the ranges pre-printed in the proforma.

### E.4 Table/item identification

Each pre-printed item in a PIXIT table is provided with a serial number in the left hand table column called "Item". This provides a unique identifier of the item, distinguishing it from TBR-RT items.

### E.5 Guidance on completing the PIXIT

For each layer to be tested, the associated PIXIT proformas should be completed by the supplier.

The information provided in the PIXIT should be consistent with information provided in the corresponding TBR-RT.

### E.6 Environmental test conditions

Table E.1: Environmental test conditions

Ambient temperature range °C	Relative humidity range %	Air pressure range kPa	Power Supply	
			Voltage V	Frequency Hz
If no values/ranges are indicated above, values in the following ranges will be used				
21 - 25°C for layer 1 15 - 35°C for layers 2 and 3	10 - 75	86 - 106	within ± 5 % of normal operating voltage	within ± 4 % of normal operating frequency
<b>OTHER TEST CONDITIONS</b> (indicate any other condition that may be needed/useful during testing):				

## E.7 Layer 1 PIXIT

If the IUT implements on-demand access of layer 1, then the PIXIT contained in subclause E.7 of TBR 4 [8] shall be applied.

If the IUT implements semi-permanent access of layer 1, then no PIXIT are provided.

NOTE: For semi-permanent access of layer 1, testing is performed according to TBR 13 [9]. This TBR does not provide PIXIT.

## E.8 Layer 2 PIXIT

**Table E.2: Additional layer 2 information**

Item	Reference	Description
E.5.1	10.5.2	If non-automatic TEI assignment is used: - state the TEI value(s) implemented; - explain the operation needed to assign a TEI.
E.5.2	10.6.1	Does the IUT, when in state 4 and no I-frames are to be sent, remain in state 4 for more than 6 seconds.
E.5.3	10.2.3.3	State the SAPI value (0 or 16) for which the test campaign will be run.
E.5.4	10.6.1	Explain how the transmission of a SABME frame can be invoked by the user:
E.5.5	10.5.2	Explain how the transmission of an identity request frame can be invoked by the user:

**Table E.3: Supplier's additional information**

Item	Description
E.6.1	<p>Indicate a coding of an information field containing an activate message command.  (Example codings:  SAPI = 0: compatible SETUP message '0802000105'O  SAPI = 16: CALL REQUEST message '10010B08435510210001000000'O)</p>
E.6.2	<p>Indicate a coding of an information field containing a dummy message which will not cause a response.  (Example codings:  SAPI = 0: RELEASE COMPLETE message '080280015A08028290'O  SAPI = 16: CALL CONFIRM message '100117'O)</p>
E.6.3	<p>Indicate a coding of an information field containing a soliciting message which will cause the response as given in subclause E.6.4.  (Example codings:  SAPI = 0: RELEASE message '080200014D08028290'O  SAPI = 16: RESTART INDICATION message '1000FB0700'O)</p>
E.6.4	<p>Indicate a coding of an information field containing a response message to the soliciting message as given in subclause E.6.3.  (Example codings:  SAPI = 0: RELEASE COMPLETE message '080280015A'O  SAPI = 16: RESTART CONFIRM message '1000FF'O)</p>

## E.9 Layer 3 PIXIT

Table E.4: Test co-ordination information

Item.	Reference	Description
If the following procedures are supported on the terminal, explain how they can be invoked by the user.		
E.7.1	11.4.1.1	Initiation of a demand access B-channel connection. (i.e. sending a SETUP message without Called party and Called subaddress information element.)
E.7.2	11.4.2.6	Answering of an incoming call. (i.e. sending a CONNECT message.)
E.7.3	11.4.3.3	Initiation of call clearing. (i.e. sending a DISCONNECT message.)
E.7.4	10.6.1.2, 11.4.1	Initiation of a data link connection for SAPI = 0. (i.e. sending of a DL-ESTABLISH-REQUEST primitive at the relevant SAP.)
E.7.5	10.6.1.2, 11.4.3.4.2	Initiation of a data link connection for SAPI = 16. (i.e. sending of a DL-ESTABLISH-REQUEST primitive at the relevant SAP.)
E.7.6	11.4.2.7	Acceptance of an incoming virtual call on an idle B-channel.



**Table E.5: Additional layer 3 information**

<b>Item</b>	<b>Reference</b>	<b>Description</b>
E.8.1	11.1.1.7	If entering state U7, does the terminal remain in that state for at least 3 seconds?
E.8.2	11.1.9	If entering state U9, does the terminal remain in that state for at least 3 seconds?
E.8.3	11.4.2.7	If establishing a B-channel connection, does the terminal maintain that connection, if no virtual call occurs on that B-channel?
E.8.4	11.4.2.5.1	Does the terminal support sending of the CALL PROCEEDING PDU?
E.8.5	11.4.2.5.1	Does the terminal support sending of the ALERTING PDU?
E.8.6	11.4.1.5	Does the terminal support sending of the CONNECT ACKNOWLEDGE PDU?
E.8.7	11.3.5.5, 11.4.2.2.1	State a value of the Bearer capability information element which the TE accepts for the purpose of compatibility checking of incoming calls requesting the acceptance of incoming virtual calls on the B- or D-channel.
E.8.8	11.3.5.5, 11.4.2.2.1	State a value of the Bearer capability information element which the TE accepts for the purpose of compatibility checking of incoming calls requesting the acceptance of incoming virtual calls on the D-channel (i.e. the Channel identification information element in the SETUP message that carries this Bearer capability value will indicate no channel with the preferred/exclusive bit set to "exclusive: only the indicated channel is acceptable" and the D-channel indicator set to "the channel identified is the D-channel").
E.8.9	11.3.5.5, 11.4.2.2.1	State a value of the Bearer capability information element which the TE rejects for the purpose of compatibility checking of incoming calls. (Only applicable if the answer to A29.4 or A29.5 is YES.)
E.8.10	11.3.5.7, 11.4.2.2	State a value of the Called party number information element which the TE accepts for the purpose of address checking of incoming calls.
E.8.11	11.3.5.9, 11.4.6.5.2	State a value of the Calling party number information element exceeding 24 octets for the purpose of checking the correct reaction to a non-mandatory information element exceeding the maximum length.
E.8.12	11.3.5.12, 11.4.2	State a value of the Channel identification information element which the TE accepts for the purpose of address checking of incoming calls.

## Annex F (informative): Justifications for the requirements in the TBR

### F.1 Principles applicable to the whole TBR

#### F.1.1 General principles

The following general principles form the basis of whether a requirement is essential:

- 1) the only point at which conformance with the TBR is monitored is the network interface. Internal implementation of the TE is not constrained in any way. The network interface is described as a "Point of Control and Observation" (PCO) in ISO/IEC 9646-2 [5]. ISO/IEC 9646-2 [5] stresses that the addition of a second PCO would, in effect, be the addition of a requirement on the equipment under test to provide it;
- 2) other interfaces (e.g. an interface for connection of other equipment, or the man-machine interface) may be used to stimulate the TE into performing actions whose effects at the user-network interface are monitored (i.e. such other interfaces may be used for control but not for observation);
- 3) the TE does not interwork with the network either in the D-channel or in the B-channels for the purpose of setting up, clearing etc. real or virtual connections as described in Article 4 (f). Therefore requirements relating to B-channels in the base standards are not included in the TBR. The TE uses either the B-channels or the D-channel to interwork with the distant TE **via** the network. This is an Article 4 (g) issue which is outside the scope of this TBR. This TBR therefore includes no requirement for the TE to be capable of any meaningful exchange of information in either the B-channel of a call or the D-channel in the Active state.

#### F.1.2 Requirements vs. definitions

Generally, clauses that describe a state, frame, field, message, information element or system parameter are classed as definitions. Such definitions have only been included in the TBR where they are referred to, either directly or via other definitions, by essential requirements. These definitions are in addition to those included within clause 3 of this TBR.

Clauses that specify a change of state within the TE or an exchange of information across the interface are classed as requirements. The information exchanged by the TE is usually described by the definitions referred to above.

Only requirements have test cases attached to them, and only requirements are listed in the TBR-RT. Definitions are not testable *per se*.

#### F.1.3 Error conditions

This TBR assumes that (except for bit errors arising during transmission of the signal to the TE from the public exchange) the network operates without error according to the base standards. This has an effect on whether certain requirements of the base standard (particularly at layers 2 and 3) are essential. The principle followed is that where the base standard requires a specific response on the user side to a message which the network side is not permitted to send, the requirement is generally considered not to be essential.

In most cases, the requirements affected are those for the handling of various kinds of messages containing content errors from the network. However, some other requirements are also affected. These are listed individually in the tables below.

Nevertheless, some layer 3 error condition requirements from subclause 5.8 of ETS 300 102-1 [13] have been retained in the TBR to account for the following possibilities:

- implementation in the network of an already defined supplementary service not supported by the TE;
- implementation in the network of a more recent version of ITU-T Recommendation Q.931/ETS 300 102-1 [13] than the one on which this TBR is based;

- implementation in the network of a supplementary service not yet defined. This is difficult to determine for certain. However, there are a number of fairly well-established guidelines concerning the drafting of DSS1 protocols for supplementary services, and it is possible to state with some certainty that certain message types will not be used in the definition of supplementary services.

In general, the intention is to provide a reasonable degree of "future-proofing" of the terminal, to ensure that it remains compatible with reasonably foreseeable evolutions of the network.

#### **F.1.4 General editorial changes to text from the base standards**

The following general changes have been made when including text from the base standards within this TBR:

- deletion of requirements and definitions applicable only to the network side;
- deletion of the words "ETSI Requirement" wherever they occur;
- editorial changes to express text using the correct modal auxiliary verbs (i.e. using "is" for definitions, and "shall" for requirements);
- replacement of "this ETS" or "this Recommendation" with "this TBR" wherever appropriate;
- at the end of every requirement, relevant test cases are indicated;
- deletion of the word "optional(ly)" in expressions like "may optionally";
- deletion of references to deleted clauses and annexes.

#### **F.1.5 Detailed list of changes with respect to the base standards**

Detailed changes to requirements of individual clauses of the base standards are given in a series of tables below. The format of the tables is as follows.

The first column contains the clause number and clause title of the clause of the base standard.

The second column contains the clause number of this TBR which contains text on the same subject.

The third column contains the following:

- "X" if no text from that clause has been included in the TBR;
- "D" if text has been included as a definition;
- "I" if text has been included as a note or as introductory text to subsequent clauses;
- "R" if in the subclause references are made to other subclauses of this TBR, containing changes with respect to TBR 4 [8], or referring themselves to such subclauses. The text does not change literally, but the semantics of the text has changed. Subclauses attached with this status normally have not indicated any further justification;
- "E" if the change occurs because of different requirements;
- "A" if the change consists in the addition of explaining text, e.g. notes or temporary notes;
- "N" if there is new text related to CCITT Recommendation X.25;
- a reference to one or more paragraphs of Article 4 of Directive 91/263/EEC if text has been included as a requirement. The reference is to the paragraph of the Directive under which the requirement is justified.

The fourth column includes any comment particular to that clause, including:

- for requirements, a justification for the clause being regarded as essential;
- a justification for changes made compared to the base standard. In particular, any technical changes (as opposed to merely editorial) are highlighted.

General changes in accordance with the principles described above are not listed on an individual basis.

#### **F.1.6 Untested requirements**

Certain requirements which have been regarded as essential, are not accompanied by a test. The reason for the absence of a test is generally that the requirement was not included in the NETs, that a test method is therefore not readily available, and that time and resources did not permit the development of a new test. Notes have been included in the affected requirements clauses, indicating which requirements are untested. A second edition of the TBR may result in such tests being included.

#### **F.1.7 Primitives**

See subclause F.1.7 of TBR 4 [8].

#### **F.1.8 Supplementary services**

See annex G.

#### **F.1.9 Differences in clauses 10 and 11 and the TBR-RT between TBR 33 and this TBR**

The differences between the requirements for TBR 33 and this TBR are, in general, a result of the following:

- a) call rearrangements only required for basic access;
- b) incoming calls using the broadcast data link only required for basic access;
- c) no point-to-multipoint condition for RESTART for primary rate access.

Specific changes to clauses are as follows:

- clause 10 only specifies primary rate access default window size;
- subclause 11.1 contains no specification of User and Network call states associated with call rearrangements in this TBR;
- subclause 11.2 contains no specification of the message types (RESUME, SUSPEND etc.) associated with call rearrangements in this TBR;
- the tables in subclause 11.3 contain no references to call rearrangement message types or information elements in this TBR;
- subclause 11.4.2 contains no requirements for incoming calls using point-to-multipoint configuration. Also there are no requirements in this TBR for support of SETUP message delivered by broadcast data link;
- subclause 11.4.4 contains no requirements in this TBR for call rearrangements;
- in subclause 11.4.8, Restart is mandatory for this TBR whereas conditional on point-to-point data link for TBR 33;
- in the TBR-RT, the call rearrangement condition and options for receipt of SETUP on broadcast data link are omitted. The requirements table for call rearrangements is omitted. Restart is mandatory for this TBR whereas conditional on point-to-point data link for TBR 33.

### F.1.10 Article 4(e) of the Directive

There are no requirements in this TBR justified under Article 4(e) because the access does not make use of the radio spectrum. However, Article 4(e) is included within the scope of the TBR, to make it clear that no other TBRs or other standards exist containing additional requirements under Article 4(e) applicable to TEs within the scope of this TBR.

## F.2 Changes with respect to TBR 4

Table F.1: Summary list of changes with respect to TBR 4 [8]

Clause of TBR 4 [8]	Clause in this TBR	Status	Justification
Foreword		X	This TBR has its own foreword.
1 Scope		X	This TBR has its own scope.
2 Normative references		X	This TBR has its own set of normative references. TBR 13 [9] references have been added.
3 Definitions, symbols and abbreviations		D	Relevant definitions, symbols and abbreviations are included.
4 General		X	New text to include description and requirements from ETS 300 007 [10].
5, 6, 7 & 8 Requirements	5, 6, 7 & 8		No change
9 Layer 1 requirements	9		Changes due to semi-permanent B-channel case addition.
10 Layer 2 requirements	10		Changes due to the packet mode requirements and to the semi-permanent mode of operation.
11 Layer 3 requirements	11		Packet mode operation requirements.
X.25 (n/a)	12	N	New text to define X.25 requirements and procedures.
Annex A	Annex A		New RTs when applicable.
Annex B	Annex B		Test suites for layer 1 referring to TBR 4 [8] and TBR 13[9].
Annex C, D	Annex C, D		Test suites (annex C and D) adapted to packet mode calls.
Annex E	Annex E		PIXIT proformas adapted to test suites of annexes B, C and D.
Annex F	Annex F		Change references made with respect to TBR 4 [8].
Annex G	Annex G		Supplementary services for packet mode calls introduced.
Annex H	Annex J		Reference made to the bibliography of TBR 4 [8]. Addition of a few references specific for packet mode.
	Annex H		Examples for simple access configurations added.

### F.2.1 Changes for layer 1

The following general principles are followed in these requirements.

#### F.2.1.1 Timing considerations

Synchronization with the input is not essential for the following reasons.

The main reason for synchronization is to avoid slips. Some slips in the D-channel can be tolerated by the network without causing significant misoperation. Slips in the B-channel for data applications may cause corruption of the data. However, the avoidance or prevention of slips in the traffic carried is not an essential requirement for an access standard.

The essential requirement is therefore to ensure that the output clock accuracy is sufficient to keep the number of slips to a tolerable level, and to permit the network to decode correctly the signalling sent by the TE. 50 ppm has been selected as the figure which achieves this, being the maximum bit rate tolerance permitted by ITU-T Recommendation G.703 [1].

#### F.2.1.2 CRC-4 monitoring and E-bits

It is an essential requirement to transmit the MFAS and the CRC-4 information in bit 1 of TS0.

It is not strictly an essential requirement to transmit the E-bits according to the presence of errors in received sub-multiframes, because there is no consequent action by the network which affects call-processing. However, the requirement has been retained for the following reasons:

- a) many layer 1 tests derived from TBR 4 [8] use the presence of E = 1 in the output signal to indicate that the input signal, disturbed by various ways (e.g. jitter, longitudinal voltages) has been received by the TE without bit errors. It would be difficult to re-write these tests without reliance on the E-bits;
- b) the TE already has, as an essential requirement, the monitoring of received CRC-4 sub-multiframes, and consequent actions in the event of receipt of a large number of errored sub-multiframes, to achieve security of Frame Alignment. The additional effort on the part of a TE to output the results of that monitoring into the E-bits is trivial, and unlikely to be omitted from any commercial implementation of a 2 048 kbit/s interface which implements CRC-4 monitoring.

#### F.2.1.3 Protection requirements

The requirements of clause 8 limit the common mode and transverse mode voltages at the TE output to the levels to which the network interface presentation is protected from electrical damage. Any voltages in excess of those specified could cause harm to the network (Article 4 (d)). Other requirements from ETS 300 046-3 [12] are concerned with protection of the terminal and are therefore outside the scope of this TBR.

#### F.2.1.4 Detailed list of changes with respect to TBR 4

Table F.2: Changes for layer 1 with respect to TBR 4 [8]

Clause of TBR 4 [8]	Clause in this TBR	Status	Justification
-	9.6	4.f	Semi-permanent B-channel connections according to TBR 13 [9] are supported.

F.2.2 Changes for layer 2 of the D-channel

Table F.3: Changes for layer 2 of the D-channel with respect to TBR 4 [8]

Clause of TBR 4 [8]	Clause in this TBR	Status	Justification
10 Layer 2 requirements	10	E	TE capability of only initiating or only responding to data link establishment, new test case references (taking prA1 to TBR 4 [8] and new test suite into account).
10.1.5 Information field	10.1.5	R	
10.1.9 Invalid or incompatible frames	10.1.9	R	
10.2.3.3 Service Access Point Identifier (SAPI)	10.2.3.3	E	SAPI 16 has been added to support access of the PH over the D-channel.
10.2.5.2.2 Send state variable V(S)	10.2.5.2.2	R	
10.2.6.1 Commands and responses	10.2.6.1	R	SABM, DISC and UI have been indicated in notes to be optional under certain conditions. See justification of clause 10.
10.2.6.6 Receive Ready (RR) command/response	10.2.6.6	R	
10.5.6.5 Action indicator	10.5.6.5	A	A temporary note has been included because the original text in TBR 4 [8] contains an incorrect reference.
10.6.1.2 Establishment procedures	10.6.1.2.1, 10.6.1.2.2	E	The establishment procedures have been divided in data link establishment on-demand (initiation) of the TE and on-demand of the network (response). See also justification of clause 10.
10.7.1 Transmitting I-frames	10.7.1	R	
10.7.2.2 P bit set to 0	10.7.2.2	R	
10.7.3 Receiving acknowledgements	10.7.3	R	
10.7.4 Receiving REJ frames	10.7.4	R	
10.7.5.1 Receiving a valid RNR command or response	10.7.5.1	R	
10.7.5.2 Expiry of timer T200 during "peer receiver busy"	10.7.5.2	R	
10.7.5.4 Receiving a valid RR or REJ command or response during "peer receiver busy"	10.7.5.4	R	
10.7.5.5 Appropriate supervisory response frame	10.7.5.5	R	
10.7.6 Waiting acknowledgement	10.7.6	R	
10.8 Re-establishment of multiple frame operation	10.8	R	
10.9.2 Invalid frame condition	10.9.2	R	
10.9.3 Frame rejection condition	10.9.3	R	
10.9.4 Multiple-assignment of TEI value	10.9.4	R	
10.10.3 Maximum number of octets in an information field (N201)	10.10.3	R	
10.10.5 Maximum number of outstanding I-frames (k)	10.10.5	A	Notes have been added to indicate the independence of the values of k for SAPI 0 and SAPI 16.

## F.2.3 Changes for layer 3 of the D-channel

Table F.4: Changes for layer 3 of the D-channel with respect to TBR 4 [8]

Clause of TBR 4 [8]	Clause in this TBR	Status	Justification
11 Layer 3 requirements	11	E	The introduction has been extended to point to the different access configurations and to indicate that the procedures of this clause are optional (as opposite to TBR 4 [8]), because it is possible to access the PH over the D-channel only.
11.1 Overview of call control	11.1	R	
11.1.1 Call states at the user side of the interface	11.1.1	E	The call states not applicable to the access of the packet handler (due to overlap sending, overlap receiving and call rearrangement) have been deleted.
11.1.2 Network call states	11.1.2	E	The call states not applicable to the access of the packet handler (due to overlap sending, overlap receiving and call rearrangement) have been deleted.
11.1.3 States associated with the global call reference	11.1.3	R	
11.2 Message functional definitions and content	11.2	E	Table 11.1 has been modified to contain only the messages listed in clauses B.1 to B.11 of ETS 300 007 [10].
11.2.1 Alerting	11.2.1	E	Changed according to clause B.1 of ETS 300 007 [10].
11.2.2 Call proceeding	11.2.2	E	Changed according to clause B.2 of ETS 300 007 [10].
11.2.3 Connect	11.2.3	E	Changed according to clause B.3 of ETS 300 007 [10].
11.2.4 Connect acknowledge	11.2.4	E	Changed according to clause B.4 of ETS 300 007 [10].
11.2.5 Disconnect	11.2.5	E	Changed according to clause B.5 of ETS 300 007 [10].
11.2.6 Information	-	E	Deleted because overlap sending/receiving is not used.
11.2.7 Notify	-	E	Deleted because the message is not used by the network.
11.2.8 Progress	-	E	Optional according to clause B.6 of ETS 300 007 [10]
11.2.9 Release	11.2.6	E	Changed according to clause B.7 of ETS 300 007 [10].
11.2.10 Release complete	11.2.7	E	Changed according to clause B.8 of ETS 300 007 [10].
11.2.11 Resume	-	E	Deleted because the procedures of call rearrangement are not used.
11.2.12 Resume acknowledge	-	E	See justification for deletion of Resume (11.2.11).
11.2.13 Resume reject	-	E	See justification for deletion of Resume (11.2.11).
11.2.14 Setup	11.2.8	E	Changed according to clause B.9 of ETS 300 007 [10].
11.2.15 Setup acknowledge	-	E	
11.2.16 Status	11.2.9	E	Changed according to clause B.10 of ETS 300 007 [10].
11.2.17 Status enquiry	11.2.10	E	Changed according to clause B.11 of ETS 300 007 [10].
11.2.18 Suspend	-	E	See justification for deletion of Resume (11.2.11).
11.2.19 Suspend acknowledge	-	E	See justification for deletion of Resume (11.2.11).
11.2.20 Suspend reject	-	E	See justification for deletion of Resume (11.2.11).

(continued)



Table F.4 (continued): Changes for layer 3 of the D-channel with respect to TBR 4 [8]

Clause of TBR 4 [8]	Clause in this TBR	Status	Justification
11.3 General message format and information elements coding	11.3	R	
11.3.4 Message type	11.3.4	E	Table 11.26 has been modified (it is table 11.13 in this TBR) to contain only the messages listed in clauses B.1 to B.11 of ETS 300 007 [10].
11.3.5.1.1 Codeset 0	11.3.5.1.1	E	Table 11.27 has been modified (it is table 11.14 in this TBR) to contain only the information elements of table C.2 in annex C of ETS 300 007 [10].
11.3.5.5 Bearer capability	11.3.5.5	E	The coding of the bearer capability has been adapted to the requirements of ETS 300 007 [10] (see e.g. subclause 7.2.2.3.1 of ETS 300 007 [10]).
-	11.3.5.9	E	The calling party number IE has been included because it is used in ETS 300 007 [10] (required to be used by some networks for X.32 identification purposes).
-	11.3.5.10	E	calling party subaddress IE has been included because it is used in ETS 300 007 [10] (required to be used by some networks for X.32 identification purposes).
11.4 Call control procedures for packet-mode access connections	11.4	E	The introductory text has been changed with respect to the applicability of the requirements of this subclause. In TBR 4 [8], circuit-switched call control procedures are generally required, while in this TBR they are not applicable to all kinds of access connections to the PH.
11.4.1 Call establishment at the originating interface	11.4.1		The requirement to use SAPI 0 for the circuit-switched call control procedures has been added.
11.4.1.1 Call request	11.4.1.1	R	
11.4.1.2 Overlap sending	11.4.1.2	E	Not used in this TBR. See the justification of subclause 11.2.6 above.
11.4.1.3 Call proceeding	11.4.1.3	E	Changes necessary as result of not using overlap sending and the associated states.
11.4.1.4 Call confirmation indication	11.4.1.4	E	n/a as result of not using overlap sending and the associated states.
11.4.1.5 Call connected	11.4.1.5	R	
11.4.2 Call establishment at the destination interface	11.4.2	E	Use of SAPI 0 indicated.
11.4.2.1 Incoming call	11.4.2.1	E	Changes necessary as result of not using overlap receiving and the associated states.
11.4.2.2.1 Compatibility checking	11.4.2.2.1	E	The references to the Lower Layer Compatibility information element and the High Layer Compatibility information element have been removed, since these are not used in this TBR (see subclause 11.3.5.1.1).
11.4.2.2.2 Address checking	11.4.2.2.2	E	Deleted according to prA1 of TBR 4 [8].
11.4.2.3 B-channel selection-destination	11.4.2.3	E	Changes are necessary because the use of the D-channel also applies. The procedures of subclause 7.2.2.3.1 of ETS 300 007 [10] are used.
11.4.2.4 Overlap receiving	11.4.2.4	E	Not used in this TBR. See the justification of subclause 11.2.6 above.
11.4.2.5 Call confirmation	11.4.2.5	E	Changes necessary as result of not using overlap receiving and the associated states.
11.4.2.6 Call accept	11.4.2.6	E	Changes necessary as result of not using overlap receiving and the associated states.
			(continued)

**Table F.4 (concluded): Changes for layer 3 of the D-channel with respect to TBR 4 [8]**

Clause of TBR 4 [8]	Clause in this TBR	Status	Justification
11.4.3.2 Exception conditions	11.4.3.2	E	The reference to the SETUP ACKNOWLEDGE message has been removed, since this message is not used. See e.g. justification of subclause 11.2.
11.4.3.4.1 Clearing when tones/announcements provided	11.4.3.4.1	E	Clearing with tones/announcements is not applicable to packet mode connections.
11.4.3.4.2 Clearing when tones/announcements not provided	11.4.3.4.2	E	Changes are necessary because RELEASE from the network using cause #7 (call awarded and being established in an established channel) is applicable. See e.g. ETS 300 007 [10], subclause 7.2.2.3.1.
11.4.4 Call rearrangements	11.4.4	E	Call rearrangements are not used in this TBR. See justification of subclause 11.2.11.
11.4.6.4.1 Mandatory information element missing	11.4.6.4.1	R	
11.4.6.5 Non-mandatory information element errors	11.4.6.5	R	
11.4.6.5.1 Unrecognized information element	11.4.6.5.1	R	
11.4.6.5.2 Non-mandatory information element content error	11.4.6.5.2	R	
11.4.6.6 Status enquiry procedure	11.4.6.6	R	
11.4.6.7 Receiving a STATUS message	11.4.6.7	R	
11.4.7 User notification procedure	11.4.7	E	The user notification procedure is not applicable. See justification of subclause 11.2.7.
11.4.8 Restart procedure	11.4.8	R	

## **Annex G (normative): List of supported telecommunication services**

### **G.1 Basic telecommunication services**

This TBR is applicable to packet-mode terminals TE supporting one or more of the following basic telecommunication services (ETS 300 007 [10]):

- packet switched synchronous data transmission service provided by an ISDN with access by a direct connection via a B-channel at data signalling rates of 2,4, 4,8, 9,6, 48 and 64 kbit/s (Services T1, T2, T3, T4 and T5 of X.1);
- packet switched synchronous data transmission service provided by an ISDN with access by a direct connection via a D-channel at data signalling rates of 2,4, 4,8, 9,6 and 48 kbit/s (Services U1, U2, U3 and U4 of X.1);
- packet switched synchronous data transmission service provided by an ISDN with access by a switched connection via a B channel at data signalling rates of 2,4, 4,8, 9,6, 48 and 64 kbit/s (Services Y1, Y2, Y3, Y4 and Y5 of X.1).

NOTE 1: This does not include circuit-mode access to a PSPDN (X.31 case A) which is covered by TBR 4 [8].

NOTE 2: Rate adaptation function and aggregation function ( $n \times 64\text{kbit/s}$ ) are not covered.

NOTE 3: H channels services are not included.

### **G.2 Supplementary services for the access connection**

- Multiple Subscriber Number (MSN);
- Direct Dialling In (DDI);
- Calling Line Identification Presentation (CLIP);
- any teleservice based on packet-mode bearer capability and using X.25 or similar protocol at layer 3.

**Annex H (informative): Examples for TE access configurations with small sets of requirements**

Many possibilities to access the PH have been defined in this TBR. This informative annex gives some examples of access configurations for TEs implementing only outgoing or only incoming virtual calls. Only "small" subsets of all the requirements expressed in this TBR are applicable to such TEs.

The information of this annex is only intended to serve as an overview. In case of any conflict with the requirements tables of annex A, the requirements tables supersede.

The columns under "Layer 2/3 requirements" refer to the D-channel protocols only.

Table H.1 contains some examples for TEs supporting only outgoing calls and table H.2 contains some examples for TEs supporting only incoming calls.

**Table H.1: Configurations for TEs supporting only outgoing virtual calls**

Access configuration	Layer 1 requirements	Layer 2 requirements	Layer 3 requirements
Semi-permanent B-channel, point-to-point	Only requirements for semi-permanent layer 1	SAPI 0: not applicable  SAPI 16 not applicable  SAPI 63 not applicable	Not applicable
Switched B-channel, point-to-point	Only requirements for switched layer 1	SAPI 0: only data link setup initiation  SAPI 16 not applicable  SAPI 63 not applicable	Only call establishment/clearing at the outgoing interface
D-channel, point-to-point, semi-permanent data link (controlled by the network)	Only requirements applicable to the D-channel	SAPI 0: not applicable  SAPI 16 only data link setup response  SAPI 63 not applicable	Not applicable
D-channel, point-to-point, on-demand data link (controlled by the TE)	Only requirements applicable to the D-channel	SAPI 0: not applicable  SAPI 16 only data link setup initiation  SAPI 63 not applicable	Not applicable

**Table H.2: Configurations for TEs supporting only incoming virtual calls**

<b>Access configuration</b>	<b>Layer 1 requirements</b>	<b>Layer 2 requirements</b>	<b>Layer 3 requirements</b>
Semi-permanent B-channel, point-to-point	Only requirements for semi-permanent layer 1	SAPI 0: not applicable  SAPI 16 not applicable  SAPI 63 not applicable	Not applicable
Switched B-channel, point-to-point, no notification	Only requirements for switched layer 1	SAPI 0: only data link setup initiation  SAPI 16 not applicable  SAPI 63 not applicable	Only call establishment/clearing at the outgoing interface
D-channel, point-to-point, semi-permanent data link (controlled by the network)	Only requirements applicable to the D-channel	SAPI 0: not applicable  SAPI 16 only data link setup response  SAPI 63 not applicable	Not applicable
D-channel, point-to-point, on-demand data link (controlled by the TE), no notification	Only requirements applicable to the D-channel	SAPI 0: not applicable  SAPI 16 only data link setup initiation  SAPI 63 not applicable	Not applicable

## **Annex J (informative): Bibliography**

For the purposes of this TBR, the informative references in the Bibliography of TBR 4 [8] apply and the following additional informative references are given:

- ITU-T Recommendation X.32: "Interface between Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) for terminals operating in the packet mode and accessing a packet switched public data network through a public switched telephone network or an integrated digital service network or a circuit switched public data network".
- ETS 300 048: "Integrated Services Digital Network (ISDN); ISDN Packet Mode Bearer Service (PMBS); ISDN Virtual Call (CV) and Permanent Virtual Circuit (PVC) bearer services provided by the B-channel of the user access - basic and primary rate".
- ETS 300 049: "Integrated Services Digital Network (ISDN); ISDN Packet Mode Bearer Service (PMBS); ISDN Virtual Call (VC) and Permanent Virtual Circuit (PVC) bearer services provided by the D-channel of the user access - basic and primary rate".
- ETS 300 166: "Transmission and Multiplexing (TM); Physical and electrical characteristics of hierarchical digital interfaces for equipment".
- ETS 300 418: "Business TeleCommunications (BTC); 2 048 kbit/s digital unstructured and structured leased lines (D2048U and D2048S); Network interface presentation".
- ETS 300 419: "Business TeleCommunications (BTC); 2 048 kbit/s digital structured leased line (D2048S); Connection characteristics".
- ETS 300 420: "Business TeleCommunications (BTC); 2 048 kbit/s digital structured leased line (D2048S); Terminal equipment interface".
- TBR 12: "Business Telecommunications (BT); Open Network Provision (ONP) technical requirements; 2 048 kbit/s digital unstructured leased line (D2048U) Attachment requirements for terminal equipment interface".

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