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**Integrated Services Digital Network (ISDN);
Attachment requirements for terminal equipment to connect to
an ISDN using ISDN basic access
(Candidate NET 3 Part 1)**

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Foreword

This European Telecommunication Standard (ETS) has been produced by the Terminal Equipment (TE) Technical Committee of the European Telecommunications Standards Institute (ETSI). The text of this ETS may be utilised, wholly or in part, for the establishment of NET 3, Part 1.

Every ETS prepared by ETSI is a voluntary standard. This ETS has been prepared as a candidate NET which may be transposed, in whole or in part, into a mandatory NET by the Technical Recommendations Application Committee (TRAC). It therefore contains text concerning type approval of the equipment to which it relates. This text should be considered only as a guidance and does not make this ETS mandatory.

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1 Scope

This ETS specifies the attachment requirements for layers 1 and 2 for Terminal Equipment (TE), as defined in subclause 4.1, to connect at the T reference point or coincident S and T reference point to a public Integrated Services Digital Network (ISDN) using ISDN basic access based on the following:

- layer 1 in accordance with ETS 300 012 [1];
- layer 2 in accordance with ETS 300 125 [2].

In addition, this ETS specifies those requirements for Electro-magnetic Compatibility (EMC), safety and protection that arise from connection to the ISDN basic access interface and that are not covered by generic standards under the EMC Directive (89/336/EEC) or Low Voltage Directive (73/23/EEC).

The Static Attachment Requirements (SARs) and tests specified in this ETS are for Terminal Equipments (TEs) having the capability of both originating a circuit switched call and receiving an incoming circuit switched call.

No requirements or tests are included in this ETS concerning the procedures for communications in the D-channel. In addition, leased lines operation is excluded.

2 Normative references

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

- [1] ETS 300 012 (1992): "Integrated Services Digital Network (ISDN); Basic user-network interface, Layer 1 specification and test principles".
- [2] 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] ETS 300 047-1 (1992): "Integrated Services Digital Network (ISDN); Basic access - safety and protection; Part 1: General".
- [4] ETS 300 047-2 (1992): "Integrated Services Digital Network (ISDN); Basic access - safety and protection; Part 2: Interface I_a - safety".
- [5] ETS 300 047-3 (1992): "Integrated Services Digital Network (ISDN); Basic access - safety and protection; Part 3: Interface I_a - protection".
- [6] ETS 300 104 (1991): "Integrated Services Digital Network (ISDN); attachment requirements for terminal equipment to connect to ISDN using ISDN basic access, Layer 3 aspects (Candidate NET 3 Part 2)."
- [7] CCITT Recommendation I.411 (1988): "ISDN user-network interface - Reference configurations".
- [8] CCITT Recommendation I.112 (1988): "Vocabulary of terms for ISDNs".
- [9] ISO/IEC 9646-1 (1991): "OSI conformance testing methodology and framework Part 1: General concepts".
- [10] CCITT Recommendation V.11 (1988): "Electrical characteristics for balanced double-current interchange circuits for general use with integrated circuit equipment in the field of data communications".

- [11] ISO IS 4902 (1986): "Data communication - 37 pin and 9 pin DTE/DCE interface connector and pin assignments".
- [12] CCITT Recommendation Q.921 (1988): "ISDN User-network Interface - Data Link layer Specification".
- [13] CCITT Recommendation Q.920 (1988): "Digital subscriber signalling system No. 1 data link layer - general aspects".

3 Definitions and abbreviations

3.1 Definitions

For the purpose of this ETS, the definitions and abbreviations given in the base standards (references [1] to [3] inclusive) apply together with the terms and definitions given in CCITT Recommendation I.112 [8].

3.2 Abbreviations

For the purpose of this ETS, the abbreviations given in the base standards (references [1] to [3] inclusive) apply together with those given in CCITT Recommendation I.112 [8].

In addition, the following abbreviations apply:

CCITT	International Telegraph and Telephone Consultative Committee
EMC	Electro-magnetic Compatibility
ENV	European Pre-Standard
ET	Exchange Termination
FCS	Frame Check Sequence
ISDN	Integrated Services Digital Network
ISO	International Organisation for Standardisation
IUT	Implementation Under Test
LAPD	Link Access Procedure on the D-channel
LCL	Longitudinal Conversion Loss
NT	Network Termination
NET	Norme Européenne de Télécommunication
PBX	Private Branch eXchange
PICS	Protocol Implementation Conformance Statement
PIXIT	Protocol Implementation eXtra Information for Testing
PTNX	Private Telecommunications Network eXchange
PTN	Public Telecommunication Network
SAP	Service Access Point
SAR	Static Attachment Requirements
TA	Terminal Adaptor
TE	Terminal Equipment
TEI	Terminal Endpoint Identifier

4 General

4.1 Introduction

This ETS specifies the basic requirements which Terminal Equipment (TE) shall meet for attachment to the public ISDN basic user - network interface at the T reference point or coincident S and T reference point as defined in the scope (Clause 1). The requirements specified in this ETS are in addition to those relating to the layer 3 aspects given in ETS 300 104 [6]. The basic user - network interface at reference point T or coincident S and T provides to users an ISDN basic access composed of two B-channels of 64 kbit/s each and a D-channel of 16 kbit/s. This ETS does not cover all the requirements which a specific type of TE has to meet. However, ETSI Standards which define attachment requirements relevant to a specific type of TE should refer to this ETS for the attachment requirements within the scope of this ETS.

Unless otherwise stated, the use of the term Terminal Equipment (TE) within this ETS refers to customers terminal apparatus which may be a Terminal Equipment Type 1 (TE1), a Terminal Adaptor (TA) or an Network Termination Type 2 (NT2) as defined in CCITT Recommendation I.411 [7].

The Auxiliary Power Source defined in ETS 300 012 [1], subclause 7.3, shall not be part of the terminal equipment.

Communication between adjacent layers (primitive procedures) is conceptual and allows the description of interactions between functions dedicated to different layers within a TE. These primitive procedures, which do not constrain implementation, are system internal and therefore cannot be tested in isolation. However, as seen from outside, the design of TE shall be such that the sequence of events across the user - network interface shall be the same as if the primitives were implemented as described in the Standards relevant to this ETS.

4.2 Configurations at user premises

This subclause describes the operational configurations to which the requirements of this ETS apply.

- a) a TE which meets the layer 1 requirements and does not constrain the use of layer 1 modes of operation (see ETS 300 012 [1], Clause 3), is able to operate in the layer 1 wiring configurations:
 - short passive bus which is able to accommodate up to eight TEs;
 - extended passive bus; or
 - point-to-point configuration;
- b) a TE of the automatic TEI assignment category shall be able, under non-fault conditions, to operate in multiple point-to-point data link arrangements without causing multiple assignment of TEI values (however, see d));
- c) in order to allow TEs of the non-automatic TEI assignment category to operate properly in multiple point-to-point data link arrangements, correct TEI values have to be entered into each TE (however, see d)). The assignment of TEI values is the responsibility of the user. The network provides an indication if multiple TEI assignment has been detected;
- d) networks may set constraints on the number of point-to-point data links being simultaneously in a state where information may be transferred. This implies that the resources provided by the network may be exhausted;
- e) a TE which meets the requirements in this ETS shall be able to operate in multiple TE configurations.

4.3 Testing and approval methodology

The suitability of the TE for attachment to the Public Telecommunications Network (PTN) shall be verified according to the test principles specified in the relevant ETS. Those functions and procedures which are optional as indicated in the underlying Standards shall be subject to an attachment test if they are implemented in the TE and an attachment test is specified in the relevant Standard. The means of determining whether an optional function/procedure has been implemented is by either apparatus supplier's statement or as a result of performing the attachment tests on the TE under test. Where no statement is made by the apparatus supplier as to the implementation (or not) of an optional function/procedure, and the attachment test reveals that the option has at least in part been implemented, the option shall be deemed to have been implemented and the apparatus shall be evaluated accordingly.

The user-network interface at the T reference point or coincident S and T reference point provides the only access for testing the terminal equipment. However, actions at the user side of the equipment under test (e.g. at the man-machine interface, execution of higher layer processes, at the interface at the

R reference point in the case of terminal adaptors) may be used to invoke actions at layers 1, 2 and 3 of the D-channel protocol within the equipment under test.

The attachment tests for each layer of the D-channel protocol are specified separately and the test configuration(s) to be used in testing each layer is specified in the relevant Clause of this ETS relating to the attachment tests for that layer.

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 Implementation Under Test (IUT) are required in order to perform an attachment test for a particular lower layer.

When carrying out a test, it may be necessary for the equipment under test to be maintained in the active state of a call. In such cases, it may be necessary for the tester to achieve this by procedural means related to functional entities outside the scope of this ETS (e.g. any layers above layer 2 of the control plane or any layer within the user plane). Some examples of these procedural means are:

- a) the tester sending a specified bit pattern within the B-channel subsequent to the CONNECT or CONNECT ACKNOWLEDGE message being sent in the D-channel; and/or
- b) disabling the TE timers associated with any layers above layer 2 of the control plane or any layer within the user plane having an impact on lower layer control plane functions.

Any actions necessary to prevent the equipment under test from premature clearing shall be indicated by the supplier (see subclause 4.5).

This ETS does not require any additional test to cover the case of user equipment that can be connected to the public ISDN by means of multiple basic user-network interfaces e.g. in the case of a Private Branch eXchange (PBX) performing the function of an NT2. Where there is more than one basic rate interface on the terminal equipment and these interfaces are implemented in the same manner, the tests shall be applied to only one of these interfaces.

4.4 Connection of equipment under test to the tester

A TE may be equipped with either an integral cord (see figure 1, case A) or with a socket (case B). In the former case (case A), the TE shall be connected to the tester using the integral cord. In the latter case, the TE may be supplied with or without a detachable connecting cord. The method of connecting the TE under test to the tester in each of these cases shall be as follows:

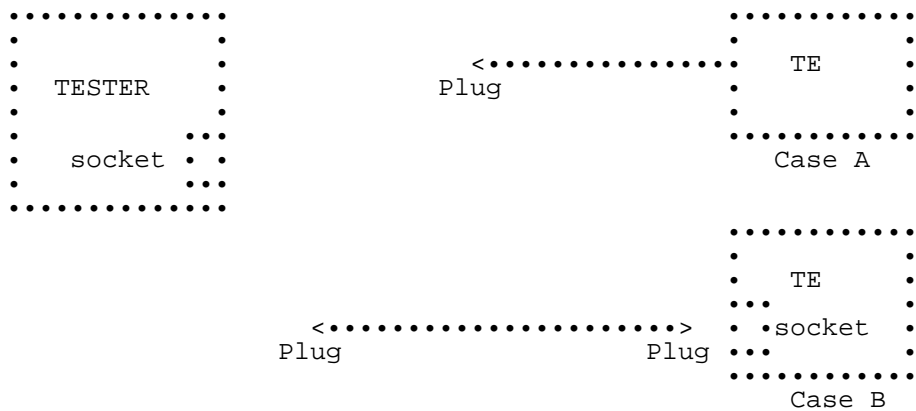


Figure 1: Connection of TE to tester

For a TE provided with a socket (case B), the test shall be performed using the specific cord (if any) provided with the TE and with the reference cord as specified in Annex D to ETS 300 012 [1].

In the case where a Private Telecommunications Network Exchange (PTNX) does not use a connection cord at the T reference point, the location of interface I_a shall be declared by the PTNX supplier.

4.5 Information to be provided by the apparatus supplier

Apparatus suppliers shall provide the information required in this ETS to enable the tests to be carried out. Annex B of this ETS provides guidance.

NOTE: Proformas for Protocol Implementation Conformance Statements (PICS) and Protocol Implementation eXtra Information for Testing (PIXITs) are being prepared.

4.6 Test support by the apparatus suppliers TEs

If the equipment to be tested does not provide:

- access to the B1 and B2 channels externally (see subclause 4.6.1); or
- implementation of loopback 4 (manually controlled), and also a test pattern of INFO 3 frames with the B1- and B2-channels set to binary zero (see ETS 300 012 [1], Annex A, for definition of loopback 4); then the equipment cannot support layer 1 tests requiring specific bit patterns in the B channels.

In this case the apparatus supplier shall additionally provide a test equipment using the same chip set and interface components as in the equipment to be tested. This test equipment shall provide either access to the B1- and B2- channels (see subclause 4.6.1) to allow insertion of specific test patterns so that the necessary layer 1 tests can be carried out or else implementation of loopback 4 with test pattern sending.

4.6.1 Interface providing access to the B-channels

The interface providing access to the B-channels shall be as follows. Such an interface shall be provided either directly on the terminal equipment or else by an adaptor provided by the equipment supplier.

- Two ports are to be provided, one for B1- and one for B2- access;
- the ports shall use a subset of the ISO IS 4902 [11] interface with balanced drivers/receivers in accordance with CCITT Recommendation V.11 [10] and include the signal lines SD, RD, and SG and clock lines RT and ST. The clocks RT and ST may be independent but shall be synchronous with the data on RD and SD respectively and operate at a frequency of 64 kbit/s;
- each port shall have a standard 37-way D-type female connector.

4.7 Test environment

All tests shall be performed at:

- an ambient temperature in the range 15° C to 35° C;
- a relative humidity in the range 25 % to 75 %;
- an air pressure in the range 86 kPa to 106 kPa; unless otherwise stated in a relevant standard either giving further general test conditions or specific conditions for a test.

For terminal equipment which is directly powered (either wholly or partly) from the mains supply, all tests shall be carried out within ± 5 % of the normal operating voltage. If the equipment is powered by other means and those means are not supplied as part of the apparatus (e.g. batteries, stabilised ac supplies, dc) all tests shall be carried out within the power supply limit declared by the supplier. If the power supply is ac, the tests shall be conducted within ± 4 % of the normal operating frequency. If the terminal equipment is either wholly or partly powered across the user-network interface, then power feeding conditions defined in ETS 300 012 [1] shall apply.

5 Layer 1 interface requirements

5.1 General

This Clause defines the requirements for TE operation at layer 1 of the ISDN basic user-network interface at reference point T or coincident S and T reference point. The associated conformance tests are specified in ETS 300 012 [1], Annex D.

The requirements on the TE are indicated in subclause 5.2 of this ETS.

A TE may be implemented in two ways, as far as layer 1 is concerned, either with detection or with non-detection of power source 1. In accordance with ETS 300 012 [1], Annex A, table A.1, subclause A.9.1.2, public networks provide power source 1 (restricted) [and optionally may provide power source 1 (normal)]

and offer to TEs the facility for detecting the connection status (i.e. whether the TE is connected or disconnected to the basic ISDN user - network interface) based on the presence/absence of a voltage on the phantom. Conceivably, a TE could implement both detection and non-detection of power source 1, but it shall be clearly identifiable as to which mode the TE is operating in.

5.2 Static attachment requirements

The Static Attachment Requirements (SAR) define the tests with which, at a minimum, a TE shall comply to ensure the operability at basic user-network interface to the public network. For layer 1, the SAR is specified in table 1.

Within table 1 the following notation is used:

M =	mandatory i.e. the TE implementation shall conform to these tests;
O =	optional i.e. it is optional whether the TE implements the underlying function but, if the function is implemented it shall conform to these tests;
ETS =	test number as given in ETS 300 012 [1], Annex D;
SAR =	Static Attachment Requirement (minimal acceptance);
COMMENT =	available field for supportive comments/values.

NOTE: Where there is more than one basic user-network interface the equipment designer is advised to ensure that the terminal equipment can tolerate a differential wander of up to 10 ms between these interfaces.

ETS 300 012 [1], Annex C, gives additional information concerning the testing of IUT with more than one interface I_a.

ETS 300 012 [1], Annex C, gives additional definitions which are used in the test specifications.

Table 1: Layer 1 Static Attachment Requirements (SAR)

Function to be tested	ETS 300 012 Annex D	SAR	COMMENT
Binary organisation of frame	- Test A - Test B	2.1.1 2.1.2	M M
Interframe (layer 2) time fill		3.1.1	M
D-echo channel response		3.1.2	M
Activation/deactivation procedure		3.2.1	M
Timer for activation when receiving INFO 2		3.2.2.1	M
Timer for activation when receiving INFO 4		3.2.2.2	M
Timer for activation when receiving any signal		3.2.2.3	M
Value of the timer T3		3.2.2.4	M
Timer for physical deactivation		3.2.2.5	M
Timer for complete deactivation		3.2.2.6	M
Frame alignment procedures		3.3	M
Multiframe procedures		3.4	M
Idle channel code on the B-channels		3.5	M
Frame rate when transmitting INFO 1		4.1	M
TE jitter measurement characteristics	- Test A	4.2.1	M
TE output phase deviation	- Test B	4.2.2	M
TE transmitter output impedance	- Test A - Test B - Test C - Test D - Test E	4.3.1 4.3.2 4.3.3 4.3.4 4.3.5	M M M M M
Pulse shape and amplitude		4.4	M
Pulse amplitude		4.5.1	M
Pulse unbalance of an isolated couple of pulses		4.5.2	M
Voltage on other test loads	- Test A - Test B	4.6.1 4.6.2	M M
Longitudinal conversion loss of transmitter output		4.7	M
TE Receiver input impedance	- Test A - Test B - Test C - Test D	4.8.1.1 4.8.1.2 4.8.1.3 4.8.1.4	M M M M
Receiver sensitivity - noise and distortion immunity		4.8.2	M
Unbalance about earth of receiver input		4.8.3	M
Normal power provision	- Test A - Test B - Test C - Test D - Test E	5.1.1.1 5.1.1.2 5.1.1.3 5.1.1.4 5.1.1.5	O O O O O
Restricted power provision	- Test A - Test B - Test C - Test D - Test E - Test F	5.1.2.1 5.1.2.2 5.1.2.3 5.1.2.4 5.1.2.5 5.1.2.6	O O O O O O
Current transient		5.1.3	O
Current/time limitation for TE		5.1.4.1	O
Current/time limitation for TE when connecting		5.1.4.2	O
Behaviour of a TE using a connection detector		5.1.4.3	O
Power start-up test after removal of short circuit		5.1.4.4.1	O
Power start-up at low input voltage		5.1.4.4.2	O
Protection against short term interruption		5.1.4.5.1	O
Behaviour at the switch-over		5.1.4.5.2	O
DC unbalance of TEs using power sink 1		5.1.4.6.1	O
Effect of current unbalance		5.1.4.6.2	O
Power source 2 - optional third pair		5.1.4.7	O
		5.1.4.8	M
		5.2	O

The optionality of power feeding requirements is due to terminal implementation alternatives with regard to the use of local or remote power feeding.

Some TEs may be powered either wholly from across the user-network interface, or wholly from a local power source. Some TEs may simultaneously be partly locally powered and partly powered across the interface.

All tests derived from ETS 300 012 [1], Annex D, Clause D.4 shall be applied only as prescribed below:

- a) locally powered TEs that do not use a connection detector shall be tested under local power conditions only;
- b) locally powered TEs that do use a connection detector shall be tested at 42 V normal and local power except for the Longitudinal Conversion Loss (LCL) tests of subclauses D.4.7 and D.4.8.3 which shall be conducted with power off, 42 V Normal and 42 V Restricted;
- c) TEs that use phantom power, in whole or in part, as their normal source shall be tested at 42 V and 24 V Normal and 42 V and 32 V Restricted.

It shall be clearly identifiable to the human user whether or not the TE may consume power from power source 1 or from power source 2 (normal and/or restricted) and, if it can, the maximum value of the power drawn by the TE from power source 1 or from power source 2 (normal and/or restricted) shall be declared.

Locally powered TEs using a connected detector shall pass the following tests:

- D.5.1.1.4, D.5.1.2.4 and D.5.1.4.3.

Locally powered TEs not using a connected detector shall pass the following tests:

- D.5.1.1.5 and D.5.1.2.5.

TEs with power sink 1 normal and restricted mode approved shall pass the following tests:

- D.5.1.1.1, D.5.1.1.2, D.5.1.1.3, D.5.1.2.1, D.5.1.2.2, D.5.1.2.3, D.5.1.3, D.5.1.4.1, D.5.1.4.4.1, D.5.1.4.4.2, D.5.1.4.5.1, D.5.1.4.5.2, D.5.1.4.6.1, D.5.1.4.6.2, and D.5.1.4.7.

TEs with power sink 1 normal mode only shall pass the following tests:

- D.5.1.1.1, D.5.1.1.2, D.5.1.1.3, D.5.1.2.6, D.5.1.3, D.5.1.4.1 (test 1 only), D.5.1.4.2, D.5.1.4.4.1 (test 2 only), D.5.1.4.4.2, D.5.1.4.5.1 and D.5.1.4.7.

TEs with power sink 2 approved shall pass the following test:

- D.5.2.

6 EMC requirements

The scope of this ETS is such that it should define only those requirements for equipment immunity to electromagnetic interferences and emission limitation that arise from the connection to the ISDN basic interface and that are not covered by generic standards under the EMC Directive (89/336/EEC). Therefore, any requirements shall be limited to conducted emissions. Because appropriate specifications are not available, the need for a requirement for conducted emissions will be reviewed when further progress has been made with the EMC standards.

7 Safety requirements

7.1 General

This Clause defines only those requirements for equipment electrical safety that arise from connection to the ISDN basic interface and that are not covered by generic standards under the low voltage directive. The associated conformance tests are specified in ETS 300 047-2 [4] together with ETS 300 047-1 [3].

7.2 Static Attachment Requirements (SAR)

Table 2 specifies the minimum electrical safety requirements. In the table the following notation is used:

ETS =	Clause or subclause number of ETS 300 047-2 [4] with which conformance is mandatory or not applicable;
M =	Conformance with this Clause or subclause is mandatory;
SAR =	Static Attachment Requirement (minimal acceptance);
GID =	General Information and Guidelines.

Table 2: Safety requirements

Requirement	ETS 300 047 Part 2	SAR	COMMENTS
Safety requirements and tests	5	GID	
General	5.1	M	
Touch current	5.3	M	
Separation between interface Ia and user-accessible parts	5.4	M	NOTE
NOTE: This requirement covers aspects additional to safety.			

8 Protection requirements

8.1 General

This Clause defines only those requirements for equipment over-voltage protection at the ISDN basic interface. The associated conformance tests are specified in ETS 300 047-3 [5] together with ETS 300 047-1 [3].

8.2 Static Attachment Requirements (SAR)

Table 3 specifies the minimum over-voltage protection requirements. In the table the following notation is used:

- ETS = Clause or subclause number of ETS 300 047-3 [5] with which conformance is mandatory or not applicable;
- M = Conformance with this Clause or subclause is mandatory;
- O = Optional;
- SAR = Static Attachment Requirement (minimal acceptance);
- GID = General Information and Definitions;
- N/A = Not applicable.

Table 3: Protection requirements

Requirement	ETS	SAR
	300 047-3	
Overvoltage surge simulation at interface Ia:	5.5	GID
- Common mode test	5.5.1	N/A
- Transverse mode test	5.5.2	N/A
Mains overvoltage simulation:	5.6	GID
- Common mode test	5.6.1	N/A
- Transverse mode test	5.6.2	N/A
Impulse transfer	5.7	GID
- From mains to interface Ia	5.7.1	M
- From auxiliary interface	5.7.2	0
- Conversion of common to transverse mode	5.7.3	M
Electrostatic discharge	5.8	N/A
Interface miswiring resistibility test	5.9	N/A
Voltage and current limitation under single fault conditions	5.10	M
Enhanced requirements and test levels for extra-strength equipment	Annex A	N/A

9 Layer 2 requirements

9.1 General

This Clause defines the requirements for TE operation at layer 2 of the ISDN basic user - network interface at reference point T or coincident S and T reference point. The associated attachment tests are specified in Annex A (normative) to this ETS.

A TE shall meet the functional requirements and support the protocol associated with the user side in accordance with ETS 300 125 [2]. Specifically the requirements for which this places on the TE are indicated in subclause 9.6 of this ETS.

The protocol supported by a TE is based on frames containing a two octet address field, modulo 128 numbering for the support of the acknowledged information transfer service and generate frames in accordance with Link Access Procedure on the D-channel (LAPD) protocol procedures.

9.2 Service Access Points (SAPs) to be supported

Each type of TE shall support the Service Access Point (SAP) for layer 2 management procedures; this SAP is identified by the Service Access Point Identifier (SAPI) value of 63. TEs which support circuit switched call control procedures shall also support the SAPI value of 0. The support of other SAPs shall be specified in the ETS/NET which applies to the specific type of TE.

9.3 Terminal Endpoint Identifier (TEI) administration

With respect to Terminal Endpoint Identifiers (TEIs), two classes of TEs are defined:

- non-automatic TEI assigned category;
- automatic TEI assigned category. A TE of the automatic TEI assignment category shall determine its connection status based on the presence/absence of a voltage on the phantom (see subclause 5.2) and shall conform to the requirements for such TEs.

A TE of the non-automatic TEI assignment category shall not be committed to detect the presence/absence of a voltage on the phantom for the purposes of determining its connection status.

9.4 Layer 2 response time

ETS 300 125 [2] defines a system parameter T200 which specifies the maximum time between the transmission of a command frame and the reception of the corresponding response or acknowledgement frames. This time includes the time which elapses for layer 1 information transfer, layer 1 contention in the case of access to the passive bus, layer 2 processing time and layer 2 queuing delays.

In order to ensure proper operation of the layer 2 procedures, the layer 2 processing time shall be specified.

The layer 2 processing time is the maximum time a TE takes to transmit a frame in response to a frame in a single link arrangement on a point-to-point configuration. The layer 2 processing time shall be less than or equal to 200 ms.

9.5 Optional procedures

The following procedures specified in ETS 300 125 [2] are optional:

- TEI identity verifies procedure as specified in ETS 300 125 [2], Part 2, Application of CCITT Recommendation Q.921 [12], subclause 5.3.5. A TE invoking this procedure has to make provision that no lock-up occurs if the network does not support this procedure by proceeding according to the protocol (see ETS 300 125 [2], Part 2, Application of CCITT Recommendation Q.921 [12], subclause 5.3.5.3);
- the use of the data link layer supervision procedures (implementation of timer T203) as specified in ETS 300 125 [2], Part 2, Application of CCITT Recommendation Q.921 [12], subclause 5.10. A TE shall, however, respond according to the procedures specified in ETS 300 125 [2] if the network side invokes these procedures.

9.6 Static Attachment Requirements (SAR)

The SAR defines features and functions which, as a minimum, shall be supported to ensure the operational integrity of an ISDN I-series terminal. For layer 2, the SAR is specified in the tables 4 to 18.

Within tables 4 to 18, the following notation is used:

M =	mandatory i.e. the TE implementation shall conform to those clauses in that section relating to the operation of the layer 2 protocol in the TE. If options or several parameter values are specified in the referred subclause of ETS 300 125 [2], only those that correspond to the information supplied by the apparatus supplier shall be used for the test;
O =	optional i.e. it is optional whether the TE implements that function but, if the function is implemented it shall conform to the clauses in that section relating to the operation of the TE layer 2 protocol;
N/A =	not applicable i.e. either the requirements specified in the section on the TE shall not be applied for attachment approval or else the section relates solely to the operation of the network, or it relates to the operation at the man-machine interface, or else the section provides general information e.g. terms and definitions;
ETS =	ETS 300 125 [2]; indicated in brackets under the heading is whether the section reference is to Part 1, of CCITT Recommendation Q.920 [13]/(I.440) or to Part 2, of CCITT Recommendation Q.921 [12]/(I.441);
SAR =	Static Attachment Requirement (minimal acceptance);
COMMENT =	Available field for supportive comments/values;
App. =	Appendix in ETS 300 125 [2].

9.6.1 Service characteristics

Table 4: Layer 2 service characteristic requirements

SERVICE CHARACTERISTICS			
Title	ETS 300 125, Part 1 (Q.920)	SAR	COMMENTS
General	Clause 1	N/A	Background Info
Concepts and terminology	Clause 2	N/A	Background Info + definitions
Overview Description of LAPD functions and procedures	Clause 3	N/A	Background Info
Service characteristics	Clause 4		
General	subclause 4.1	N/A	Background Info
Services provided to layer 3	subclause 4.2		
Unacknowledged information transfer service	subclause 4.2.1	M	NOTE 2
Acknowledged information transfer service	subclause 4.2.2	M	NOTE 2
Services provided to layer management	subclause 4.3	M	NOTE 2
Administrative services	subclause 4.4	NOTE 1	
Model of the data link service	subclause 4.5	N/A	Explanatory Info
Services required from the physical layer	subclause 4.6	M	NOTE 2
Data link layer - Management structure	Clause 5	N/A	Explanatory Info
NOTE 1:	The provision of the administrative services for handling the TEI assignment, checking and removal procedures shall be mandatory. The provision of administrative services for data link parameter passing are not applicable.		
NOTE 2:	The use of specific primitives across (TE internal) interfaces shall not be subject to an explicit verification test. However, the functionality behind a service definition marked with an "M" shall be verified implicitly during the tests according to the following sections covering the functional characteristics and the user network procedures at the data link layer.		

9.6.2 Functional characteristics

9.6.2.1 Frame structure

Table 5: Layer 2 frame structure requirements

FUNCTIONAL CHARACTERISTICS			
Function = Frame structure	ETS 300 125 (Q.921)	SAR	COMMENTS
General	Clause 1	N/A	Background Info
Frame structure for peer-to-peer communication	Clause 2		
General	subclause 2.1	M	
Flag sequence	subclause 2.2	M	
Address field	subclause 2.3	M	
Control field	subclause 2.4	M	
Information field	subclause 2.5	M	
Transparency	subclause 2.6	M	
FCS field	subclause 2.7	M	
Format Convention	subclause 2.8		
Numbering Convention	subclause 2.8.1	N/A	Explanatory Info
Order of bit transmission	subclause 2.8.2	M	
Field mapping convention	subclause 2.8.3	M	
Invalid frames	subclause 2.9	M	
Frame abort	subclause 2.10	M	

9.6.2.2 Elements of procedure and formats

Table 6: Layer 2 procedural and format requirements

FUNCTIONAL CHARACTERISTICS			
Function = Elements of procedure and formats	ETS 300 125 (Q.921)	SAR	COMMENTS
Elements of procedures and formats of fields for data link layer peer-to-peer communication	Clause 3	.	.
General	subclause 3.1	N/A	Background Info
Address field format	subclause 3.2	M	.
Address field variables	subclause 3.3	.	.
Address field extension bit (EA)	subclause 3.3.1	M	.
Command/Response field bit (C/R)	subclause 3.3.2	M	.
Service Access Point Identifier(SAPI)	subclause 3.3.3	M	.
Terminal Endpoint Identifier (TEI)	subclause 3.3.4	.	.
TEI for broadcast data link connection	subclause 3.3.4.1	M	.
TEI for point-to-point data Link connection	subclause 3.3.4.2	M	.
Provision of point-to-point signalling connections	Annex A	M	.
Control field Formats	subclause 3.4	M	.
Information transfer (I) format	subclause 3.4.1	M	.
Supervisory (S) format	subclause 3.4.2	M	.
Unnumbered (U) format	subclause 3.4.3	M	.
Control field parameters and associated state variables	subclause 3.5	M	.
Poll/Final bit	subclause 3.5.1	M	.
Multiple frame operation - variables and sequence numbers	subclause 3.5.2	.	.
Modulus	subclause 3.5.2.1	M	.
Send state variables V(S)	subclause 3.5.2.2	M	.
Acknowledge state variable V(A)	subclause 3.5.2.3	M	.
Send sequence number N(S)	subclause 3.5.2.4	M	.
Receive state variable V(R)	subclause 3.5.2.5	M	.
Receive sequence number N(R)	subclause 3.5.2.6	M	.
Unacknowledged operation - variables and parameters	subclause 3.5.3	N/A	Background Info See NOTE
Frame types	subclause 3.6	.	.
Commands and responses	subclause 3.6.1	M	.
Information (I) command	subclause 3.6.2	M	.
Set asynchronous balance mode extended (SABME) command	subclause 3.6.3	M	.
DISConnect (DISC) Command	subclause 3.6.4	M	.
Unnumbered Information (UI) command	subclause 3.6.5	M	.
Receive Ready (RR) command/response	subclause 3.6.6	M	.
REject (REJ) command/response	subclause 3.6.7	M	.
Receive Not Ready (RNR) command/response	subclause 3.6.8	M	.
Unnumbered Acknowledgement (UA) Response	subclause 3.6.9	M	.
Disconnect Mode (DM) response	subclause 3.6.10	M	.
Frame reject (FRMR) response	subclause 3.6.11	N/A	.
Exchange Identification (XID) command/response	subclause 3.6.12	N/A	.
NOTE:	For parameter N201 see ETS 300 125 [2], subclause 5.9.3.		

9.6.2.3 Layer-to-layer communication

Table 7: Layer 2 layer-to-layer communication requirements

Functional characteristics			
Function = Layer-to-layer communication	ETS 300 125 (Q.921)	SAR	COMMENTS
Elements for layer-to-layer communication	Clause 4	N/A	see note
NOTE: See subclause 4.1 of this ETS concerning communications between layers.			

9.6.2.4 Data link layer parameters

Table 8: Data link layer parameter requirements

Functional characteristics			
Function = Data Link layer parameters	ETS 300 125 (Q.921)	SAR	COMMENTS
List of system parameters	subclause 5.9	M	
Timer T200	subclause 5.9.1	M	1s - see NOTE
Maximum number of retransmissions (N200)	subclause 5.9.2	M	see NOTE
Maximum number of octets in an information field (N201)	subclause 5.9.3	M	see NOTE
Maximum number of transmission of the TEI identity request message (N202)	subclause 5.9.4	M	see NOTE
Maximum number of outstanding I-frames (k)	subclause 5.9.5	M	see NOTE
Timer T201	subclause 5.9.6	N/A	
Timer T202	subclause 5.9.7	M	
Timer T203	subclause 5.9.8	O	see subclause 9.5 of this ETS
NOTE: The default values for the system parameters (appropriate to the SAP(s) implemented in the TE) shall be implemented in the TE.			

9.6.3 Interface procedures

9.6.3.1 General

Table 9: Layer 2 general procedural requirements

Interface procedures			
Procedure = General	ETS 300 125 (Q.921)	SAR	Comments
Definition of peer-to-peer procedures for the data link layer	Clause 5		
Procedures for the use of the P/F bit	subclause 5.1		
Unacknowledged information transfer	subclause 5.1.1	M	
Acknowledged multiple frame information transfer	subclause 5.1.2	M	
SDL for point-to-point procedures	Annex B	NOTE	
State transition table of the point-to-point procedures of the data link layer	Annex D	NOTE	
NOTE: These annexes specify the protocols described in the main body of the ETS using SDLs and state transition tables and hence place no requirements on the TE other than identified in the procedures as defined in ETS 300 125 [2], Part Q.921, Clause 5.			

9.6.3.2 Unacknowledged information transfer

Table 10: Unacknowledged information transfer requirements

Interface procedures			
Procedure = unacknowledged information transfer	ETS 300 125 (Q.921)	SAR	Comments
Procedures for unacknowledged information transfer	subclause 5.2		
General	subclause 5.2.1	N/A	Background info
Transmission of unacknowledged information	subclause 5.2.2	M	
Receipt of unacknowledged information	subclause 5.2.3	M	
An SDL representation of the broadcast procedures of the data link layer	Annex C	NOTE	
NOTE: These annexes specify the protocols described in the main body of the ETS using SDLs and state transition tables and hence place no requirements on the TE other than identified in the procedures as defined in ETS 300 125 [2], Part Q.921, Clause 5.			

9.6.3.3 TEI management

Table 11: TEI management requirements

Interface procedures			
Procedure = TEI management	ETS 300 125 (Q.921)	SAR	Comments
TEI management procedures	subclause 5.3		
General	subclause 5.3.1	M	
TEI assignment procedure	subclause 5.3.2	M	
Expiry of timer T202	subclause 5.3.2.1	M	
TEI check procedure	subclause 5.3.3		
Use of the TEI check procedure	subclause 5.3.3.1	N/A	
Operation of the TEI check Procedure	subclause 5.3.3.2	M	
TEI removal procedure	subclause 5.3.4	M	
Action taken by the data link Layer Entity receiving the MDL-REMOVE-REQUEST primitive	subclause 5.3.4.1	M	
Conditions for TEI removal	subclause 5.3.4.2	M	
TEI identity verify procedure	subclause 5.3.5	O	See subclause 9.5 of this ETS
Formats and codes	subclause 5.3.6		
General	subclause 5.3.6.1	M	
Layer management entity identifier	subclause 5.3.6.2	M	
Reference number (Ri)	subclause 5.3.6.3	M	
Message type	subclause 5.3.6.4	M	
Action indicator (Ai)	subclause 5.3.6.5	M	

9.6.3.4 Negotiation of data link layer parameters

Table 12: Negotiation of data link layer parameter requirements

Interface procedures			
Procedure = Negotiation of data link layer parameters	ETS 300 125 (Q.921)	SAR	Comments
Automatic negotiation of data link layer parameters	subclause 5.4	N/A	
	App. IV	N/A	

9.6.3.5 Establishment/release of multiple frame operation

Table 13: Establishment/release of MF operation requirements

Interface procedures			
Procedure = Establishment/release of MF operation	ETS 300 125 (Q.921)	SAR	Comments
Procedures for the establishment and release of multiple frame operation	subclause 5.5		
Establishment of multiple frame operation	subclause 5.5.1	M	
General	subclause 5.5.1.1	M	
Establishment procedures	subclause 5.5.1.2	M	
Procedure on expiry of timer T200	subclause 5.5.1.3	M	
Information transfer	subclause 5.5.2	M	
Termination of multiple frame operation	subclause 5.5.3		
General	subclause 5.5.3.1	M	
Release procedure	subclause 5.5.3.2	M	
Procedure on expiry of timer T200	subclause 5.5.3.3	M	
TEI-assigned state	subclause 5.5.4	M	
Collision of unnumbered commands and responses	subclause 5.5.5		
Identical transmitted and received commands	subclause 5.5.5.1	M	
Different transmitted and received commands	subclause 5.5.5.2	M	
Unsolicited DM response and SABME or DISC command	subclause 5.5.6	M	

9.6.3.6 Information transfer in multiple frame operation

Table 14: Information transfer in MF operation requirements

Interface procedures			
Procedure = Information transfer in MF operation	ETS 300 125 (Q.921)	SAR	Comments
Procedures for information transfer in multiple frame operation	subclause 5.6		
Transmitting I-frames	subclause 5.6.1	M	
Receiving I-frames	subclause 5.6.2	M	
P bit set to 1	subclause 5.6.2.1	M	
P bit set to 0	subclause 5.6.2.2	M	
Sending and receiving acknowledgements	subclause 5.6.3		
Sending acknowledgements	subclause 5.6.3.1	M	
Receiving acknowledgements	subclause 5.6.3.2	M	
Receiving REJ-frames	subclause 5.6.4	M	
Receiving RNR-frames	subclause 5.6.5	M	
Data link layer own receiver	subclause 5.6.6	M	
Busy condition			
Waiting acknowledgement	subclause 5.6.7	M	

9.6.3.7 Re-establishment of multiple frame operation

Table 15: Re-establishment of MF operation requirements

Interface procedures			
Procedure =	ETS 300 125	SAR	Comments
Re-establishment of multiple frame operation	(Q.921)	.	.
Re-establishment of multiple frame operation	subclause 5.7	.	.
Criteria for re-establishment	subclause 5.7.1	M	.
Procedures	subclause 5.7.2	M	.

9.6.3.8 Handling of exception conditions

Table 16: Layer 2 handling of exception condition requirements

Interface procedures			
Procedure =	ETS 300 125	SAR	Comments
Handling of exception conditions	(Q.921)	.	.
Exception condition reporting and recovery	subclause 5.8	N/A	Background info
N(S) sequence error	subclause 5.8.1	M	.
N(R) sequence error	subclause 5.8.2	M	.
Timer recovery condition	subclause 5.8.3	M	.
Invalid frame condition	subclause 5.8.4	M	.
Frame rejection condition	subclause 5.8.5	M	.
Receipt of an FRMR response frame	subclause 5.8.6	N/A	.
Unsolicited response frames	subclause 5.8.7	M	.
Multiple-assignment of TEI value	subclause 5.8.8	M	.
Retransmission of REJ response frames	App. I	N/A	.
Occurrence of MDL-ERROR-INDICATION within the basic states & actions to be taken by the management entity	App. II	N/A	.

9.6.3.9 Data link layer monitor

Table 17: Data link layer monitor requirements

Interface procedures			
Procedure =	ETS 300 125	SAR	Comments
Data link layer monitor	(Q.921)	.	.
Data link monitor function	subclause 5.10	0	see subclause 9.5 of this ETS

9.6.3.10 Basic access deactivation

Table 18: Basic access deactivation requirements

Interface procedures			
Procedure =	ETS 300125	SAR	Comments
Basic access deactivation	(Q.921)		
Optional basic access deactivation procedures	App. III	N/A	

Annex A (normative): Test schedule for layer 2 conformance

A.1 Introduction

A.1.1 Object and scope

A.1.1.1 General

The object of this Annex is to provide details of how layer 2 of the TE shall be tested to prove compliance with the static attachment requirements given in this ETS.

The testing shall be performed using the test configuration described in subclause A.1.1.2.

This schedule does not test for conformance of any maintenance functions.

The TE under test shall conform to the test schedule and the Remote Single-layer (RS) test method (see ISO/IEC IS 9646-1 [9], Clause 7) shall be used.

A.1.1.2 Test configurations

The layer 2 test configuration defines the layer 2 functional blocks of a TE being tested and the access arrangement between TE and tester.

These functional blocks provide the layer 2 basic capabilities which shall be implemented in accordance with the specification given in ETS 300 125 [2]. However, the definition of layer 2 in the form of a number of functional blocks places no requirements on the layer 2 implementation in a TE. The only requirements on the TE layer 2 implementation are those specified in Clause 9 of the main body of this specification and these requirements shall be tested for conformance using the tests defined in the remainder of this test schedule.

The layer 2 of a TE includes functional blocks as follows:

- Data Link entity for the support of broadcast data link procedures. There is one data link entity associated with each SAP;
- Data Link entity for the support of point to point data link procedures. With each SAP other than the SAP for the support of layer 2 management procedures, one or more data link entity/entities is/are associated;
- Layer Management Entity (LME). There is one LME contained in the TE for the management of resources that have a layer wide impact;
- Connection Management Entity (CME). There is one CME for each data link entity contained in the TE for the management of resources that have an impact on individual data link connections;
- Layer 2 multiplexing function.

These functional blocks provide basic capabilities which shall be implemented in accordance with ETS 300 125 [2]. Where there are alternatives or options included in ETS 300 125 [2], these are provided as complementary capabilities.

The user-network interface at the T or coincident S and T reference point provides the only test access for the purpose of tests for layer 2 conformance. However, layer 2 services may be invoked within a TE by layer 3 e.g. based on human interventions at a man-machine interface.

The test configuration is shown in figure A.1. The TE shown here does not depict the layer 2 multiplexing function bearing in mind this function shall be tested implicitly while testing other functional blocks. The layer 3 entity is included to illustrate the interactions between layer 2 and 3 which take place as a result of the exchange of layer 2 frames.

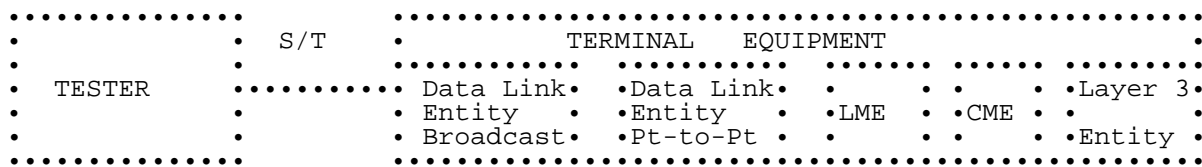


Figure A.1: Test configuration

A.1.1.3 Preconditions

Before carrying out any layer 2 tests, the tests specified for layer 1 (see Clause 5 of the main body of this ETS) shall be performed.

A.1.1.4 Layer 2 test signals

The layer 2 attachment tests are accomplished by sequences of those signals which are contained in ETS 300 125 [2] (layer 2 frame repertoire, messages for TEI management procedures, etc...).

These signal sequences are under control of the tester and are related to the state that the tester perceives the TE to be in as a result of signals transferred across the user-network interface.

These signal sequences shall comply with the following rules:

- a) the test sequences exchanged between the tester and TE are assumed to be free from transmission errors;
- b) the tester may simulate transmission errors in the direction tester to TE by inserting a wrong Frame Check Sequence (FCS);
- c) the tester may simulate transmission errors in the direction TE to tester by assuming that the FCS check failed;
- d) the tester may violate the protocol rules related to the control of state variables to provoke sequence gaps;
- e) there is no contention on the D-channel at layer 1 (layer 1 point-to-point);
- f) with respect to contention on the D-channel at layer 2, two distinct situations are defined:
 - 1) test of the protocol procedure supported by a single entity. In this case there is no contention on the D-channel (one peer-peer information transfer invoked at the time);
 - 2) test of layer 2 multiplexing and TE processing capacity in terms of the number of SAPs and links which a TE is able to support simultaneously. In this case there is contention on the D channel at layer 2 and this contention is resolved within layer 2 based on the SAPI.

A.2 Test schedule

A.2.1 General

In the case where the tester is required to monitor for no response from the TE under test (e.g. see subclause A.2.2.1.3 in this test schedule), the monitoring time shall be 2 s after the sending of the stimulus from the tester.

When a test (or part of a test) checks the value of a timer implemented in the terminal under test, a tolerance of $\pm 5\%$ shall be allowed.

The tests in this test schedule show "Expected sequence". However, should an unexpected or unsolicited response be received this should not in itself be considered a reason for failure of the test, as long as that response is an allowed TE action according to CCITT Recommendation Q.921 [12] in the state just before or just after the receipt of the frame sent by the tester. The tester should not consider the test to have failed until the monitoring time has expired and the correct response not been received.

If a TE acknowledges an I-frame by an I-frame within T200 instead of an RR-frame, the TE shall not be considered to have failed the test and the test shall be continued. This is applicable to tests in subclauses A.2.2.2.2, A.2.2.2.3, A.2.2.2.4, A.2.2.4.2, A.2.2.4.3, A.2.2.8.4.2 and A.2.2.8.4.3.

If a TE sends an I-frame with P bit set to "1", the TE shall not be considered to have failed the test on account of this, and the test shall be continued.

A.2.2 Testing using layer 2 sequences

A.2.2.1 Initialisation

A.2.2.1.1 Normal initialisation, Modulo 128

Purpose: tests the normal initialisation of multiple-frame operation.

Expected sequence:

Tester	Terminal
•	•
• (SAPI,TEI) SABME c p = 1	• 1
• <.....	•
•	•
2 • (SAPI,TEI) UA r f = 1	•
•>	•
•	•
• (SAPI,TEI) Ic N(S)N(R) p=0	• 3
• <.....	•
•	•
• (SAPI,TEI)RRr N(R) f = 0	• 4
•>	•

Precondition: the data link should be in the TEI assigned state (TEI used in the range of 0-63 or 64-126 if obtained using management procedures).

The sequence may be started by call origination from the terminal or by offering the terminal a compatible call using the broadcast link. In the latter case this combines test A.2.2.2.1.

Frame content from terminal:

- 1, A 3 octet SABME-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 1.
- 3, An "n" octet I-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 0.
The layer 3 content shall be:
SETUP if call originated by the terminal.
SETUP ACKNOWLEDGE, CALL PROCEEDING, ALERTING or CONNECT if call offered by the tester.

Frame content to terminal:

- 2, 3 octet UA-frame (SAPI = 0, TEI = Current TEI) r = 0, f = 1.
Should be sent in less than T200 s.
- 4, A 4 octet RR-frame (SAPI = 0, TEI = Current TEI) r = 0, f = 0.

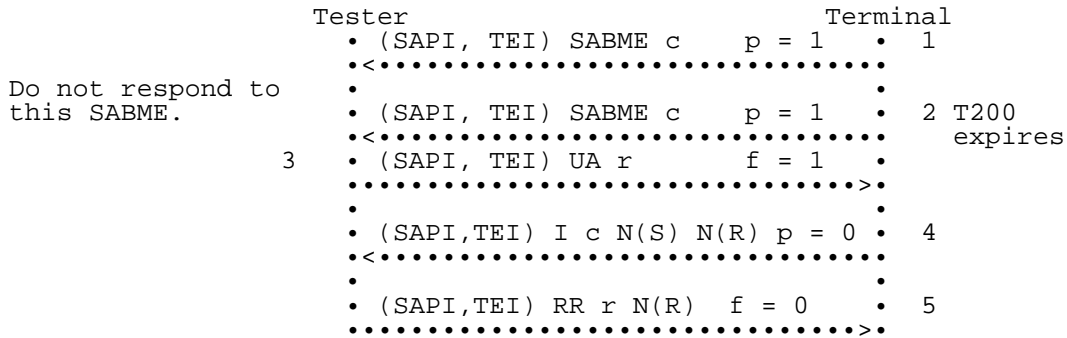
NOTE: The sending of this frame is to return the terminal to a stable state and is not part of the test.

Refer to: ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclause 5.5.1.2.

A.2.2.1.2 Initialisation failure, Modulo 128

Purpose: tests the terminal's response to the loss of a layer 2 UA-frame during initialisation.

Expected sequence:



Precondition: the data link should be in the TEI assigned state (TEI used in the range 0-63 or 64-126 if obtained using management procedures).

Invocation of the initialisation sequence should be caused as for test A.2.2.1.1.

Frame content from terminal:

1,2, A 3 octet SABME-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 1.
The second SABME should be received after a timeout = T200 s.

4, An n octet I-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 0.
The layer three content shall be:
SETUP if call originated by the terminal.

SETUP ACKNOWLEDGE, CALL PROCEEDING, ALERTING or CONNECT if call offered by the tester.

Frame content to terminal:

3, A 3 octet UA-frame (SAPI = 0, TEI = Current TEI) r = 0, f = 1.

5, A 4 octet RR-frame (SAPI = 0, TEI = Current TEI) r = 0, f = 0.

NOTE: The sending of this frame is to return the terminal to a stable state and is not part of the test.

Refer to: ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclause 5.5.1.3.

A.2.2.1.3 Initialisation denial

Purpose: to test that terminal takes appropriate action if the data link connection cannot be initialised, e.g. in case of the unavailability of resources at the network side.

Expected sequence:

Tester	Terminal
•	•
• (SAPI, TEI) SABME c p = 1	• 1
•<.....	•
2 • (SAPI, TEI) DM r f = 1	• Test should ensure that
•<.....>•	• no information frames
•	• are received after DM
3 • (SAPI, TEI) DISC c p = 1	• frame.
•<.....>•	•
• (SAPI, TEI) DM r f = 1	• 4
•<.....	

Precondition: the data link should be in the TEI assigned state (TEI used in the range 0-63 or 64-126 if obtained using management procedures).

Invocation of the initialisation sequence should be caused as for test A.2.2.1.1.

Frame content from terminal:

- 1, 3 octet SABME-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 1.
- 4, 3 octet DM-frame (SAPI = 0, TEI = Current TEI) r = 1, f = 1.

Frame content to terminal:

- 2, 3 octet DM-frame (SAPI = 0, TEI = Current TEI) r = 0, f = 1.
- 3, 3 octet DISC-frame (SAPI = 0, TEI = Current TEI) c = 1, p = 1.

Refer to: ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclause 5.5.1.2.

A.2.2.1.4 Total initialisation failure, Modulo 128

Purpose: tests the terminal's response to the inability of the network to respond to requests to initialise the data link and to ensure that the TE under test tries only N200+1 times to initialise the data link.

Expected sequence:

	Tester		Terminal
	•		•
	• (SAPI, TEI) SABME c	p = 1	• 1
Do not respond to this SABME.	•<.....		
	•		•
	• (SAPI, TEI) SABME c	p = 1	• 2 T200 expires.
Do not respond to this SABME.	•<.....		
	•		•
	• (SAPI, TEI) SABME c	p = 1	• 3 T200 expires
Do not respond to this SABME.	•<.....		
	•		•
	• (SAPI, TEI) SABME c	p = 1	• 4 T200 expires
	•<.....		
	•		•

The terminal should stop re-transmissions of the SABME-frames.

Precondition: the data link should be in the TEI assigned state (TEI used in the range 0-63 or 64-126 if obtained using management procedures).

Invocation of the initialisation sequence should be caused as for test A.2.2.1.1.

Frame content from terminal:

1,2,3,4, 3 octet SABME (SAPI = 0, TEI = Current TEI) c = 0, p = 1.

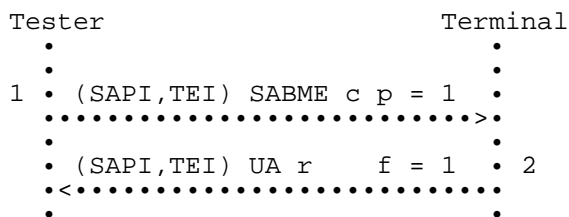
The SABME-frames should be received at intervals of timeout = T200 s.

Refer to: ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclause 5.5.1.3.

A.2.2.1.5 Data link reset by the network side

Purpose: to ensure correct data link reset by the terminal.

Expected sequence:



Precondition: the data link should be in the MF established state.

Frame content to terminal:

1, 3 octet SABME-frame (SAPI = 0, TEI = Current TEI) c = 1, p = 1.

Frame content from terminal:

2, 3 octet UA-frame (SAPI = 0, TEI = Current TEI) r = 1, f = 1. Should be received in less than T200 s.

NOTE: This test may be used at any time to reset the data link into the MF established state with the state variables initialised at zero.

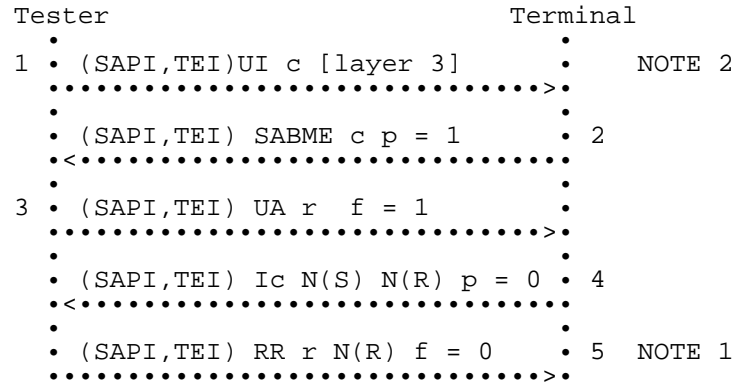
Refer to: ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclauses 5.5.1.2 and 5.7.2.

A.2.2.2 Frame transfer tests

A.2.2.2.1 Unacknowledged transfer

Purpose: tests unnumbered frame transfer on the broadcast data link.

Expected sequence:



Preconditions: the data link should be in the TEI assigned state (TEI used in the range 0-63 or 64-126 if obtained using management procedures).

The layer 3 content of the message shall be coded such that the terminal shall accept the call offered.

Frame content to terminal:

- 1, "n" octet UI-frame offering compatible call to the terminal (SAPI = 0, TEI = 127) c = 1, p = 0.
- 3, 3 octet UA-frame (SAPI = 0, TEI = Current TEI) r = 0, f = 1. Should be transmitted in less than T200 s from the reception of the SABME-frame.
- 5, A 4 octet RR-frame (SAPI = 0, TEI = Current TEI) r = 0, f = 0.

NOTE 1: The sending of this frame is to return the terminal to a stable state and is not part of the test.

NOTE 2: P bit set to 0 for all unnumbered frames, TEI = 127 is the broadcast data link, the UI-frame should contain a SETUP message tailored to the device under test.

Frame content from terminal:

- 2, 3 octet SABME-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 1.
- 4, "n" octet I-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 0. The layer 3 information should indicate acceptance of the call (SETUP ACKNOWLEDGE, CALL PROCEEDING, ALERTING or CONNECT message).

Refer to: ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclauses 3.6.5, 5.2.2 and 5.2.3.

A.2.2.2.2 Normal information transfer - receiver ready responses

Purpose: tests the operation layer 2 sequence numbering. Since there are 128 sequence numbers the test program should cycle through this number of information frame transfers.

Expected sequence:

	Tester		Terminal
	1	•(SAPI,TEI)I c N(S)=0 N(R)=0 p = 0	•
		•.....>	•
N(R)=1 indicates that		•(SAPI,TEI) RR r N(R)=1 f = 0	• 2
V(R) has been reset		<.....	
N(S)=0 indicates that		•(SAPI,TEI)I c N(S)=0 N(R)=1 p = 0	• 3
V(S) has been reset		<.....	
4		•(SAPI,TEI) RR r N(R)=1 f = 0	•
		•.....>	
		•Repeat this sequence until all values	•
		•of N(S) and N(R) have been generated.	•
		•	•
		•(SAPI,TEI)I c N(S)=0 N(R)=1 p = 0	• 5
		<.....	
6		•(SAPI,TEI) RR r N(R)=1 f = 0	•
		•.....>	

Wait at least T200 to ensure that T200 has stopped.

Precondition: the data link should be in the MF established state. V(S) and V(R) should be reset to zero by performing test A.2.2.1.5.

Frame content to terminal:

- 1, An "n" octet I-frame (SAPI = 0, TEI = Current TEI) c = 1, p = 0.
Layer 3 content - RELEASE.
- 4,6, 4 octet RR-frame (SAPI = 0, TEI = Current TEI) r = 0, f = 0.
This RR-frame shall be sent in less than T200 s.

Frame content from terminal:

- 2, 4 octet RR-frame (SAPI = 0, TEI = Current TEI) r = 1, f = 0.
This RR should be received in less than T200 s.
- 3,5, An "n" octet I-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 0.
Layer 3 content - RELEASE COMPLETE.

Refer to: ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclauses 3.4.1, 3.4.2, 3.6.1, 3.6.2, 3.6.6, 5.6.1, 5.6.2, and 5.6.3.

A.2.2.2.3 Normal information transfer - I-frame response

Purpose: to test that the terminal correctly accepts an "I" command frame as valid response to an "I" command frame which it has transmitted.

Expected sequence:

Tester	Terminal
1 • (SAPI, TEI) I c N(S) N(R) p = 0	•
•.....>•	•
• (SAPI, TEI) RR r N(R) f = 0	•2
•<.....	•
• (SAPI, TEI) I c N(S) N(R) p = 0	•3
•<.....	• This I-frame (4)
4 • (SAPI, TEI) I c N(S) N(R) p = 0	• should be
•.....>•	• accepted as a
• (SAPI, TEI) RR r N(R) f = 0	•5 valid response
•<.....	• to 3.
•	•

Wait for at least T200 s

Precondition: the data link should be in the MF established state. V(S) and V(R) should be reset to 0 performing test A.2.2.1.5.

Frame contents to terminal:

- 1,4, An "n" octet I-frame (SAPI = 0, TEI = Current TEI) c = 1, p = 0.
 Layer 3 content - RELEASE in frame 1,
 - RELEASE COMPLETE in frame 4.

Frame content from terminal:

- 2,5, 4 octet RR-frame (SAPI = 0, TEI = Current TEI) r = 1, f = 0.
 This RR should be received in less than T200 s.
- 3, An "n" octet I-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 0.
 Layer 3 content - RELEASE COMPLETE.

Refer to ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclauses 3.4.1, 3.4.2, 3.6.1, 3.6.2, 3.6.6, 5.6.1, 5.6.2 and 5.6.3.

A.2.2.2.4 Receipt of an I-frame in the timer recovery state

Purpose: ensures that whilst in the timer recovery state the terminal is able to receive I-frames.

Expected sequence:

Test (a) Terminals polling using RR command frame.

Tester	Terminal
1 • (SAPI,TEI) I c N(S) N(R) p = 0	•
.....>	•
• (SAPI,TEI) RR r N(R) f = 0	• 2
<.....	•
• (SAPI,TEI) I c N(S) N(R) p = 0	• 3
<.....	•
Wait for expiry of T200	•
• (SAPI,TEI) RR c N(R) p = 1	• 4
<.....	• Terminal enters Timer Recovery condition
•	•
•	•
5 • (SAPI,TEI) I c N(S) N(R) p = 0	• This frame NOT to acknowledge frame (3)
.....>	•
• (SAPI,TEI) RR r N(R) f = 0	• 6
<.....	•
Wait for expiry of T200	•
• (SAPI,TEI) RR c N(R) p = 1	• 7
<.....	•
8 • (SAPI,TEI) RR r N(R) f = 1	• This frame acknowledges frame (3)
.....>	•
• (SAPI,TEI) I c N(S) N(R) p = 0	• 9
<.....	•
10 • (SAPI,TEI) RR r N(R) f = 0	•
.....>	•
•	•

Wait at least T200 s

Precondition: the terminal should be in the MF Established state.

Frame content to terminal:

- 1, An "n" octet I-frame (SAPI = 0, TEI = Current TEI) c = 1, p = 0. Layer 3 content - RELEASE.
- 5, An "n" octet I-frame (SAPI = 0, TEI = Current TEI) c = 1, p = 0. Layer 3 content - RELEASE (new call reference).
- 8, A 4 octet RR-frame (SAPI = 0, TEI = Current TEI) r = 0, f = 1.
- 10, A 4 octet RR-frame (SAPI = 0, TEI = Current TEI) r = 0, f = 0.

Frame content from terminal:

- 2, A 4 octet RR-frame (SAPI = 0, TEI = Current TEI) r = 1, f = 0.
- 3, An "n" octet I-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 0. Layer 3 content - RELEASE COMPLETE (same call reference as in frame (1)).
- 4,7, A 4 octet RR-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 1. N(R) shall be incremented between frames 4 and 7 by the reception of I-frame (5).
- 6, A 4 octet RR-frame (SAPI = 0, TEI = Current TEI) r = 1, f = 0.

9, An "n" octet I-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 0.
Layer 3 content - RELEASE COMPLETE (same call reference as in I-frame (5)).

Test (b): Terminals polling using last I-frame

Expected sequence:

Tester	Terminal
1. (SAPI,TEI) I c N(S) N(R) p = 0	.
.....>	.
2. (SAPI,TEI) RR r N(R) f = 0	2
<.....	.
3. (SAPI,TEI) I c N(S) N(R) p = 0	3
<.....	.
Wait for expiry of T200	4 Terminal enters Timer Recovery condition
5. (SAPI,TEI) I c N(S) N(R) p = 0	.
.....>	This frame NOT to ack -nowledge frame (4)
6. (SAPI,TEI) RR r N(R) f = 0	6
<.....	.
Wait for expiry of T200	7
8. (SAPI,TEI) RR r N(R) f = 1	.
.....>	This frame acknowledges frame (4 (or 7))
9. (SAPI,TEI) I c N(S) N(R) p = 0	9
<.....	.
10. (SAPI,TEI) RR r N(R) f = 0	.
.....>	.

Wait at least T200 s

Precondition: the terminal should be in the MF established state.

Frame content to terminal:

- 1, An "n" octet I-frame (SAPI = 0, TEI = Current TEI) c = 1, p = 0.
Layer 3 content - RELEASE.
- 5, An "n" octet I-frame (SAPI = 0, TEI = Current TEI) c = 1, p = 0.
Layer 3 content - RELEASE (new call reference).
- 8, A 4 octet RR-frame (SAPI = 0, TEI = Current TEI) r = 0, f = 1.
- 10, A 4 octet RR-frame (SAPI = 0, TEI = Current TEI) r = 0, f = 0.

Frame content from terminal:

- 2, A 4 octet RR-frame (SAPI = 0, TEI = Current TEI) r = 1, f = 0.
- 3, An "n" octet I-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 0.
Layer 3 content - RELEASE COMPLETE (same call reference as in frame (1)).
- 4,7, An "n" octet I-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 1.
Layer 3 content - RELEASE COMPLETE (same call reference as in frame (1)).
N(R) shall be incremented between frames 4 and 7 by the reception of I-frame (5)
- 6, A 4 octet RR-frame (SAPI = 0, TEI = Current TEI) r = 1, f = 0.

9, An "n" octet I-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 0.
 Layer 3 content - RELEASE COMPLETE (same call reference as in I-frame (5)).

Refer to: ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclauses 5.6.2, 5.6.3 and 5.6.7.

A.2.2.3 Layer 2 disconnection

A.2.2.3.1 Normal layer 2 disconnection

Purpose: tests the normal data link disconnection sequences.

Expected sequence:

	Tester		Terminal
	1	• (SAPI, TEI) DISC c p = 1	•
		•>.....	•
		• (SAPI, TEI) UA r f = 1	• 2
		•<.....	•
		•	•
2nd sequence	3	• (SAPI, TEI) DISC c p = 1	•
verifies link		•>.....	•
disconnection		• (SAPI, TEI) DM r f = 1	• 4
		•<.....	•

Wait at least T200 to ensure T200 is stopped.

Precondition: the data link should be in the MF established state.

Frame content to terminal:

1,3, A 3 octet DISC-frame (SAPI = 0, TEI = Current TEI) c = 1, p = 1.

Frame content from terminal:

2, A 3 octet UA-frame (SAPI = 0, TEI = Current TEI) r = 1, f = 1.
 Should be transmitted in less than T200 s from the reception of the DISC frame.

4, A 3 octet DM-frame (SAPI = 0, TEI = Current TEI) r = 1, f = 1.

NOTE: This sequence may be used (when layer 3 in the idle state) to cause the terminal to enter the TEI assigned state from the MF established state.

Refer to: ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclauses 3.6.4, 3.6.9, 3.6.10 and 5.5.3.2.

A.2.2.4 Link failure

A.2.2.4.1 Frame Check Sequence (FCS) check

Purpose: tests the layer 2 FCS check mechanism.

Expected sequence: transmission of a frame containing FCS error should not be accepted by the terminal.

Tester	Terminal
1	
• (SAPI,TEI) RR c N(R) p = 1	•
•>	•
• (SAPI,TEI) RR r N(R) f = 1	• 2
•<	•
•	•
3	
• (SAPI,TEI) I c N(S) N(R) p = 0	• Frame to
•	• be sent
•>	• with
•	• invalid
•	• FCS
•	•
4	
• (SAPI,TEI) RR c N(R) p = 1	•
•>	•
• (SAPI,TEI) RR r N(R) f = 1	• 5
•<	•
•	•

The first poll sequence confirms the current setting of V(R) in the terminal. There should be no response from the terminal to the received I-frame. The second poll sequence should confirm there has been no change to the value of V(R) as a result of receiving the frame.

Precondition: the data link should be in the MF established state.

Frame content to terminal:

- 1,4, 4 octet RR-frame c = 1, p = 1.
- 3, An "n" octet I-frame (SAPI = 0, TEI = Current TEI) c = 1, p = 0.
 Layer 3 content - RELEASE.

Frame content from terminal:

- 2,5, 4 octet RR-frame (SAPI = 0, TEI = Current TEI) r = 1, f = 1.

Refer to: ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclauses 2.7 and 2.9.

A.2.2.4.2 I-frame loss (terminal to ET).

Purpose: tests the layer 2 recovery mechanism of the TE in the event of I-frame loss.

Expected sequence: outstanding acknowledgement causes the layer 2 timer T200 to expire prompting polling by either:

- a) an RR command frame; or
- b) the last transmitted I-frame.

Test (a) Polling using RR command frame

Tester	Terminal
1. (SAPI, TEI) I c N(S) N(R) p = 0	•
.....>	•
• (SAPI, TEI) RR r N(R) f = 0	• 2
<.....	•
Do not acknowledge this frame and do not update V(R)	• (SAPI, TEI) I c N(S) N(R) p = 0
	<.....
	•
	• (SAPI, TEI) RR c N(R) p = 1
	<.....
Allow second expiry of T200	•
	• (SAPI, TEI) RR c N(R) p = 1
	<.....
	•
	6. (SAPI, TEI) RR r N(R) f = 1
>
	•
Check N(S) and update V(R)	• (SAPI, TEI) I c N(S) N(R) p = 0
	<.....
	8. (SAPI, TEI) RR r N(R) f = 0
>

T200 expires
T200 expires
N(R) should confirm I-frame loss

Test (b) Polling using last I-frame

Tester	Terminal
1. (SAPI, TEI) I c N(S) N(R) p = 0	•
.....>	•
• (SAPI, TEI) RR r N(R) f = 0	• 2
<.....	•
Do not acknowledge this frame and do not update V(R)	• (SAPI, TEI) I c N(S) N(R) p = 0
	<.....
	•
	• (SAPI, TEI) I c N(S) N(R) p = 1
	<.....
Allow second expiry of T200	•
	• (SAPI, TEI) I c N(S) N(R) p = 1
	<.....
Check N(S) and update V(R)	11. (SAPI, TEI) RR r N(R) f = 1
>
	•
	12. (SAPI, TEI) I c N(S) N(R) p = 0
>
	• (SAPI, TEI) RR r N(R) f = 0
	<.....
	• (SAPI, TEI) I c N(S) N(R) p = 0
	<.....
	15. (SAPI, TEI) RR r N(R) f = 0
>

9 T200 expires
10 T200 expires
N(R) should confirm frame delivery

Precondition: the data link should be in the MF established state. V(S) and V(R) should be reset to 0 by performing test A.2.2.1.5.

Frame content to terminal:

- 1,12, An "n" octet I-frame (SAPI = 0, TEI = Current TEI) c = 1, p = 0.
 Layer 3 content - RELEASE.
- 6,11, 4 octet RR-frame (SAPI = 0, TEI = Current TEI) r = 0, f = 1.
- 8,15, 4 octet RR-frame (SAPI = 0, TEI = Current TEI) r = 0, f = 0.

NOTE: The sending of this frame is to return the terminal to a stable state and is not part of the test.

Frame content from terminal:

- 2,13, 4 octet RR-frame (SAPI = 0, TEI = Current TEI) r = 1, f = 0.
- 3,7,14, An "n" octet I-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 0.
 Layer 3 content - RELEASE COMPLETE
 Frame 3 and 9 to be ignored simulating loss of the frame.
- 4,5, 4 octet RR-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 1.
- 9,10, An "n" octet I-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 1.
 Layer 3 content - RELEASE COMPLETE.

All responses should be received/made within T200 s of their initiating frame.

Refer to: ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclauses 5.6.1, 5.6.2, 5.6.3, 5.6.7 and 5.8.3.

A.2.2.4.3 RR response frame loss (ET to terminal)

Purpose: test layer 2 recovery mechanism in the event of RR-frame loss.

Expected sequence: loss of RR response frame allows layer 2 timer T200 to expire prompting polling by either:

- Test a) Polling using RR command frame;
- Test b) Polling using last I-frame. Polling using last I-frame.

Test a) Polling using RR command frame.

Tester		Terminal
1 • (SAPI,TEI) I c N(S) N(R) p = 0	•	•
•	•	•
• (SAPI,TEI) RR r N(R) f = 0	•	•2
•<•	•	•
•	•	•
Accept this frame update	• (SAPI,TEI) I c N(S) N(R) p = 0	•3
V(R) but make	•<•	•
no response	•	•
•	•	•
•	• (SAPI,TEI) RR c N(R) p = 1	•4 T200 expires
•	•<•	•
5 • (SAPI,TEI) RR r N(R) f = 1	•	• N(R) should
•	•	• confirm
•	•	• I-frame (3)
		• delivery

Wait at least T200 s

Test b) Polling using last I-frame

Tester	Terminal
6	• (SAPI, TEI) I c N(S)N(R) p=0
	•>
	• (SAPI,TEI) RR r N(R) f=0
	•<
Accept this frame update	• (SAPI,TEI) I c N(S)N(R) p=0
V(R) but make no response	•<
	•
	•
	• (SAPI,TEI) I c N(S) N(R)p=1
	•<
10	• (SAPI,TEI) REJ r N(R) f = 1
	•>
	•

Wait at least T200 s

Precondition: the data link should be in the MF established state. V(S) and V(R) should be reset to 0 by performing test A.2.2.1.5.

Frame content to terminal:

- 1,6, An "n" octet I-frame (SAPI = 0, TEI = Current TEI)c = 1, p = 0. Layer 3 content - RELEASE.
- 5, A 4 octet RR-frame (SAPI = 0, TEI = Current TEI) r = 0, f = 1.
- 10, A 4 octet REJ-frame (SAPI = 0, TEI = Current TEI) r = 0, f = 1.

Frame content from terminal:

- 2,7, A 4 octet RR-frame (SAPI = 0, TEI = Current TEI) r = 1, f = 0.
- 3,8, An "n" octet I-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 0. Layer 3 content - RELEASE COMPLETE.
- 4, A 4 octet RR-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 1.
- 9, An "n" octet I-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 1. Layer 3 content - RELEASE COMPLETE. Refer to: ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclauses 5.6.1, 5.6.2, 5.6.3, 5.6.4, 5.6.7 and 5.8.3.

A.2.2.4.4 RR response frame loss (terminal to ET)

Purpose: test layer 2 recovery mechanism in the event of RR-frame loss.

Expected sequence: Loss of RR response frame allows layer 2 timer T200 to expire prompting polling by either:

a) RR command frame; or

b) last transmitted I-frame.

(a) Polling using RR command frame

Covered by other test sequences.

(b) Polling using I command frame

	Tester		Terminal
	1	(SAPI,TEI) I c N(S) N(R) p = 0	
	>	
Ignore this frame		(SAPI,TEI) RR r N(R) f = 0	2
		<.....	
I-frame poll with same N(S) as frame 1	3	(SAPI,TEI) I c N(S) N(R) p = 1	
	>	
		(SAPI,TEI) REJ r N(R) f = 1	4
			N(R) should confirm I-frame (1) delivery
		<.....	

Precondition: the data link should be in the MF established state. V(S) and V(R) should be reset to 0 by performing test A.2.2.1.5.

Frame content to terminal:

1, An "n" octet I-frame (SAPI = 0, TEI = Current TEI) c = 1, p = 0.
Layer 3 content - RELEASE COMPLETE.

3, An "n" octet I-frame (SAPI = 0, TEI = Current TEI) c = 1, p = 1.
Layer 3 content - RELEASE COMPLETE.

Frame content from terminal:

2, 4 octet RR-frame (SAPI = 0, TEI = Current TEI) r = 1, p = 0.

4, 4 octet REJ-frame (SAPI = 0, TEI = Current TEI) r = 1, f = 1.

Refer to ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclauses 5.6.2, 5.6.3, 5.6.7, and 5.8.1.

A.2.2.5 Flow control

A.2.2.5.1 ET indicates "Receiver Not Ready"

Purpose: to ensure correct handling of peer busy conditions.

Expected sequence: after the ET has indicated its busy state the terminal should poll the ET for its current status at an interval of T200. Polling should end once the busy condition has been removed.

Tester	Terminal
1 • (SAPI,TEI) RNR r N(R) f = 0 •	•
•.....>•	•
• (SAPI,TEI) RR c N(R) p = 1 •	2 On each expiry
•	of T200
•<.....>•	•
3 • (SAPI,TEI) RNR r N(R) f = 1 •	Shall be made
•	within T200
•.....>•	•
•	•

During the busy condition transmit I-frame containing layer 3 RELEASE message. No I-frame should be received from the terminal until the busy condition is lifted.

4 • (SAPI,TEI) I c N(S) N(R) p=0 •	
•.....>•	
• (SAPI,TEI) RR r N(R) f=0 •	5
•<.....>•	

then

	• (SAPI,TEI) RR c N(R) p = 1 •	6
	•<.....>•	
a)	7 • (SAPI,TEI) RR r N(R) f = 1 •	Polling due to
	•	peer busy
	•.....>•	condition stops
	• (SAPI,TEI) I c N(S) N(R) p=0 •	8
	•<.....>•	
	9 • (SAPI,TEI) RR r N(R) f = 0 •	
	•.....>•	
	Wait for at least T200 s	

Alternatively if no RR poll outstanding.

	10 • (SAPI,TEI) RR r N(R) f = 0 •	Polling due to
	•	peer busy
	•.....>•	condition stops
b)	• (SAPI,TEI) I c N(S) N(R) p=0 •	11
	•<.....>•	
	12 • (SAPI,TEI) RR r N(R) f = 0 •	
	•.....>•	
	Wait for at least T200 s	

Frame content to terminal:

- 1, A 4 octet RNR-frame (SAPI = 0, TEI = Current TEI) r = 0, f = 0.
- 3, A 4 octet RNR-frame (SAPI = 0, TEI = Current TEI) r = 0 f = 1.
- 4, An "n" octet I-frame (SAPI = 0, TEI = Current TEI) c = 1, p = 0.
Layer 3 content - RELEASE.
- 7, A 4 octet RR-frame (SAPI = 0, TEI = Current TEI) r = 0, f = 1.
- 9,10,12, A 4 octet RR-frame (SAPI = 0, TEI = Current TEI) r = 0, f = 0.

Frame content from terminal:

- 2,6, A 4 octet RR-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 1.

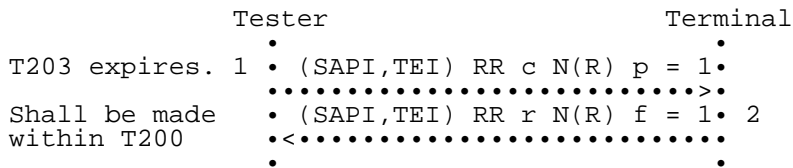
- 5, A 4 octet RR-frame (SAPI = 0, TEI = Current TEI) r = 1, f = 0.
- 8,11, An "n" octet I-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 0.
Layer 3 content - RELEASE COMPLETE.

Refer to: ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclauses 5.6.1, 5.6.2, 5.6.3, 5.6.5, 5.6.6, 5.6.7.

A.2.2.5.2 Link supervision

Purpose: tests the link supervision procedures used to verify the integrity of the data link during normal use.

Expected sequence:



Precondition: data link should be in the MF established state. Preferably layer 3 should be in a long term stable call state to prevent unsolicited disconnection.

Frame content to terminal:

- 1, A 4 octet RR-frame (SAPI = 0, TEI = Current TEI) c = 1, p = 1.

Frame content from terminal:

- 2, A 4 octet RR-frame (SAPI = 0, TEI = Current TEI) r = 1, f = 1.

Refer to: ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclause 3.6.6.

A.2.2.6 Layer 2 command collision

A.2.2.6.1 Terminal disconnects - ET initialises

Purpose: tests for correct action in the event of collision between mode setting commands. This test can only be applied to those terminals which disconnect the data link.

Expected sequence:

```

Tester                                     Terminal
.
. (SAPI,TEI) DISC c p = 1 . 1
.<.....>
2 . (SAPI,TEI) SABME c p = 1 .
. ....>
. (SAPI,TEI) DM r f = 1 . 3
.<.....>
. (SAPI,TEI) DISC c p = 1 . 4 T200 expires.
.<.....>
5 . (SAPI,TEI) UA r f = 1 . Terminal should
. . enter TEI
. ....> assigned state.
.

```

No further frames should be generated by the terminal.

```

After a period .
> T200 .
6 . (SAPI,TEI) DISC c p = 1 . Checks that the
. . terminal has
. . entered the TEI
. ....> . assigned state
. (SAPI,TEI) DM r f = 1 . 7
.<.....>
.

```

Precondition: the layer 3 entity in the terminal should be in the idle condition and the data link should be in the MF established state.

Frame contents to terminal:

- 2, A 3 octet SABME-frame (SAPI = 0, TEI = Current TEI) c = 1, p = 1.
- 5, A 3 octet UA-frame (SAPI = 0, TEI = Current TEI) r = 0, f = 1.
- 6, A 3 octet DISC-frame (SAPI = 0, TEI = Current TEI) c = 1, p = 1.

Frame content from terminal:

- 1,4, A 3 octet DISC-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 1.
- 3,7, A 3 octet DM-frame (SAPI = 0, TEI = Current TEI) r = 1, f = 1.

Response times:

- SABME "2" sent to terminal within T200,
- DM "3" received from terminal within T200,
- DISC "4" receive not before T200 from frame "1",
- DISC "6" sent to terminal not earlier than twice T200 from "4".

If the terminal has moved directly to the incorrect state having sent the DISC "1" frame then the SABME "2" shall cause the receipt of a UA-frame, r = 0, f = 1.

Refer to: ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclause 5.5.5.2.

A.2.2.7 Management procedures

A.2.2.7.1 TEI allocation

Purpose: tests the allocation of TEIs using management procedures and tests that the terminal shall perform TEI check on a check request message for a specific TEI value.

Expected sequence:

Tester	Terminal
• (SAPI,TEI) UI c [Id request]	• 1
<.....>	
2 • (SAPI,TEI) UI c [Id Assigned]	•
.....>	
3 • (SAPI,TEI) UI c [Id check request]	•
.....>	
• (SAPI,TEI) UI c [Id check response]	• 4
<.....>	
•	•

Precondition: terminal shall be in TEI unassigned state. This test only applies to terminals supporting automatic assignment procedures.

Frame content from terminal:

- 1, An 8 octet UI-frame (SAPI = 63, TEI = 127) c = 0, p = 0.
contents
- Reference Number
Identity Request
Action Indicator = 127.
- 4, An 8 octet UI-frame (SAPI = 63, TEI = 127) c = 0, p = 0.
contents
- Reference Number
Identity Check Response
Action Indicator = Current TEI.

Frame content to terminal:

- 2, An 8 octet UI-frame (SAPI = 63, TEI = 127) c = 1, p = 0.
contents
- Reference Number
Identity Assigned
Action Indicator = TEI to be assigned as "Current".
- 3, An 8 octet UI-frame (SAPI = 63, TEI = 127) c = 1, p = 0.
contents
- Empty octet (coded 0)
Identity Check Request
Action Indicator = Current TEI.

NOTE: SAPI = 63 for management procedures;
TEI = 127 for broadcast transmissions;
p bit set to 0 in all unnumbered frames.

Refer to: ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclauses 5.3.1, 5.3.2.

A.2.2.7.2 TEI allocation denied

Purpose: to test the terminal's response to a TEI denied frame.

Expected sequence:

Tester	Terminal
• (SAPI,TEI) UI c [Id request]	• 1
<.....>	•
2 • (SAPI,TEI) UI c [Id denied]	•
.....>	•
• (SAPI,TEI) UI c [Id request]	• 3 T202
<.....>	• expires.
4 • (SAPI,TEI) UI c [Id assigned]	•
.....>	•
•	•

Precondition: terminal shall be in TEI unassigned state. This test only applies to terminals supporting automatic assignment procedures.

Frame content from terminal:

1,3, An 8 octet UI-frame (SAPI = 63, TEI = 127) c = 0, p = 0
 contents

Reference Number
 Identity Request
 Action Indicator = 127.

Frame content to terminal:

2, An 8 octet UI-frame (SAPI = 63, TEI = 127) c = 1, p = 0.
 contents

Reference Number
 Identity Denied
 Action indicator = 127 (No TEIs available).

4, An 8 octet UI-frame (SAPI = 63, TEI = 127) c = 1, p = 0.
 contents

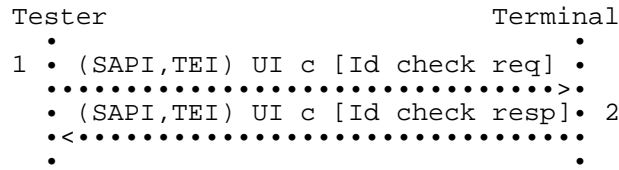
Reference Number
 Identity Assigned
 Action Indicator = TEI to be assigned as "Current".

Refer to: ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclauses 5.3.1, 5.3.2, 5.3.2.1.

A.2.2.7.3 TEI validation

Purpose: checks the terminal shall perform TEI check on request from ET.

Expected sequence:



Precondition: the data link should be in the TEI assigned state.

Frame content to terminal:

- 1, An 8 octet UI-frame (SAPI = 63, TEI = 127) c = 1, p = 0.
 contents -
 Reference Number
 Identity Check Request
 Action indicator = 127.

Frame content from terminal:

- 2, An 8 octet UI-frame (SAPI = 63, TEI = 127) c = 0, p = 0
 contents -
 Reference Number
 Identity Check Response
 Action Indicator = Current TEI(s).

The UI-frame from the terminal containing the "Id" response with all TEIs allocated listed in the action indicator could alternatively be implemented as a series of UI-frames from the terminal, each containing an "Id" check response with a single TEI allocated value in the action indicator. This alternative response shall be considered as valid.

Refer to: ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclause 5.3.3.

A.2.2.7.4 Check N202

Purpose: check whether the IUT after N202 unsuccessful attempts to acquire a TEI value makes no further attempts.

Expected sequence:

Tester	Terminal
• (SAPI,TEI) UI c [Id request]	• 1
•<.....	•
• (SAPI,TEI) UI c [Id request]	• 2 T202
•<.....	• expires
• (SAPI,TEI) UI c [Id request]	• 3 T202
•<.....	• expires
No ID request	•

Precondition: terminal shall be in TEI unassigned state. This test only applies to terminals supporting automatic assignment procedures.

Frame content from terminal:

1,2,3, An 8 octet UI-frame (SAPI = 63, TEI = 127) c = 0, p = 0.
 contents

Reference Number
 Identity Request
 Action Indicator = 127.

NOTE: SAPI = 63 for management procedures;
 TEI = 127 for broadcast transmissions;
 p bit set to 0 in all unnumbered frames.

Refer to: ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclause 5.3.2.1.

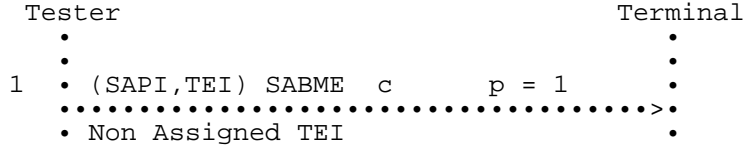
A.2.2.8 Provocative testing

A.2.2.8.1 TEI values

A.2.2.8.1.1 Frame transmission using an invalid TEI value

Purpose: ensures that the terminal does not accept frames containing an invalid address and that, on receipt of such a frame, it takes no action.

Expected sequence:



Precondition: the terminal may have assigned a TEI. If a TEI is assigned then the data link associated with that TEI may be in either the TEI assigned or multiple frame established state.

Frame contents to terminal:

1, A 3 octet SABME-frame (SAPI = 0, TEI = Non Assigned TEI) c = 1, p = 1.

There should be no response from the terminal for any TEI value not assigned to that terminal.

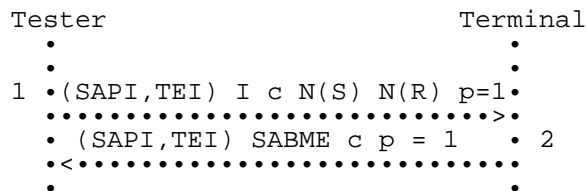
Refer to: ETS 300 125 [2], Part 1, of CCITT Recommendation Q.920 [13], subclause 5.2.

A.2.2.8.2 Frame transmission with incorrect C/R values

Purpose: tests the terminal's response to a frame with an erroneous C/R bit value.

A.2.2.8.2.1 I-frame with C bit set to zero

Expected sequence:



Precondition: data link should be in the MF established state.

Frame content to terminal:

1, An "n" octet I-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 1.
 Layer 3 content - RELEASE

Frame content from terminal:

2, An SABME (SAPI = 0, TEI = Current TEI) c = 0, p = 1.

Refer to: ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclause 3.6.1.

A.2.2.8.2.2 SABME-frame with C bit set to zero

Expected sequence:

```

Tester                                     Terminal
  .                                         .
1 . (SAPI,TEI) SABME c = 0 p = 1          .
  .....>                                  .
Test should ensure                          .
no response received.                       .

```

Precondition: data link should be in the TEI assigned state.

Frame content to terminal:

1, 3 octet SABME-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 1.

Refer to: ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclauses 3.3.2 and 5.8.5.

A.2.2.8.3 Receipt of modulo 8 frames during modulo 128 operations

Purpose: ensures the terminal shall not accept a modulo 8 supervisory frame during modulo 128 operation.

Expected sequence:

```

Tester                                     Terminal
  .                                         .
  .                                         .
1 . (SAPI,TEI) RR c N(R) p = 1           .
  .....>                                  .
  . (SAPI,TEI) SABME c p = 1             . 2
  <.....                                  .
  .                                         .

```

Precondition: the data link should be in the MF established state (modulo 128). V(S) and V(R) shall be reset to 0 by performing test A.2.2.1.1.

Frame contents to terminal:

1, A 3 octet frame containing a LAPB RR control field (SAPI = 0, TEI = Current TEI) c = 1, p = 1.

This is coded as follows:

```

.....
. 0 . 0 . 0 . 0 . 0 . 0 . 1 . 0 . 02H SAPI
.....
. X . X . X . X . X . X . X . 1 . XXH Current
..... TEI value
. .... N(R) .... .1(P) . 0 . 0 . 0 . 1 . X1H RR
.....

```

Frame content from terminal:

2, An SABME (SAPI = 0, TEI = Current TEI) c = 0, p = 1.

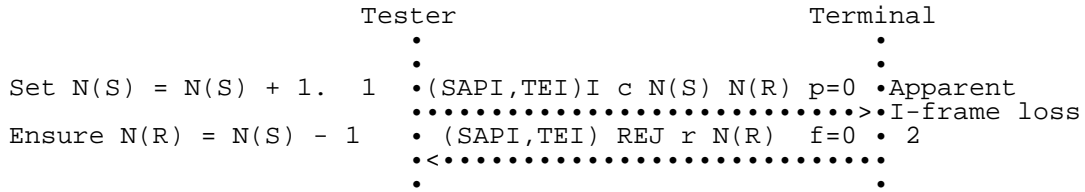
Refer to: ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclauses 5.7, 5.8.5, 3.6.1.

A.2.2.8.4 Reject frame operations

A.2.2.8.4.1 Out of sequence I-frame

Purpose: ensures that the terminal shall transmit a REJ-frame in response to an out of sequence I-frame.

Expected sequence:



Precondition: the data link should be in the MF established state. V(S) and V(R) should be reset to 0 by performing test A.2.2.1.5.

Frame contents to terminal:

- 1, An "n" octet I-frame (SAPI = 0, TEI = Current TEI) c = 1, p = 0.
Layer 3 content - RELEASE.

Frame content from terminal:

- 2, 4 octet REJ-frame (SAPI = 0, TEI = Current TEI) r = 1, f = 0.

Refer to: ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclauses 3.6.7 and 5.8.1

A.2.2.8.4.2 Forced I-frame retransmission

Purpose: ensures that on receipt of a REJ-frame the terminal retransmits the appropriate I-frame.

Expected sequence:

Tester	Terminal
1 • (SAPI,TEI) I c N(S) N(R) p = 0	•
.....>	•
• (SAPI,TEI) RR r N(R) f = 0	• 2
<.....	•
• (SAPI,TEI) I c N(S) N(R) p = 0	• 3
<.....	•
4 • (SAPI,TEI) REJ r N(R) f = 0	• N(R) should not
.....>	confirm I-frame
•	• (3) delivery
• (SAPI,TEI) I c N(S) N(R) p = 0	• 5
<.....	•
6 • (SAPI,TEI) RR r N(R) f = 0	•
.....>	•
•	•

Precondition: the data link should be in the MF established state. V(S) and V(R) should be reset to 0 by performing test A.2.2.1.5.

Frame content to terminal:

- 1, An "n" octet I-frame (SAPI = 0, TEI = Current TEI) c = 1, p = 0.
Layer 3 content - RELEASE.
- 4, A 4 octet REJ-frame (SAPI = 0, TEI = Current TEI) r = 0, f = 0.
- 6, A 4 octet RR-frame (SAPI = 0, TEI = Current TEI) r = 0, f = 0.

NOTE: The sending of this frame is to return the terminal to a stable state and is not part of the test.

Frame content from terminal:

- 2, A 4 octet RR-frame (SAPI = 0, TEI = Current TEI) r = 1, p = 0.
- 3, 5, An "n" octet I-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 0.
Layer 3 content - RELEASE COMPLETE.
The terminal should not wait for the expiry of T200 before the retransmission of I-frame (5).

Refer to: ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclause 5.6.4.

A.2.2.8.4.3 Forced I-frame retransmission during timer recovery operation

Purpose: ensures that on receipt of a REJ-frame during the timer recovery condition the terminal retransmits the appropriate I-frame.

Expected sequence:

Tester		Terminal
1	(SAPI,TEI) I c N(S) N(R) p = 0	
>	
	(SAPI,TEI) RR r N(R) f = 0	2
	<.....	
	(SAPI,TEI) I c N(S) N(R) p = 0	3
	<.....	
	Wait for T200 to expire	
	- terminal polls either	
	(SAPI,TEI) I c N(S) N(R) p = 1	4
	<.....	
	or	
	(SAPI,TEI) RR c N(R) p = 1	5
	<.....	
	then	
6	(SAPI,TEI) REJ r N(R) f = 1	N(R) should not
>	confirm I-frame
		(3) delivery
	(SAPI,TEI) I c N(S) N(R) p = 0	7
	<.....	
8	(SAPI,TEI) RR r N(R) f = 0	
>	

Precondition: the data link should be in the MF established state. V(S) and V(R) should be reset to 0 by performing test A.2.2.1.5.

Frame content to terminal:

- | | |
|----|--|
| 1, | An "n" octet I-frame (SAPI = 0, TEI = Current TEI) c = 1, p = 0.
Layer 3 content - RELEASE. |
| 6, | A 4 octet REJ-frame (SAPI = 0, TEI = Current TEI) r = 0, f = 1. |
| 8, | A 4 octet RR-frame (SAPI = 0, TEI = Current TEI) r = 0, f = 0. |

NOTE: The sending of this frame is to return the terminal to a stable state and is not part of the test.

Frame content from terminal:

- | | |
|-------|--|
| 2, | A 4 octet RR-frame (SAPI = 0, TEI = Current TEI) r = 1, p = 0. |
| 3, 7, | An "n" octet I-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 0.
Layer 3 content - RELEASE COMPLETE.
The terminal should not wait for the expiry of T200 before the retransmission of I-frame (7). |
| 4, | An "n" octet I-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 1.
Layer 3 content - RELEASE COMPLETE. |
| 5, | A 4 octet RR-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 1. |

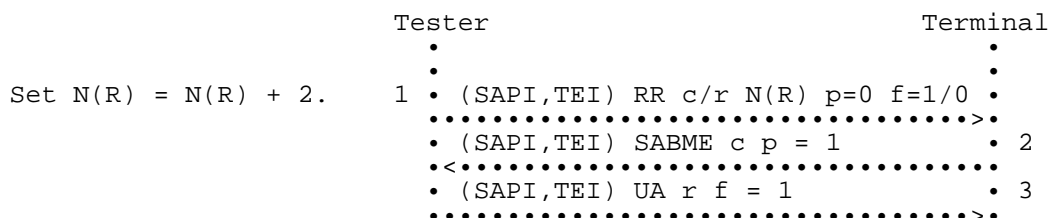
Refer to: ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclause 5.6.4.

A.2.2.8.5 Error in control field parameters

A.2.2.8.5.1 Invalid N(R) value

Purpose: ensures that the terminal resets the data link on receipt of a frame with an invalid N(R) value. (N(R) is valid in the range $V(A) \leq N(R) \leq V(S)$).

Expected sequence:



Precondition: the data link should be in the MF established state. V(S) and V(R) should be reset to 0 by performing test A.2.2.1.5.

Frame contents:

- 1, 4 octet RR-frame (SAPI = 0, TEI = Current TEI)
 Test with values of:
 - (a) c = 1, p = 0;
 - (b) r = 0, f = 1;
 - (c) r = 0, f = 0.
- 2, 3 octet SABME-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 1.
- 3, 3 octet UA-frame (SAPI = 0, TEI = Current TEI) r = 0, f = 1.

NOTE: The sending of this frame is to return the terminal to a stable state and is not part of the test.

Refer to: ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclauses 3.5.2.6 and 5.8.5.

A.2.2.8.6 Receipt of unexpected frames whilst in the TEI - assigned state

A.2.2.8.6.1 Receipt of a DISC-frame

Purpose: ensures the correct response on receipt of a DISC command by the terminal.

Expected sequence:

Tester	Terminal
•	•
•	•
1 • (SAPI,TEI) DISC c p = 1	•
•.....>	•
• (SAPI,TEI) DM r f = 1	• 2
•<.....>	•
•	•

Precondition: the data link should be in the TEI assigned state.

Frame content to the terminal:

1, A 3 octet DISC-frame (SAPI = 0, TEI = Current TEI) c = 1, p = 1.

Frame content from terminal:

2, A 3 octet DM-frame (SAPI = 0, TEI = Current TEI) r = 1, f = 1.

Refer to: ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclause 5.5.4.

A.2.2.8.6.2 Receipt of "I" or supervisory frames

Purpose: ensures that the terminal shall not accept any "I" or supervisory frames whilst in the TEI assigned state and that it shall discard their contents.

Expected sequence:

Tester	Terminal
•	•
•	•
1 • (SAPI,TEI) I c N(S) N(R) p = 0	•
•.....>	•
Ensure no response. After 2 x T200.	•
2 • (SAPI,TEI) RR c N(R) p = 1	•
•.....>	•
Ensure no response After 2 x T200	•
3 • (SAPI,TEI) RNR c N(R) p = 1	•
•.....>	•
Ensure no response	•

Precondition: the data link should be in the TEI assigned state.

Frame contents:

1, An "n" octet I-frame (SAPI = 0, TEI = Current TEI) c = 1, p = 0.
 Layer 3 content - RELEASE.

2, A 4 octet RR-frame (SAPI = 0, TEI = Current TEI) c = 1, p = 1.

3, A 4 octet RNR-frame (SAPI = 0, TEI = Current TEI) c = 1, p = 1.

Refer to: ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclause 5.5.4.

A.2.2.8.7 Receipt of unexpected frames whilst in the TEI-unassigned state

Purpose: ensures that the terminal shall not accept frames, except those required for TEI assignment, whilst in the TEI unassigned state. This test shall only be carried out on those terminals implementing the TEI unassigned state.

Expected sequence:

	Tester	Terminal
	•	•
	•	•
	1	•
	• (SAPI,TEI) I c N(S) N(R) p = 0	•
	•	•
Ensure no response.		•
After 2 x T200.	2	•
	• (SAPI,TEI) RR N(R) c p = 1	•
	•	•
Ensure no response.		•
After 2 x T200.	3	•
	• (SAPI,TEI) UI c p = 0	•
	•	•
Ensure no response.		•
After 2 x T200.	4	•
	• (SAPI,TEI) DISC c p = 1	•
	•	•
Ensure no response.		•
After 2 x T200.	5	•
	• (SAPI,TEI) SABME c p = 1	•
	•	•
Ensure no response.		•

Precondition: the data link layer should be in the TEI unassigned state.

Frame contents:

- 1, An "n" octet I-frame (SAPI = 0, TEI = Any TEI except 127) c = 1, p = 0. Layer 3 content - RELEASE.
- .2, 4 octet RR-frame (SAPI = 0, TEI = Any TEI except 127) c = 1, p = 1.
- 3, An "n" octet UI-frame (SAPI = 0, TEI = Any TEI except 127) c = 1, p = 0.
- 4, A 3 octet DISC-frame (SAPI = 0, TEI = Any TEI except 127) c = 1, p = 1.
- 5, A 3 octet SABME-frame (SAPI = 0, TEI = Any TEI except 127) c = 1, p = 1.

Refer to: ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclause 5.5.4.

A.2.2.8.8 Link reset provoking conditions

NOTE: FRMR-frame superseded by resetting the data link as response to error condition at layer 2.

A.2.2.8.8.1 Receipt of a command or response field that is undefined or not implemented

Purpose: ensures the terminal shall reset the data link on receipt of an undefined or not implemented frame.

Expected sequence:

```

Tester                                     Terminal
.
.
1 . (SAPI,TEI) Invalid control .
.....>.
. (SAPI,TEI) SABME c p = 1 . 2
.<.....
.

```

Precondition: the data link should be in the MF established state. V(S) and V(R) should be reset to 0 by performing test A.2.2.1.5.

Frame contents to terminal:

1, 3 octet INVALID-frame (SAPI = 0, TEI = Current TEI) c = 1, p = 1.

```

.....
. 0 . 0 . 0 . 0 . 0 . 0 . 1 . 0 . 02H SAPI
.....
. X . X . X . X . X . X . X . 1 . XXH Chosen
..... TEI value
. - Random invalid control field values - . 1 . XXH invalid
..... octet

```

and

1, 4 octet INVALID-frame (SAPI = 0, TEI = Current TEI) c = 1, p = 1.

```

.....
. 0 . 0 . 0 . 0 . 0 . 0 . 1 . 0 . 02H SAPI
.....
. X . X . X . X . X . X . X . 1 . XXH Chosen
..... TEI value
. - Random invalid control field values - . 1 . XXH invalid
..... octet
. X . X . X . X . X . X . X . 1 . XXH
.....

```

Frame contents from terminal:

2, 3 octet SABME-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 1.

Refer to: ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclauses 3.6.11 and 5.8.5.

A.2.2.8.8.2 Frame containing a not permitted information field or a supervisory or unnumbered frame of incorrect length

A.2.2.8.8.2.1 DISC-frame with information field

Purpose: ensures the terminal shall reject an unnumbered frame containing an information field which is not permitted.

Expected sequence:

Tester	Terminal
•	•
•	•
1 • (SAPI,TEI) DISC c = 1 p = 1 •	•
•>.....>•	•
• with information field •	•
•	•
• (SAPI,TEI) SABME c p=1 •2	•
•<.....<•	•
•	•

Precondition: the data link should be in the MF established state.

Frame contents to terminal:

- 1, A 6 octet DISC-frame (SAPI = 0, TEI = Current TEI) c = 1, p = 1.
 In addition to the normal three octets of the DISC-frame three additional octets, with random content, should also be transmitted in the same frame.

Frame content from terminal:

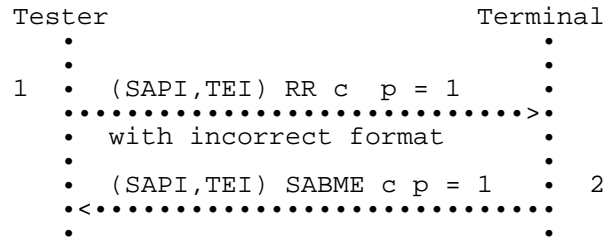
- 2, A 3 octet SABME-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 1.

Refer to: ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclauses 3.6.11, 5.8.1, 5.8.5 and 5.9.

A.2.2.8.8.2 RR-frame with additional octet

Purpose: ensures the terminal shall reject a supervisory frame of incorrect length.

Expected sequence:



Precondition: the data link should be in the MF established state.

Frame contents to terminal:

- 1, A 5 octet RR-frame (SAPI = 0, TEI = Current TEI) c = 1, p = 1.
 An additional octet, having a random value, should also be transmitted in this frame.

Frame content from terminal:

- 2, 3 octet SABME-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 1.

Refer to: ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclauses 3.6.11 and 5.8.5.

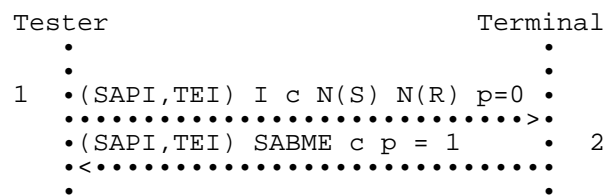
A.2.2.8.8.3 Receipt of an invalid N(R) value

Covered by test A.2.2.8.5.

A.2.2.8.8.4 Receipt of an I-frame which exceeds the maximum number of octets

Purpose: ensures the terminal shall reject an I-frame whose information field exceeds 260 octets.

Expected sequence:



Precondition: the data link should be in the MF established state. V(S) and V(R) should be reset to 0 by performing test A.2.2.1.5.

Frame contents from terminal:

- 1, An I-frame (SAPI = 0, TEI = Current TEI) c = 1, p = 0.
 The information field contents to be more than 260 octets of arbitrary data.

Frame contents from terminal:

- 2, 3 octet SABME-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 1.

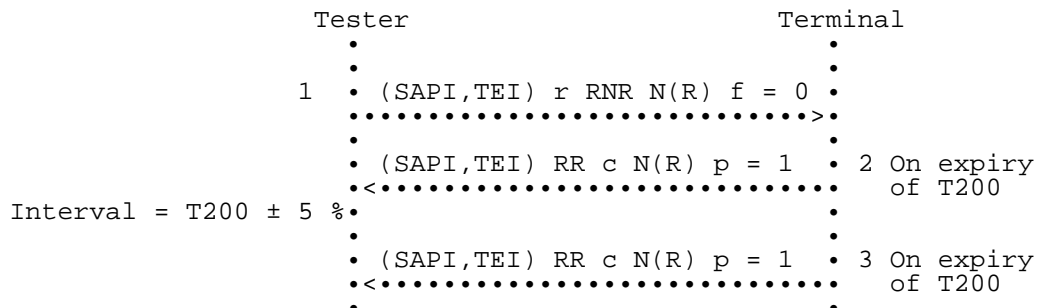
Refer to: ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclauses 3.6.11 and 5.8.5.

A.2.2.9 Layer 2 timer and transmission counter tests

A.2.2.9.1 T200, time between retransmission of a frame

Purpose: ensures T200 is within the allowed tolerance of its value of 1 second ($\pm 5\%$).

Expected sequence:



Precondition: the data link layer should be in the MF established state.

Frame contents to terminal:

1, A 4 octet RNR-frame (SAPI = 0, TEI = Current TEI) r = 0, f = 0.

Frame content from terminal:

2,3 A 4 octet RR-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 1.

Refer to: ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclause 5.9.1.

A.2.2.9.2 N200, maximum number of retransmissions of a frame

Purpose: ensures the correct value of N200, the maximum number of (retransmissions of a frame (default value 3)).

Expected sequence:

	Tester		Terminal
	•		•
	•		•
	1	• (SAPI,TEI) RNR r N(R) f = 0	•
		•<.....>	
	•••	• (SAPI,TEI) RR c N(R) p = 1	•2
		•<.....>	on expiry
count number of	•	• (SAPI,TEI) RR c N(R) p = 1	•3
polling frames.	•	•<.....>	of T200
	•	• (SAPI,TEI) RR c N(R) p = 1	•4
	•••	•<.....>	on expiry
			of T200
Ensure no further	•		•
polling frames received	•	data link reset will	•
	•	now occur	•
	•		•

Precondition: the data link layer should be in the MF established state.

Frame contents to terminal:

1, A 4 octet RNR-frame (SAPI = 0, TEI = Current TEI) r = 0, f = 0.

Frame content from terminal:

2,3,4, A 4 octet RR-frame (SAPI = 0, TEI = Current TEI) c = 0, p = 1.

Refer to: ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclause 5.9.2.

Annex B (informative): Example of information to be provided by the apparatus supplier

B.1 Introduction

This annex is provided for information only. The information to be provided by the apparatus supplier concerning the terminal equipment to be tested against the requirements specified in this ETS is a matter between the apparatus supplier and the testing house carrying out the tests. However, this annex gives examples of the type of information which a testing house may require in order to carry out the tests specified in this ETS.

B.2 Information to be provided by the apparatus supplier

Two kinds of information are required from the apparatus supplier:

- information with respect to the protocol: Protocol Implementation Conformance Statement (PICS);
- information with respect to the man-machine interface: Protocol Implementation eXtra Information for Testing (PIXIT).

B.2.1 Information with respect to a PICS

With respect to its operation under restricted power conditions, whether the TE is "designated", "non-designated" or switchable between these two conditions.

Whether the TE makes use of the connected/disconnected detector (see ETS 300 012 [1], Clause 9).

Whether the TE draws power from the network (power source 1) under normal and/or restricted power conditions.

Whether the TE uses automatic or non-automatic TEI administration. For TEs implementing non-automatic TEI administration, whether the TEI unassigned state is implemented.

Whether the TE invokes the TEI verify procedure.

The layer 2 SAPs supported by a TE.

The number of point-to-point data links a TE is able to support simultaneously.

The implemented values of layer 2 parameters defined in ETS 300 125 [2], Part 2, of CCITT Recommendation Q.921 [12], subclause 5.9.

Whether the TE invokes the data link layer supervision procedures (implementation of timer T203).

B.2.2 Information with respect to a PIXIT

If the TE is switchable between "designated" and "non-designated" the method of switching is specified.

If the TE uses non-automatic TEI assignment, the method of assigning the TEI in the TE.

In order to carry out some tests, the equipment under test must be maintained in the active state of the call. The supplier shall indicate what action, if any, is required to maintain the equipment under test in the active state (e.g. by the tester sending a specific bit pattern in the B-channel).

A brief description concerning the actions to be taken to establish and clear a call.

If any facility is implemented, a brief description concerning the activation and deactivation of this facility.

Annex C (informative): Test report format

This annex gives guidance on the format of the test report to be used by approved test laboratories when reporting on the results of testing equipment to the requirements specified in this recommendation. Text enclosed by [* and *] is comment, for guidance purposes only, and is not included in the real test report.

C.1 System test report for equipment tested against the requirements specified in ETS 300 153

C.1.1 Test laboratory

Name
Address
.....
.....
Telephone No.
Telex No.
Facsimile No.

C.1.2 Client information

Name
Address
.....
.....
Telephone No.
Telex No.
Facsimile No.

C.1.3 Product

Name
Version
Supplier's Name
Supplier's Address
.....
.....
Telephone No.
Telex No.
Facsimile No.

C.1.4 System conformance test report

Number
Date
Test Laboratory Manager
Signature

[* Name *]
[* Signature *]

C.2 Test conditions

The environmental conditions under which the equipment was tested were as follows:-

Temperature [* value *] °C
Relative humidity [* value *] %
Air Pressure [* value *] kPa
[* any other environmental conditions including voltage and frequency of power supply, if equipment under test uses power supplied from a source within the laboratory (see subclause 4.7 of this ETS *)]

[* If the environmental conditions were changed during the execution of the tests, this section of the report should indicate the range of values for the various environmental parameters under which the tests were performed and the precise values under which a given test was performed should be specified in the detailed test report - see NOTE *]

C.3 System report summary

[* For layers 1 and 2 of the D-channel protocol, EMC, safety and protection, a summary of the tests and conformance status of the product is required. *]

C.3.1 Layer 1 test report summary

Item Under Test Identifiers	[* Name and version number *]
Protocol Standard	[* Reference Number *]
PICS	[* Reference *]
PIXIT	[* Reference *]
Protocol Conformance Test Report	[* reference - see NOTE *]
Date	[* of Protocol Conformance Test Report *]
Test Method	[* Abstract Test Method used *]
Abstract Test Suite	[* reference *]
Real Test System	[* Name, Version Number *]

Conformance status:

Statically Conforming	[* Yes/No *]
Dynamically Conforming	[* Yes/No *]
Test Cases Run	[* Number *]
Test Cases Passed	[* Number *]
Test Cases Failed	[* Number *]

C.3.2 Layer 2 test report summary

Item Under Test Identifiers	[* Name and version number *]
Protocol Standard	[* Reference Number *]
PICS	[* Reference *]
PIXIT	[* Reference *]
Protocol Conformance Test Report	[* reference - see NOTE *]
Date	[* of Protocol Conformance Test Report *]
Test Method	[* Abstract Test Method used *]
Abstract Test Suite	[* reference *]
Real Test System	[* Name, Version Number *]

C.3.3 EMC

Item Under Test Identifiers	[* Name and version number *]
EMC Standard	[* Reference Number *]
PICS	[* Reference *]
PIXIT	[* Reference *]
Conformance Test Report	[* reference - see NOTE *]
Date	[* of Conformance Test Report *]
Test Method	[* Abstract Test Method used *]
Abstract Test Suite	[* reference *]
Real Test System	[* Name, Version Number *]

Conformance status:

Statically Conforming	[* Yes/No *]
Dynamically Conforming	[* Yes/No *]
Test Cases Run	[* Number *]
Test Cases Passed	[* Number *]
Test Cases Failed	[* Number *]

C.3.4 Safety

Item Under Test Identifiers	[* Name and version number *]
Safety Standard	[* Reference Number *]
PICS	[* Reference *]
PIXIT	[* Reference *]
Conformance Test Report	[* reference - see NOTE *]
Date	[* of Conformance Test Report *]
Test Method	[* Abstract Test Method used *]
Abstract Test Suite	[* reference *]
Real Test System	[* Name, Version Number *]

Conformance status:

Statically Conforming	[* Yes/No *]
Dynamically Conforming	[* Yes/No *]
Test Cases Run	[* Number *]
Test Cases Passed	[* Number *]
Test Cases Failed	[* Number *]

C.3.5 Protection

Item Under Test Identifiers	[* Name and version number *]
EMC Standard	[* Reference Number *]
PICS	[* Reference *]
PIXIT	[* Reference *]
Conformance Test Report	[* reference - see NOTE *]
Date	[* of Conformance Test Report *]
Test Method	[* Abstract Test Method used *]
Abstract Test Suite	[* reference *]
Real Test System	[* Name, Version Number *]

Conformance status:

Statically Conforming	[* Yes/No *]
Dynamically Conforming	[* Yes/No *]
Test Cases Run	[* Number *]
Test Cases Passed	[* Number *]
Test Cases Failed	[* Number *]

C.4 Summary of error report

Detailed Error Report	[* reference - see NOTE *]
Date	[* of Error Report *]

[* A summary of the errors when the equipment was tested against the requirements specified in this recommendation should be given here. If there were no errors then this should be explicitly stated in this part of the test report.
*]

C.5 Summary of particular events

Detailed Report of Particular Events	[* reference - see NOTE *]
Date	[* of Particular Events Report *]

[* A summary of any particular events which occurred during test execution should be given here. If there were no particular events then this should be explicitly stated in this part of the report *]

[* NOTE - Detailed Test reports for layers 1 and 2 protocols, EMC, safety and protection together with a detailed Error and Particular Event report should be prepared by the test laboratory. The purpose of this system test report is to provide sufficient information to indicate to the approval authority whether or not the equipment under tests meets the requirements specified in this ETS. Hence the detailed test reports do not need to be part of the report but reference to the detailed report should be given so that they can be referred to and studied if required.

The detailed test report for each aspect (i.e. layers 1 and 2, EMC, safety and protection) should specify:

Names of operators and persons involved in testing:

Date(s) of test execution:

Test System - Name and Version Number:

Test environment:

Tests Performed and result of each test:

Any error report:

Any particular event(s) that occur during testing: *]

History

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