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Télécommunication

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**Approval requirements for data terminal equipment
to connect to packet switched public data networks using
CCITT Recommendation X.25 interface**

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NORMES EUROPEENNES DE TELECOMMUNICATION

It is recognised, in the field of telecommunications within Europe, that there is a need to create common European standards for telecommunications equipment.

Such harmonisation would among other things facilitate cooperation between telecommunications equipment manufacturers and public telecommunications network operators, create a marketplace which naturally transcends that of national frontiers, enhance the efficiency of business and other communication across Europe to bring economic benefits, and help translate the vision of a united Europe into a working reality.

In 1985 an initiative by the Conference of European Posts and Telecommunications Administrations (CEPT) resulted in the drafting of a Memorandum of Understanding (MoU) agreeing to the mutual recognition of results of tests of conformity to a technical specification which would be known as a Norme Européenne de Télécommunication (or NET). A list of signatories to the MoU is shown at the end of this introductory text. The signatories represent telecommunications Administrations in most countries in Western Europe, including EEC and EFTA administrations.

In 1991, in view of the transition from the Directive 86/361/EEC (on the initial stage of the mutual recognition of type approval for telecommunications terminal equipment) to the Directive 91/263/EEC (on the approximation of the laws of the Member States concerning telecommunications terminal equipment, including the mutual recognition of their conformity) a new Memorandum of Understanding on Common Technical Regulations (CTRs) for telecommunications terminal equipment was agreed by the same signatories of the 1985 MoU. The 1991 MoU also contains provisions for the continuation of the mutual recognition of tests results against NETs.

1 NETs

1.1 Guiding principles under which a NET is written are the need to ensure essential requirements are met. These include:

- user safety insofar as this requirement is not covered by other legal instruments (e.g. Directive 73/23/EEC)
- safety of employees of public telecommunications network operators insofar as this requirement is not covered by other legal instruments (e.g. Directive 73/23/EEC)
- protection of public telecommunications networks from harm
- interworking of terminal equipment, in justified cases.

1.2 Each NET constitutes part of a series of NETs prepared in response to the MoU.

1.3 A NET details the requirements, and a specification of interface tests for conformance to those requirements, which a defined type of telecommunication terminal equipment is required to satisfy in order to obtain authorisation for connection of the equipment to a defined European telecommunications network. The NET also includes, where appropriate, requirements made necessary in a given State by historical network peculiarities.

1.4 The existence of a NET will make it possible for an accredited laboratory in a country whose Administration has signed the MoU, to carry out tests, specified in the NET, on terminal equipment submitted to it, and to issue a test report. On the basis of the report, a competent body may then issue a certificate of conformity to the NET. There may of course be cases where the laboratory itself is the competent certification authority. This certificate is then recognised as valid in all the other signatory countries, avoiding the need for the equipment to have to undergo the same tests over again each time approval is applied for in any of those countries.

1.5 The common reference point which a NET represents thus offers the opportunity of substantially reducing the complexity, length and cost of approval formalities. The operators of public networks are required to make reference to relevant NETs in public supply contracts. Manufacturers are thereby enabled to compete on a more equal technical basis in the supply of terminal equipment covered by NETs.

2 Types of NET

The majority of NETs falls into one of the two categories: access NETs and terminal NETs.

(a) Access NET

Details of the technical characteristics (electrical, mechanical and access control protocol), to be offered by terminal equipment at the interface to a specific public telecommunications network are covered in an "access NET".

The objective of an access NET is to ensure no disturbance occurs to the network and to ensure interworking between network and terminal equipment so that calls can be routed successfully through the network (but without any guarantee of terminal to terminal operation). Indeed, since an access NET may have to serve a number of terminal NETs and applications which have not even been envisaged at present, it is important for the content not to include anything which is particular to a specific terminal or otherwise inhibiting to new developments.

(b) Terminal NET

The objective of a terminal NET is to ensure the end-to-end compatibility of a defined telecommunication service. The terminal NET should include any requirements which must be added to the corresponding access NET(s) to ensure end-to-end communication.

3 Date of Application

The date of application of a NET is that date at which the NET is recognised as being applicable, in the signatory Administrations, for the purposes of type approval.

4 Transition Period

4.1 The transition period commences at the date of application. The transition period is a period of flexibility during which there will be coexistence between the NET and any national requirements which relate to the Scope.

After the expiry of the transition period the only applicable standard within the Scope for type approval purposes will be that of the particular NET.

The end of the transition period is fixed by TRAC as an objective for all signatory countries of the MoU. In some cases, however, for example when a new network has to be set up, all network operators may not be in a position to meet the objective. In such cases, the end of the transition period will be a date which is individual to the given country and Administrations will publish the projected date by which the end of the transition period can be achieved.

4.2 The following notes are offered as guidance on conformance testing of telecommunications equipment during the transition period:

During the transition period, new telecommunications equipment offered by manufacturers under the Scope of this NET may be tested at a certified laboratory located within the signatory countries, either under this NET or under the existing national requirements, at the choice of the manufacturer. Testing under the NET rather than under the old requirements might offer the manufacturer the opportunity of a larger marketplace in which to sell the equipment.

The transition period is also an opportunity for the public network operators to update their network. However, a national approval authority would have the facility of refusing the approval of terminal equipment, for which a certificate of conformance to a NET had been issued, if the network were not yet compatible with the terminal equipment to be connected.

4.3 The following note is offered as guidance on the supply and connection of telecommunications equipment that has already been approved either before application of this NET or during the transition period.

After the application date of this NET, that is, during and after the transition period, the supply and connection of equipment already approved to earlier standards may continue unless the national authority terminates the validity of approvals to earlier standards for whatever reason.

Figure 1 is a diagrammatic representation of the above points.

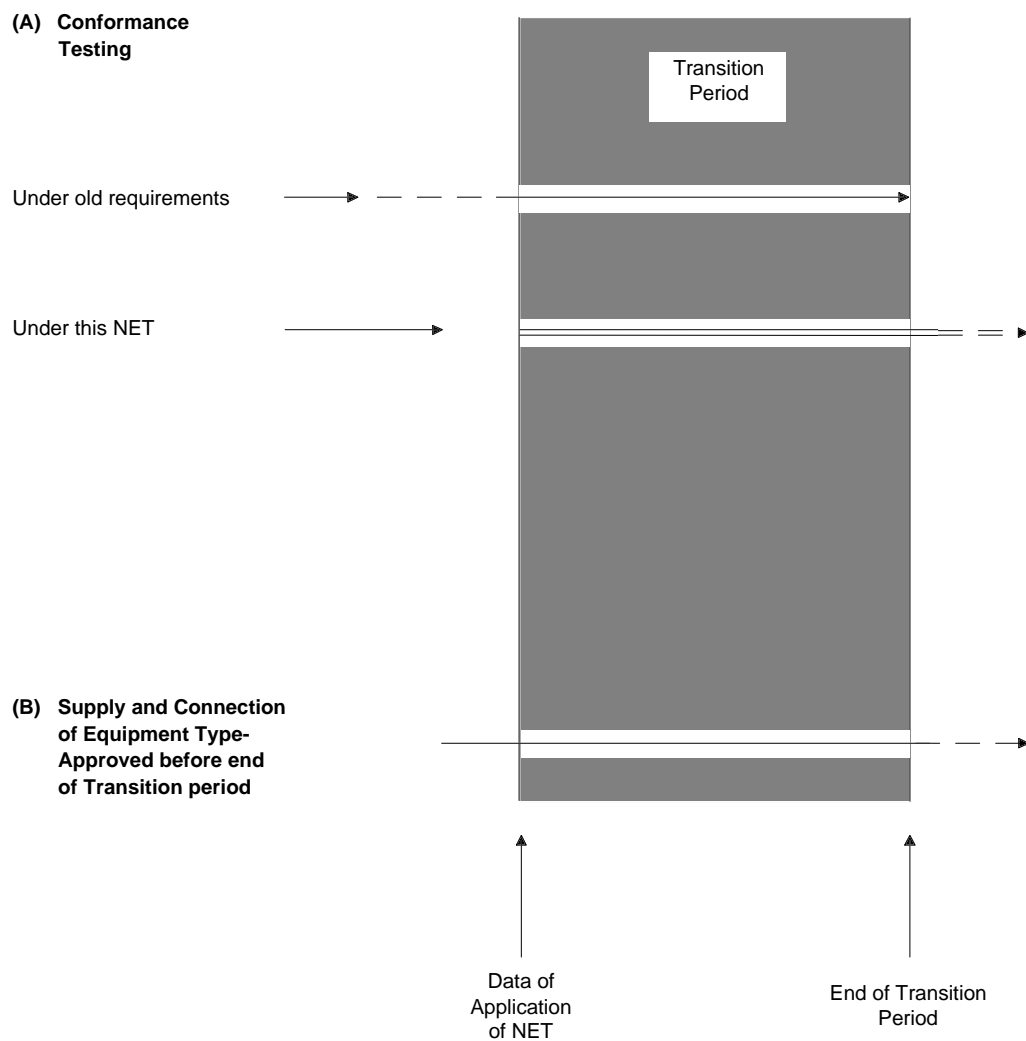


Figure 1

5 Approval Procedures

Details of national type approval procedures are not contained within NETs, but are decided by national Administrations.

6 Requirements to be satisfied

The scope statement defines which types of equipment must meet the requirements of each NET. In addition, equipment may also have to satisfy the requirements in other NETs (as defined in their scope statements) or, in the absence of harmonised NETs, one or more published national standards. In the absence of any requirements in other NETs or in published national standards, no additional tests may be sought by any approval authority in the countries whose Administration has signed the MoU.

7 Legal basis of this introductory text

This introductory text is provided for guidance, and to aid interpretation. The legal basis varies from country to country. This NET must be seen in the context of the 1985 MoU and of the 1991 MoU.

8 Signatories of the MoU

Austria	Italy
Belgium	Luxembourg
Bulgaria	Netherlands
Denmark	Norway
Finland	Portugal
France	Spain
F.R. Germany	Sweden
Greece	Switzerland
Iceland	United Kingdom
Ireland	

9 Amendments to a NET

There may in the future be a need for amendments to a NET. Any amendments to a NET, or suspension or withdrawal of a NET, will be decided by the Technical Recommendations Application Committee (TRAC) and notified through appropriate channels including publication in the EC Official Journal.

Errors detected within the text of a NET, or difficulties experienced with the application of a NET, should be reported to the following address:

The Director,
Office of the Secretariat,
European Telecommunications Standards Institute,
F - 06921 Sophia Antipolis Cedex

The comments will be considered and acted upon by TRAC under an approved modifications procedure. Public consultation will take place in respect of all but the most urgent modifications to this NET.

10 This NET (NET 2)

10.1 Adoption

The content of NET 2 was adopted by a meeting of the Technical Recommendations Application Committee (TRAC), on the basis of a CEPT Recommendation, on the 9th March 1988 in Cambridge, United Kingdom. This edition (2nd edition) includes all amendments adopted by TRAC since that date.

10.2 Scope

This NET (NET 2) details the requirements, and a specification of the interface tests for conformance to those requirements, of DTEs employing CCITT X.25 interfaces to circuit switched public data networks. The legal definition of the scope of this NET is provided in the section entitled "Scope" in the body of the NET.

10.3 Date of Application

This NET applies from 1 July 1988 within those States represented in the list of Signatories, subject to the Transition Period.

10.4 Transition Period for this NET

This NET has been subject to a transition period of two years from the date of application, which expired on 30 June 1990. Thus, the only applicable standard for type approval purposes within the Scope is this NET.

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1 Scope

This NET details the technical requirements for connection of packet mode DTEs to dedicated circuit interfaces of PSPDNs using CCITT Recommendation X.25 (1984) [1], excluding LAP, offered by an Administration.

NOTE: The physical, link and packet level tests detailed in this NET are suitable for testing of DTEs for connection to CCITT Recommendation X.25 (1980) [2] PSPDN. (See Appendix II for additional information).

The objective of this NET is to minimise, to an acceptable level, disturbance to the PSPDN and to improve the probability of interworking between a PSPDN and terminal equipment so that calls can be routed successfully through the network but without any guarantee of terminal to terminal operation.

To achieve this objective, this NET describes generalised tests to be carried out against the physical, link and packet level requirements of a CCITT Recommendation X.25 [1] DTE implementation. A DTE which satisfies the relevant technical requirements of this document and any other DTE which is of the same DTE type may be connected to every PSPDN, use any of the essential (E) facilities and invoke any of the provided additional (A) facilities as given in CCITT Recommendation X.2 (1984) [3]. Where optional user facilities which are not included in this document are supported by the network, a DTE invoking such facilities will be subject to additional tests by certain Administrations. The relevant tests will be included as a supplement to the present NET. The subject of integrated modems is outside the scope of this NET.

Certain Administrations do not apply the technical requirements in Clauses 9 and 10 (the link level and packet level requirements) before a DTE is given permission to connect to their PSPDNs. These Administrations are listed in Annex D.

NOTE: It is nevertheless important that a DTE should behave as stated in Clauses 9 and 10, otherwise it may experience service difficulties when connected to a PSPDN.

Information about testing of DTEs using CCITT Recommendation X.25 [19] (1988) can be found in Annexes H and I.

2 Field of Application

This NET has been written with the understanding that where it is necessary to ensure end-to-end compatibility of defined telecommunication services using PSPDN this NET will be referenced by terminal NETs. Thus where the DTE supports services specified in other NETs, additional requirements (for example at the network layer) may apply and will be found in the specific terminal NET.

The tests included in this NET are intended to check that the DTE is able to provide the basic access functionality given in section 6.

It should be noted that Access and Terminal NETs specify technical requirements. The procedures and framework within which these NETs are used are specified in other CEPT documents.

3 Abbreviations

DCE	Data Circuit Terminating Equipment
DTE	Data Terminal Equipment
FCS	Frame Check Sequence
GFI	General Format Identifier
hex	hexadecimal
IS	Initialisation Sequence
ISDN	Integrated Services Digital Network

LC	Logical Channel
LCN	Logical Channel Number
PSPDN	Packet Switched Public Data Network
PTI	Packet Type Identifier
PVC	Permanent Virtual Circuit
SVC	Switched Virtual Circuit (In CCITT Recommendation X.25 [1] the term Virtual Call is used.)
VS	Verification Sequence

4 Definitions

CCITT Recommendation X.25 (1984) [1] network: A PSPDN network which offers a CCITT Recommendation X.25 (1984) [1] DTE/DCE interface providing the (E) facilities for user classes of service 8-11 as defined in CCITT Recommendation X.2 [3].

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

5 References

- [1] CCITT Recommendation X.25 (1984): "Interface between data terminal equipment (DTE) and data circuit-terminating equipment (DCE) for terminals operating in the packet mode and connected to public data networks by dedicated circuit".
- [2] CCITT Recommendation X.25 (1980): "Interface between data terminal equipment (DTE) and data circuit-terminating equipment (DCE) for terminals operating in the packet mode and connected to public data networks".
- [3] CCITT Recommendation X.2 (1984): "International data transmission services and optional user facilities in public data networks".
- [4] NET 1 (1993): "Approval requirements for data terminal equipment to connect to circuit-switched public data networks and leased circuits using CCITT Recommendation X.21 interface".
- [5] ISO 2110 (1980): "Data communication - 25-pin DTE/DCE interface connector and pin assignments".
- [6] ISO 2593 (1984): "Data communication - 34-pin DTE/DCE interface connector and pin assignments".
- [7] ISO 4902 (1980): "Data communication - 37-pin DTE/DCE interface connector and pin assignments".
- [8] CCITT Recommendation X.21 (1984): "Interface between data terminal equipment (DTE) and data circuit-terminating equipment (DCE) for synchronous operation on public data networks".
- [9] CCITT Recommendation X.21bis (1984): "Use on public data networks of data terminal equipment (DTE) which is designed for interfacing to synchronous V-series modems".
- [10] CCITT Recommendation V.35 (1984): "Data transmission at 48 kilobits per second using 60-108 kHz group band circuits".

- [11] CCITT Recommendation V.36 (1984): "Modems for synchronous data transmission using 60-108 kHz group band circuits".
- [12] CCITT Recommendation V.28 (1984): "Electrical characteristics for unbalanced double-current interchange circuits".
- [13] CCITT Recommendation V.10 (1984): "Electrical characteristics for unbalanced double-current interchange circuits for general use with integrated circuit equipment in the field of data communications".
- [14] CCITT Recommendation V.11 (1984): "Electrical characteristics for balanced double-current interchange circuits for general use with integrated circuit equipment in the field of data communications".
- [15] CCITT Recommendation X.26 (1984): "Electrical characteristics for unbalanced double-current interchange circuits for general use with integrated circuit equipment in the field of data communications".
- [16] CCITT Recommendation X.27 (1984): "Electrical characteristics for balanced double-current interchange circuits for general use with integrated circuit equipment in the field of data communications".
- [17] CCITT Recommendation V.24 (1984): "List of definitions for interchange circuits between data terminal equipment and data circuit-terminating equipment".
- [18] ISO 4903 (1980): "Data communication - 15-pin DTE/DCE interface connector and pin assignments".
- [19] CCITT Recommendation X.25 (1988): "Interface between data terminal equipment (DTE) and data circuit-terminating equipment DCE for terminals operating in the packet mode and connected to public data networks by dedicated circuit".
- [20] CCITT Recommendation X.31 (1988): "Support of packet mode terminal equipment by an ISDN".
- [21] EN 41003 (1991): "Particular electrical safety requirements for equipment to be connected to a telecommunication network".
- [22] EN 60950 (1988): "Safety of information technology equipment, including electrically operated business machines".

Reference to any CCITT Recommendations in this document refers to the 1984 Red Book version, except references [2], [19] and [20].

6 Functionality

The tests in this document assume that the DTE has been designed to operate with CCITT Recommendation X.25 (1984) [1] network interface and in particular will:

- a) Observe the safety requirements and testing conditions specified in Clause 7.
- b) Implement one or more of the physical level configurations specified in Clause 8 and comply with the requirements therein.
- c) Implement the LAPB Link Access procedures defined in Sections 2.1, 2.2, 2.3, 2.4 of CCITT Recommendation X.25 (1984) [1].
- d) Implement the packet level procedures and formats defined in Sections 3, 4 and 5 of CCITT Recommendation X.25 (1984) [1] for those features for which the DTE claims a capability (e.g.: outgoing calls, incoming calls, or PVCs).

7 General Requirements

7.1 Safety Requirements

The equipment shall comply with subclause 4.1 of EN 41003 [21]. The X.21 [X.25] DTE-DCE interface circuitry shall be as defined and specified in EN 60950 [22] for accessible parts of Safety Extra Low Voltage (SELV) circuits. Subclauses 4.4.2 and 4.5 of EN 41003 [21] shall not apply to this interface (for information see ETR 012).

If there are any Telecommunication Network Voltage (TNV) circuits in the equipment, they shall be as defined and specified in EN 41003 [21]

During testing, all modes of operation that might affect the result of a test shall be simulated.

7.2 Testing Conditions

7.2.1 Environment for tests

All tests shall be performed at:

- an ambient temperature in the range 15°C to 35°C;
- a relative humidity in the range of 25% to 75%;
- an air pressure in the range 86 kPa to 106 kPa,

except that the tests shall not be performed outside the operating limits for the DTE as stated by the applicant.

7.2.2 Power Supply Limitations

For apparatus that is directly powered from the mains supply all tests shall be carried out within $\pm 5\%$ of the normal operating voltage. If apparatus is powered by other means and those means are not supplied as part of the apparatus, e.g. batteries, stabilised a.c. supplies, d.c., etc, all tests shall be carried out within the power supply limit declared by the supplier. If the power supply is a.c. the tests shall be conducted within $\pm 4\%$ of the stated frequency as declared by the supplier.

7.2.3 Equipment Requirements

Unless otherwise specified, test equipment used to measure voltage shall have a minimum resistance of 5 Mohm. Current measurements shall be made using a current measuring device of resistance no greater than 1 ohm.

7.2.4 Tolerances on test measurements

Unless otherwise specified, all voltage, current and resistance measurements specified in the tests shall be made within an accuracy of $\pm 1\%$.

7.2.5 Tolerances on test components

Unless otherwise specified, values assigned to test components shall be within $\pm 1\%$ of nominal value. All resistors specified shall be non-reactive.

7.3 Testing Considerations

This section covers some general remarks on the tests given in sections 8, 9 and 10.

The tests herein have been developed under the assumption that the DTE behaves the same way as CCITT Recommendation X.25 [1] describes for the DCE. It is recognised that there are permissible exceptions to this symmetrical behaviour.

It should be noted that because of the difficulty in fully defining the permitted DTE behaviour in response to the tests or test sequences herein, technical judgement will be applied by approved testing laboratories if the response is different from that specified in this NET.

For instance at any time there are frames and packets which may be sent by the DTE without a prior stimulus. These frames and packets are not taken into account in the specification of the test cases. However, the test laboratory must be aware of their existence and make sure that these frames and packets do not affect the outcome of a test.

The testing laboratory should note that in order to achieve mutual recognition of test results a precise record of the following must be made available.

- Tests carried out.
- Reasons for deleting any tests.
- Record of DTE behaviour.
- Record of any technical judgements taken.
- Record of any observations which would be of interest to the provider of a PSPDN.
- Record of the setting of DTE parameters which affect physical, link and packet levels.
- The suppliers declaration relating to the connections supported by the DTE-DCE interconnection cable.

The DTE supplier shall provide a DTE-DCE interconnection cable suitable for testing purposes.

The DTE supplier shall provide the completed questionnaire as shown in Annex E.

7.4 Electro Magnetic Compatibility (EMC)

Until such time as an appropriate European EMC document is agreed to be fully appropriate for CCITT Recommendation X.25 [1] attachment and is ratified, the national EMC requirements of the country in which permission to connect the DTE is sought shall apply. The source of national information may be found in the CCH Yearbook on Information on Certification, Approval and Testing Laboratories for Telecommunications Terminal Equipment.

8 Physical Level Requirements

The physical interface of the DTE shall be in accordance with CCITT Recommendation X.21 [8], CCITT Recommendation X.21bis [9] or CCITT V-series Recommendation interfaces as described in section 1.1, 1.2 and 1.3 of CCITT Recommendation X.25 [1]. Not all networks will support all of these interfaces. Loop control by the DTE is outside the scope of this NET.

The detailed requirements for the above mentioned interfaces are described in sections 8.1 and 8.2.

Physical level tests for DTEs using interfaces with other physical characteristics are not included in this NET. Until such further inclusion the national standards and/or regulations will apply.

8.1 CCITT Recommendation X.21 [8] Interface

The detailed physical requirements and associated tests are as specified in NET 1 [4], section 6 and sections 8.1.1 to 8.1.3.

8.2 CCITT Recommendations X.21bis [9] and V-series

8.2.1 Means of connection

The supplier shall provide means for the connection of the DTE in accordance with 8.2.1.1 or 8.2.1.2.

8.2.1.1 Integral connection arrangement

If the DTE-DCE interconnection cable is provided as a part of the DTE submitted for testing the DCE end of the cable shall terminate on a connector as specified in 8.2.2 as appropriate for the relevant service data rate.

Compliance shall be checked by inspection.

8.2.1.2 Non-integral connection arrangement

If the DTE-DCE interconnecting cable is not part of the DTE submitted for testing then no requirements are specified for the termination of the DTE other than it shall be possible to identify the interchange circuits.

Compliance shall be checked by inspection.

The supplier shall state the characteristics of the DTE-DCE interconnection cable in order that the requirements of 8.2.2 can be met for the DTE installation.

8.2.2 Connectors

The connector terminating the means of connection specified in 8.2.1.1 for connecting a DTE or as supplied for test purposes in accordance with 8.2.3 shall be as specified in 8.2.1.1, 8.2.2.2 or 8.2.2.3 as appropriate. Note that some Administrations use retention screw threads which differ from ISO standards.

The essential interchange circuits for direct connection to a PSPDN and for test purposes are given in Annex A together with the commonly available options. The circuits provided by the DTE shall possess the characteristics as indicated in 8.2.4.1, 8.2.4.2 or 8.2.4.3 as appropriate for the generator or load types.

The DTE supplier shall:

- a) state which of the available interchange circuits are supported by the DTE;
- b) identify unused connections in the DTE-DCE interconnection cable;
- c) state which connections are terminated other than by an appropriate generator or load at the DTE (if any);
- d) state which generator at the DTE (if any) will be held at a steady state.

8.2.2.1 Connector types and pin allocations for services up to 9 600 bit/s

The connector provided at the DCE end of the DTE-DCE interconnection cable shall be a connector conforming to ISO 2110 [5].

All available interchange circuits declared by the supplier shall be assigned, as generators or loads except the common return, to the connector pins indicated in Annex A, Table A-1 (NET 2).

Compliance shall be checked by inspection.

8.2.2.2 Connector type and pin allocation for service at 48 kbit/s using a CCITT Recommendation V.35 [10] interface.

The connector provided at the DCE end of the DTE-DCE interconnection cable shall be a connector conforming to ISO 2593 [6].

All available interchange circuits declared by the supplier shall be assigned, as generators or loads except the common return, to the connector pins indicated in Annex A, Table A-2 (NET 2).

Compliance shall be checked by inspection.

8.2.2.3 Connector type and pin allocation for service at 48 kbit/s or at 64 kbit/s using a CCITT Recommendation V.36 [11] interface.

The connector provided at the DCE end of the DTE-DCE interconnection cable shall be a connector conforming to ISO 4902 [7].

All available interchange circuits declared by the supplier shall be assigned, as generators or loads except the common return, to the connector pins indicated in Annex A, Table A-3 (NET 2).

Compliance shall be checked by inspection.

8.2.3 Connection requirements for test purposes

The DTE shall be provided for the purposes of tests, with either a DTE-DCE interconnection cable of any length as supplied to the user or a cable of $2,5 \text{ m} \pm 0,25 \text{ m}$ in length (or such other length as may be agreed with the test laboratory), terminated in a connector as specified in 8.2.2.1, 8.2.2.2 or 8.2.2.3 as appropriate.

Compliance shall be checked by inspection.

8.2.4 Electrical characteristics of Interchange Circuits

Except where stated otherwise, the tests shall be carried out at the lowest and highest signalling rates stated by the applicant.

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

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

Where the CCITT Recommendations requires the DTE to generate a certain bit pattern for the purposes of test, this pattern may be substituted by DTE generated data and control signals.

8.2.4.1 The electrical characteristics of interchange circuits intended for operation up to 9 600 bit/s

These shall conform with CCITT Recommendation V.28 [12] or V.10 [13].

Verification of the electrical characteristics shall be based on:

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

NOTE: Attention is drawn to the technical limitations associated with the interworking between V.28 and V.10 circuits given in Annex A to CCITT Recommendation V.10 [13] and Annex D to ISO 4903 [18].

8.2.4.2 The electrical characteristics of interchange circuits intended for operation at 48 kbit/s using a CCITT Recommendation V.35 [10] interface

These shall conform with CCITT Recommendation V.35 [10], V.28 [12], or V.10 [13] as indicated in Annex A, Table A-2 (NET 2).

Verification of the electrical characteristics shall be based on:

- a) the tests described in Annex B and Annex C;
- b) alternatively, by agreement between the applicant and the accredited test laboratory, by submission by the applicant to the accredited test laboratory of a declaration of conformance including circuit diagrams, component specifications and other relevant information. The accredited laboratory shall, on the basis of the evidence accompanying the declaration, be responsible for satisfying itself that the declaration gives assurance of conformity not less than that achieved by the method a) above.

8.2.4.3 The electrical characteristics of interchange circuits intended for operation at 48 kbit/s or at 64 kbit/s using a CCITT Recommendation V.36 [11] interface

These shall conform with CCITT Recommendations V.10 [13] or V.11 [14] as indicated in Annex A, Table A-3 (NET 2).

Verification of the electrical characteristics shall be based on:

- a) the tests described in 8.2.4.4 and 8.2.4.5;
- b) alternatively, by agreement between the applicant and the accredited test laboratory, by submission by the applicant to the accredited test laboratory of a declaration of conformance including circuit diagrams, component specifications and other relevant information. The accredited laboratory shall, on the basis of the evidence accompanying the declaration, be responsible for satisfying itself that the declaration gives assurance of conformity not less than that achieved by the method a) above.

8.2.4.4 Tests for DTE Declared by the Applicant as Conforming with CCITT Recommendation X.26 [15] (V10) [13]

The requirements of NET 1 [4], Clauses 7 and 8, applicable to leased circuit operation, using CCITT Recommendation X.26 [15] (V.10) [13] interchange circuits apply.

8.2.4.5 Tests for DTE Declared by the Applicant as Conforming with CCITT Recommendation X.27 [16] (V.11 [14])

The requirements of NET 1 [4], Clause 7 and 8, applicable to leased circuit operation, using CCITT Recommendation X.27 [16] (CCITT Recommendation V.11 [14]) interchange circuits apply.

8.3 CCITT Recommendation X.31 [20] Interface

8.3.1 The DCE/DTE interface does not coincide with the R reference point.
Sections 8.1 and 8.2 do not apply.
Three appropriate sections of NET 3 apply.

8.3.2 The DCE/DTE interface coincides with the R reference point.

8.3.2.1 The TA is not provided by the service provider.
Sections 8.1 and 8.2 do not apply.

8.3.2.2 The TA is provided by the service provider.
Sections 8.1 and 8.2 are applicable.

9 Link Level Requirements

- a) The tests in this section are designed to check that the DTE has implemented link level in a manner acceptable for the granting of attachment approval. Compliance shall be checked by the following tests as applicable.
- b) Each link level test consists of the following sequence of events:
- an Initialisation Sequence (IS) to ensure that the DTE is in the desired test condition,
 - performing the test sequence,
 - observing the DTE behaviour,
 - where stated: Verification Sequence (VS) to verify the DTE state.

- c) Information about the notation used:

Frame name/P = 1	frame with the P-bit set to one
Frame name/P = 0	frame with the P-bit set to zero
Frame name/F = 1	frame with the F-bit set to one
Frame name/F = 0	frame with the F-bit set to zero
Frame name/P = X	frame with the P-bit set to one or to zero
Frame name/F = X	frame with the F-bit set to one or to zero
Frame name/F = P	The F-bit in the transmitted frame should have the same value as the P-bit in the received frame
Frame 03 FF hex	03 represents content of first octet FF represents content of second octet hex is to indicate that hexadecimal notation is used

Where in a test $P = X$ then the test should be carried out with $P = 0$ and then with $P = 1$. Unless otherwise specified the contents of the fields in a frame sent by the tester will be in accordance with CCITT Recommendation X.25 (1984) [1].

The term "Discard" is used to indicate that the DTE ignores the received frame and takes no subsequent action as a direct result of receiving that frame. The test may be considered met if the DTE has not responded within a time equal to twice the DTEs declared T_1 .

- d) For all link level tests the basic test conditions are:
- physical level should be established and have been tested as per section 8,
 - the signal element timing signal is delivered to the DTE,
 - the DCE transmits flags,
 - k should always be set to 7,
 - as CCITT Recommendation X.25 (1984) [1] in section 2.4.4.6 recommends that the DTE always sets the P-bit to one in all SABM and DISC frames sent to the DCE no tests in this category are included with P-bit set to zero.

Additional conditions, if necessary, are described in the introduction to the specific test.

- e) In many tests the DTE has to transmit an I-frame. The DTE can be forced to transmit an I frame, e.g. by receiving:
- RESTART INDICATION (in state r1),
 - RESET INDICATION on an LC, assigned as a PVC, in any state except d2 and d3,
 - CLEAR INDICATION on an LC, assigned as an SVC, in any state except p6 and p7.

It depends on the characteristics of the DTE what packet should be used.

- f) Some of the tests given in this section may not be possible to carry out exactly in the way described or may be inappropriate depending on the type of DTE.
For example:
- some DTEs cannot transmit a DISC frame,
 - some DTEs transmit RESTART REQUEST after a completed link reset sequence,
 - for some DTEs the disconnected phase is a transient phase and cannot be maintained.

Hence some tests and some verifications will not apply.

It is possible that a test sequence will cause the DTE to invoke alternative reactions, e.g. by sending a DISC frame.

In these cases the testing laboratory should only carry out those tests which it considers appropriate or the testing laboratory should modify the test.

9.1 Link Set-up Testing - General

The DTE shall comply with at least one of the following:

- a) DCE initiated (section 9.1.1);
- b) DCE solicited (section 9.1.2);
- c) DTE initiated - SABM start (section 9.1.3);
- d) DTE initiated - DISC start (section 9.1.4).

The instructions for use shall include a statement on which methods of link initialisation are available with the DTE. Where more than one link initialisation is offered, the instructions for use shall include details of the procedure for selecting an offered method.

NOTE: The networks may support one or more of the three following methods of link initialisation.

- 1) Clause 9.1.1, or
- 2) Clause 9.1.2, or
- 3) Clause 9.1.3 or 9.1.4 independently.

Information or expertise shall be provided by the DTE supplier for testing that includes details of a method to be used to stimulate the DTE initiated actions.

NOTE: It should be recognised that DTEs not supporting all options above may not interwork with all PSPDNs.

Under certain conditions during link set-up, a collision of U-commands can occur and the tests with these collisions are described in section 9.2.

All tests of section 9.1 start with the DTE and DCE in the Disconnected Phase. They are in this phase:

- after the power-up of the DTE and before link set-up is established, or
- after a DISC/UA exchange, or a DISC/DM exchange.

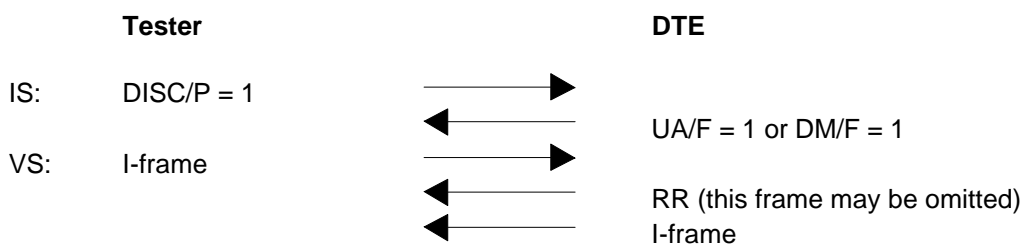
It is assumed during these tests that the DTE wants to go into the Information Transfer Phase.

After the link set-up sequence, it is necessary to transfer I-frames in both directions to ensure that both sides are in the Information Transfer Phase.

If, during link set-up, the DTE does not receive a proper response from the DCE, the DTE may decide after N2 attempts to stop transmitting frames or to change over to another frame type.

9.1.1 DCE Initiated

Test condition: The DTE and the DCE must be in the Disconnected Phase.



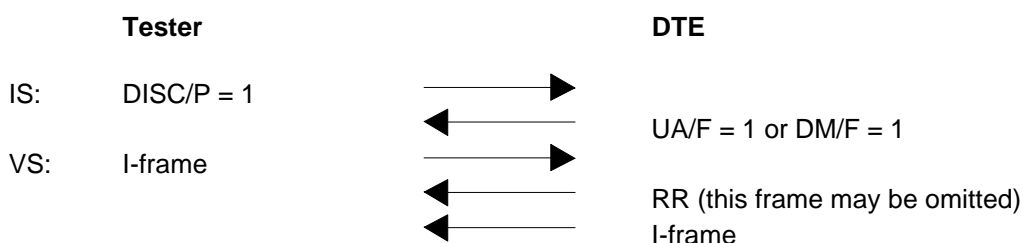
Tests:

Tester acting as DCE	→	Expected behaviour from the DTE	NOTE
9.1.1.1 SABM/P = 0	→	UA/F = 0	1)
9.1.1.2 SABM/P = 1	→	UA/F = 1	1)

NOTE 1: VS should be done.

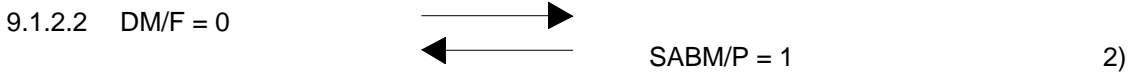
9.1.2 DCE Solicited

Test condition: The DTE and the DCE must be in the Disconnected Phase.

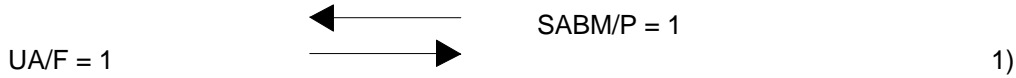


Tests:

Tester acting as DCE	→	Expected behaviour from the DTE	NOTE
9.1.2.1 DM/F = 0	→		
	←	SABM/P = 1	
UA/F = 1	→		1)



DTE should re transmit after T1 the SABM/P = 1.



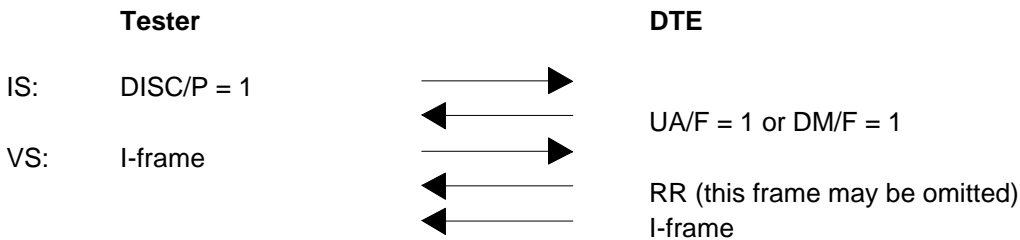
NOTE 1: VS should be done.

NOTE 2: The tester should ignore the frame sent by the DTE and therefore does not transmit a response to the DTE.

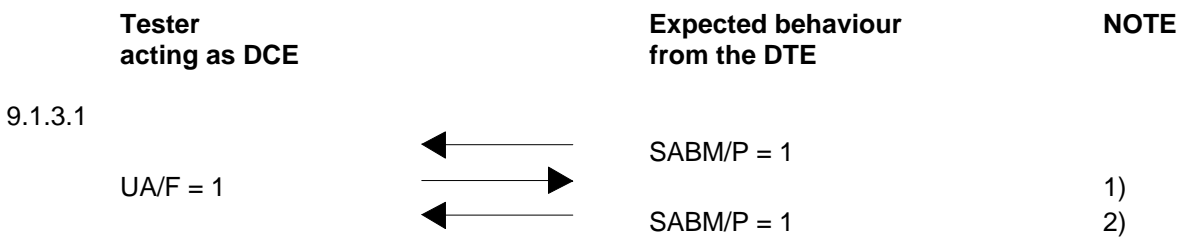
9.1.3 DTE initiated - SABM start

The DTE initiates the link set-up and starts by sending SABM/P = 1.

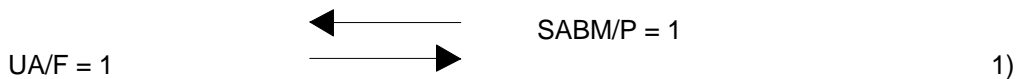
Test condition: The DTE and the DCE must be in the Disconnected Phase.



Tests:



9.1.3.2
 DTE should re transmit after T1 the SABM/P = 1



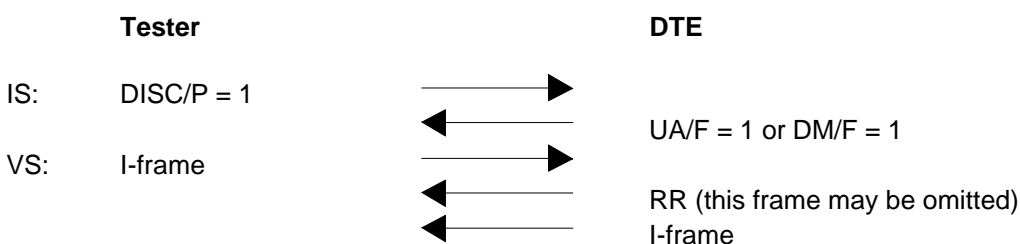
NOTE 1: VS should be done.

NOTE 2: The tester should ignore the initial frame sent by the DTE and therefore does not transmit a response to the DTE.

9.1.4 DTE initiated - DISC start

The DTE initiates the link set-up and starts by sending DISC/P = 1.

Test condition: The DTE and the DCE must be in the Disconnected Phase.



Tests:

	Tester acting as DCE		Expected behaviour from the DTE	NOTE
9.1.4.1	DM/F = 1		DISC/P = 1	
	UA/F = 1		SABM/P = 1	1)

NOTE 1: VS should be done.

9.1.4.2	DM/F = 1		DISC/P = 1	
			SABM/P = 1	2)

DTE should re transmit after T1 the SABM/P = 1.

	UA/F = 1		SABM/P = 1	1)
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NOTE 1: VS should be done.

NOTE 2: The tester should ignore the initial frame sent by the DTE and therefore does not transmit a response to the DTE.

9.2 Collisions of U-commands

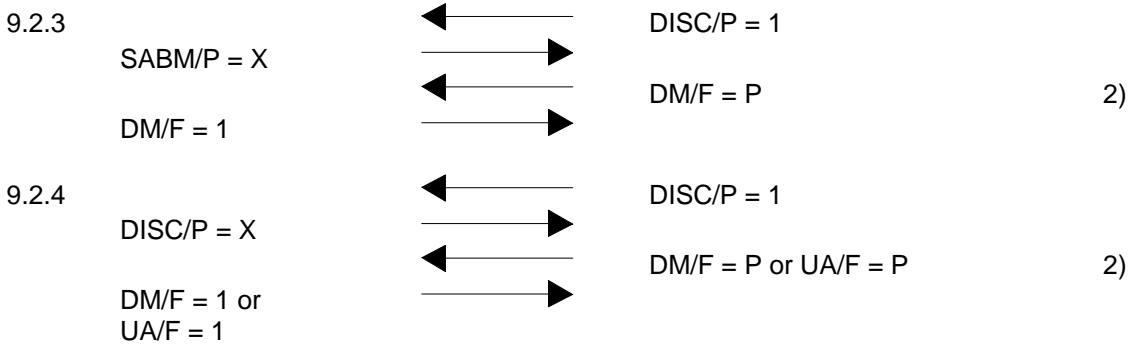
Depending on the method used for link set-up then some of the following tests may not apply to the DTE under test.

Test condition: The DTE and the DCE must be in the Disconnected Phase.

	Tester		DTE	NOTE
IS1:	DISC/P = 1			
IS2:	DM/F = 1		UA/F = 1 or DM/F = 1	
VS1:	I-frame		DISC/P = 1	NOTE
VS2:	RR/P = 1		RR (this frame may be omitted)	
			I-frame	
			DM/F = 1	

NOTE: The testing laboratory has to choose the IS it considers appropriate. Tests:

	Tester acting as DCE		Expected behaviour from the DTE	NOTE
9.2.1	SABM/P = X		SABM/P = 1	
	UA/F = 1		UA/F = P	1)
9.2.2	DISC/P = X		SABM/P = 1	
	DM/F = 1		DM/F = P	2)



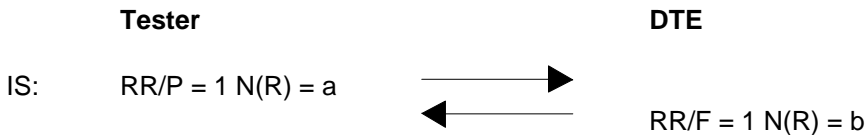
NOTE 1: VS1 should be done.

NOTE 2: VS2 should be done, unless the DTE initiates link set-up.

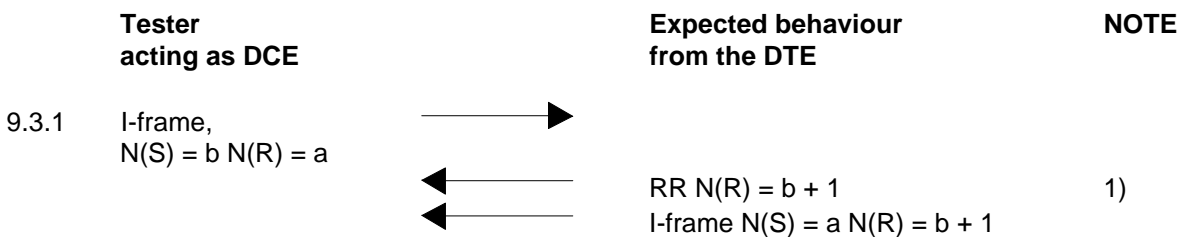
9.3 Window Rotation

In this section the window rotation (module 8) is tested.

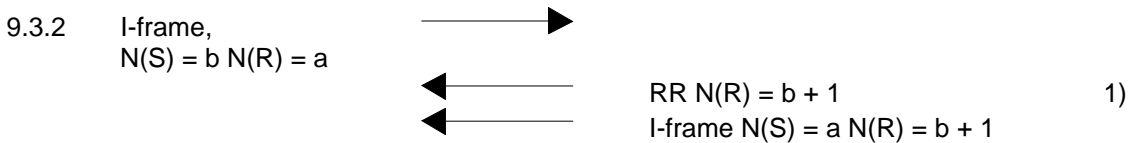
Test condition: The DTE shall be in the information transfer phase.



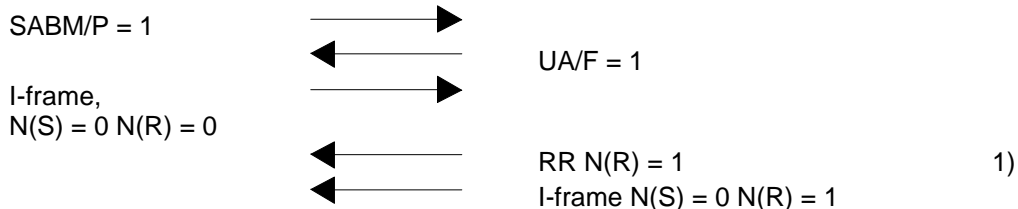
Tests:



The tester transmits an I-frame 8 more times to verify that N(R) is incremented each time by the DTE.



The tester transmits an I-frame 4 more times. 2)



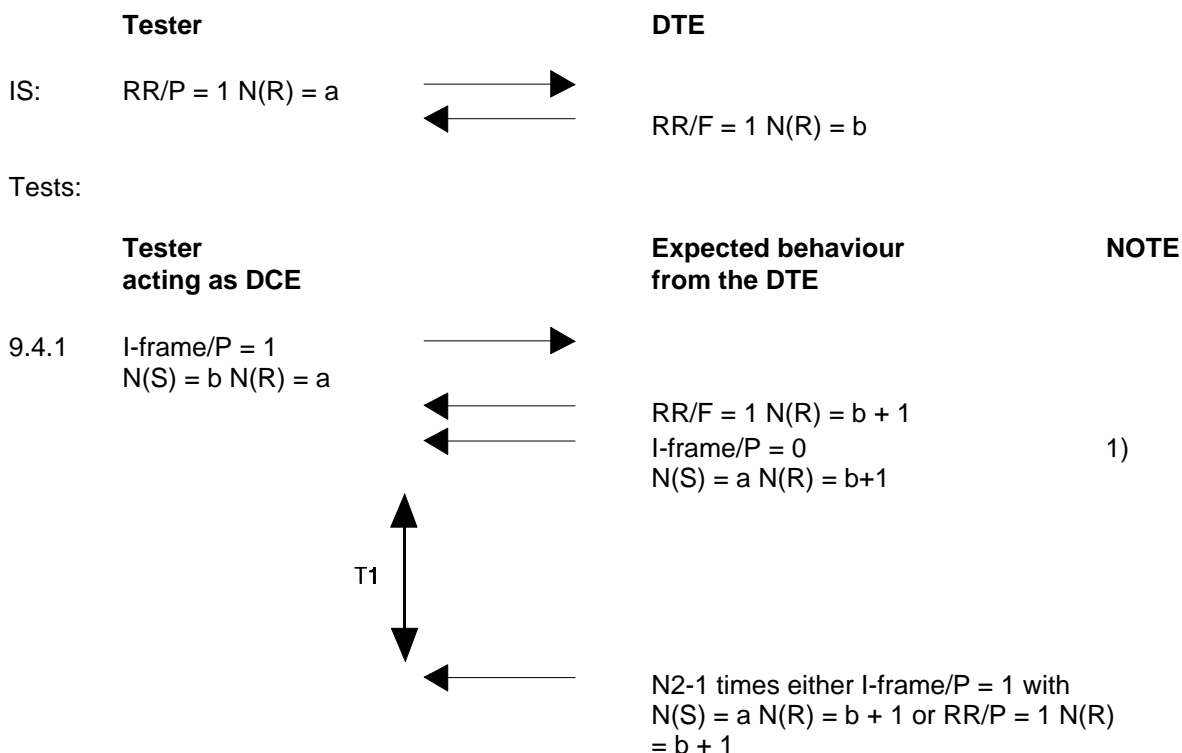
NOTE 1: This frame may be omitted.

NOTE 2: If after the 4th I-frame N(S) = 0 and/or N(R) = 0 then an additional I-frame should be sent.

9.4 N2 and T1 test

Testing of N2, T1 and the use of the P-bit in the timer recovery condition.

Test condition: The DTE shall be in the information transfer phase.



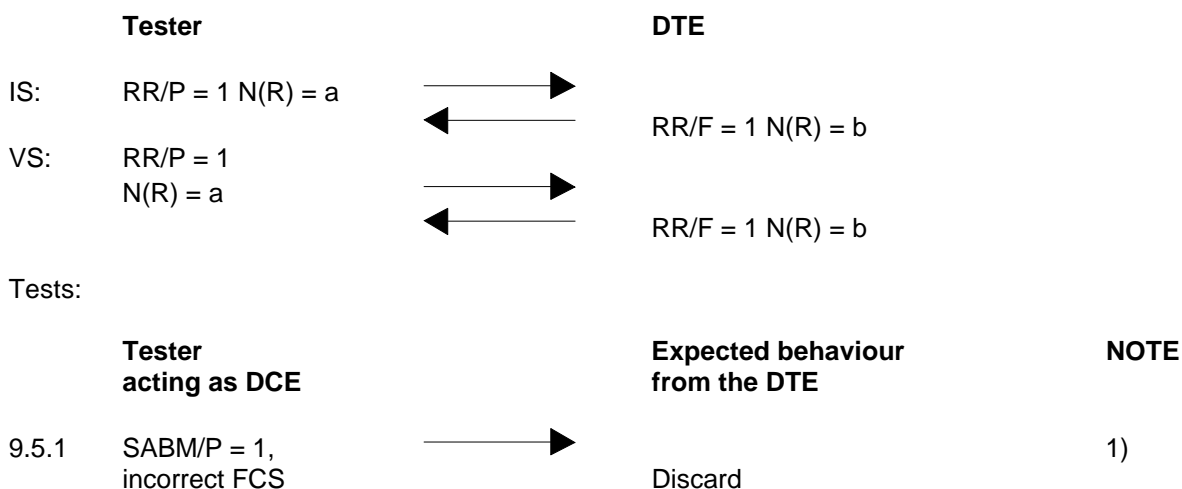
Further recovery actions are beyond the scope of this test.

NOTE 1: Tester does not acknowledge this frame. So, at the moment T1 expires, the DTE has to either re transmit the I-frame/P = 1 or to transmit RR/P = 1 both at T1 intervals.

9.5 Incorrect FCS

In this section the tester transmits frames with an incorrect FCS. The DTE should discard all these frames.

Test condition: The DTE shall be in the information transfer phase.



9.5.2	I-frame, N(R) out of sequence, incorrect FCS	→	Discard	1)
9.5.3	I-frame, N(S) out of sequence, incorrect FCS	→	Discard	1)
9.5.4	Extra long frame, incorrect FCS (Length >> N1 bits)	→	Discard	1)

NOTE 1: VS should be done after having waited a minimum of 2 x T1.

9.6 Frame Abort

In this section the tester transmits I-frames. During this transmission the tester performs a frame abort. The DTE should discard aborted frames.

Test condition: The DTE shall be in the information transfer phase.

	Tester		DTE
IS:	RR/P = 1 N(R) = a	→	
		←	RR/F = 1 N(R) = b
VS:	RR/P = 1 N(R) = a	→	
		←	RR/F = 1 N(R) = b

Tests:

	Tester acting as DCE		Expected behaviour from the DTE	NOTE
9.6.1	I-frame, N(R) out of sequence, aborted	→	Discard	1)
9.6.2	I-frame, N(S) out of sequence, aborted	→	Discard	1)

NOTE 1: VS should be done after having waited a minimum of 2 x T1.

9.7 DTE reaction to unsolicited responses with F = X

In this section, the tester transmits a response frame which should cause the DTE to either initiate a link resetting, or to ask the DCE to initiate a link set-up.

Test condition: The DTE shall be in the information transfer phase.

	Tester		DTE
IS:	RR/P = 1 N(R) = a	→	
		←	RR/F = 1 N(R) = b

Tests:

	Tester acting as DCE		Expected behaviour from the DTE	NOTE
9.7.1	UA/F = X		SABM/P = 1	1)
9.7.2	RR/F = 1		SABM/P = 1	1)
9.7.3	DM/F = 1		SABM/P = 1	1)

NOTE 1: Alternatively, the DTE may send DM/F = 0

9.8 Reject Procedure

In this section the reject procedure is tested. In the first and the second test the tester forces the DTE to transmit a REJ frame. In the third test the tester transmits a REJ; the DTE should retransmit the requested I-frames.

Test condition: The DTE shall be in the information transfer phase.

	Tester		DTE
IS:	RR/P = 1 N(R) = a		RR/F = 1 N(R) = b

Tests:

	Tester acting as DCE		Expected behaviour from the DTE	NOTE
9.8.1	I-frame, P = 0 N(S) = b + 3		REJ/F = 0 N(R) = b	3)
	I-frame			
9.8.2	I-frame, P = 1 N(S) = b + 3		REJ/F = 1 N(R) = b	3)
	I-frame			
9.8.3	I-frame, N(S) = b N(R) = a		RR N(R) = b + 1	1)
			I-frame N(S) = a N(R) = b + 1	
	I-frame, N(S) = b + 1 N(R) = a			2)
			RR N(R) = b + 2	1)
			I-frame N(S) = a + 1 N(R) = b + 2	
	REJ N(R) = a			
			I-frame N(S) = a N(R) = b + 2	
			I-frame N(S) = a + 1 N(R) = b + 2	

NOTE 1: This frame may be omitted.

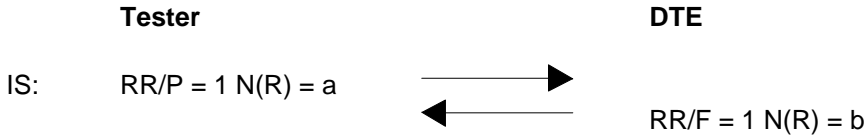
NOTE 2: The tester does not transmit an acknowledgement of the previous DTE frame.

NOTE 3: This test leaves the DTE in the REJ condition and therefore the link must be reset prior to any subsequent test.

9.9 Flow Control

In this section, the flow control mechanisms are tested. In the first test the window mechanism is used. In the second test the tester flow controls using a RNR frame.

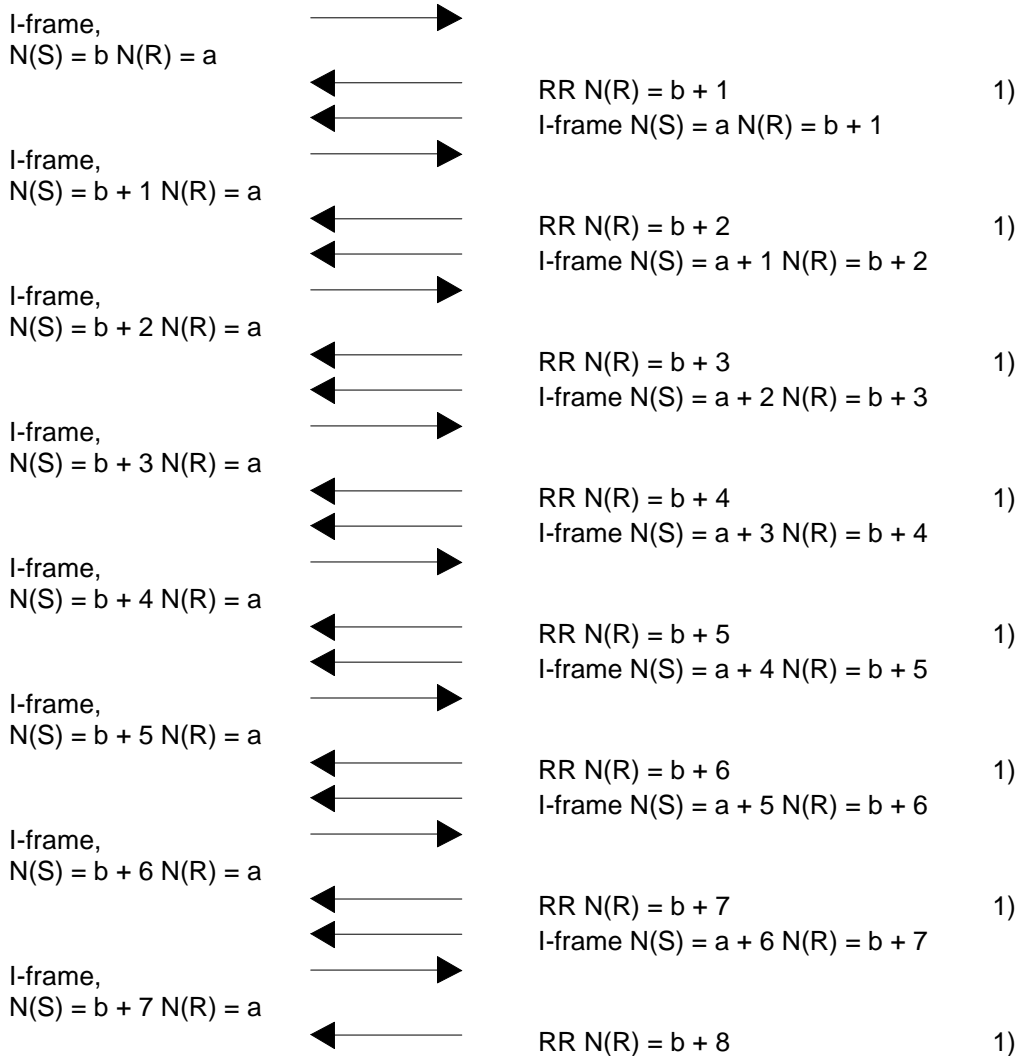
Test condition: The DTE shall be in the information transfer phase.



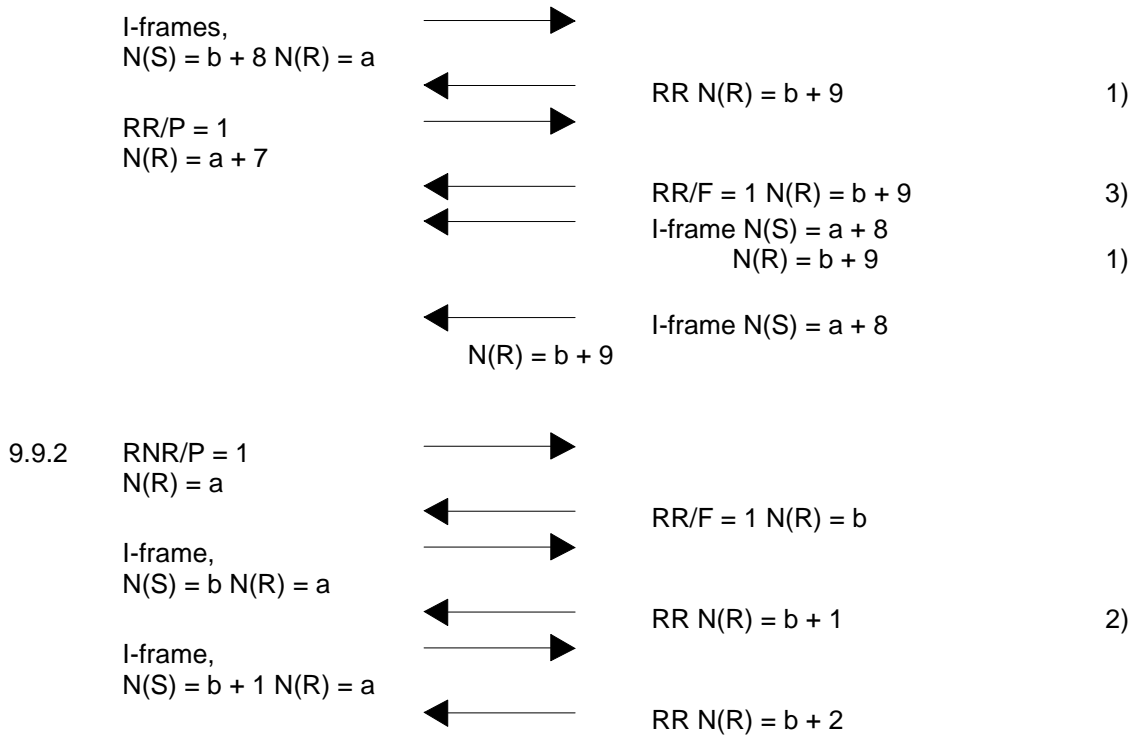
Tests:

Tester acting as DCE	Expected behaviour from the DTE	NOTE
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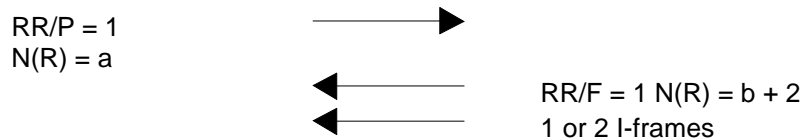
9.9.1 This test should be done within the T1 of the DTE. T1 is started upon transmitting the first I-frame by the DTE.



The DTE should stop sending I-frames.



The DTE may send one I-frame but should not send the second one until the DCE ends or leaves the busy condition.



NOTE 1: This frame may be omitted.

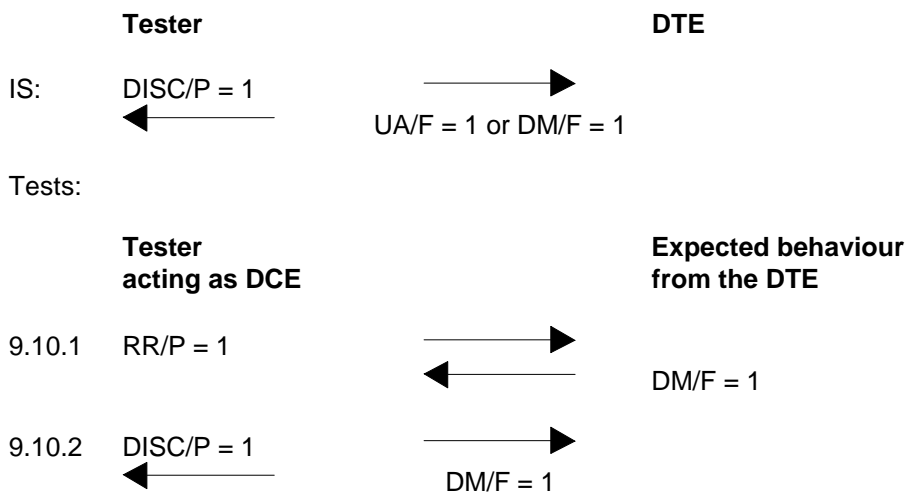
NOTE 2: This frame may be omitted if the DTE sends an I-frame.

NOTE 3: I-frames from the DTE may be transmitted prior to this frame.

9.10 Disconnected Phase

In this section, tests are described while the DTE and the DCE are in the Disconnected Phase.

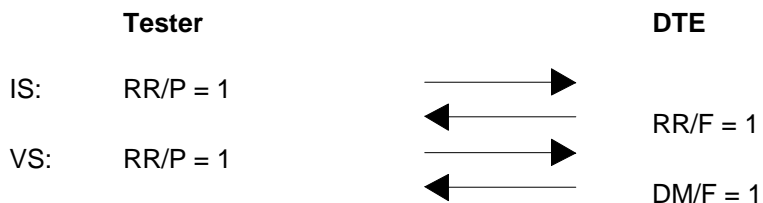
Test condition: The DTE and the DCE must be in the Disconnected Phase.





9.11 Miscellaneous Tests

Test condition: The DTE shall be in the information transfer phase.



Tests:

	Tester acting as DCE		Expected behaviour from the DTE	NOTE
9.11.1	RR/P = 1		RR/F = 1	
9.11.2	I-frame		RR	2)
	DM/F = P		I-frame	1)

The DTE should enter the Disconnected Phase and may initiate link set-up.



NOTE 1: VS should be done, unless the DTE initiates a link set-up.

NOTE 2: This frame may be omitted.

NOTE 3: Alternatively, the DTE may send DM/F = 0.

10 Packet Level Requirements

- The tests in this section are designed to check that the DTE has implemented packet level in a manner acceptable for the granting of attachment approval. Compliance shall be checked by the following tests as applicable.
- In this section tests 10.1, 10.2 and 10.3 apply to both PVCs and SVCs. The remainder of the tests covering call set-up and clearing apply only to SVCs.
- Each packet level test consists of the following sequence of events:
 - an Initialisation Sequence (IS) to force the DTE into the desired test condition;
 - performing the test sequence;
 - observing the DTE behaviour;
 - where the sequence terminates in a packet flowing from the tester to the DTE: a Verification Sequence (VS) to verify the DTE state.

It is possible that a test sequence will cause the DTE to invoke alternative recovery and react in the following manner:

- being in state r1 at any time:
discard the received packet and send a Restart Request,
- for LCs assigned as SVC being in any state except p6 and p7:
discard the received packet and send Clear Request,
- for LCs assigned as SVC, being in state p4, d1:
discard the received packet and send Reset Request.

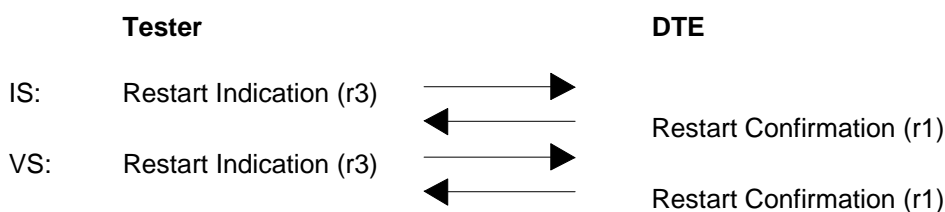
These preceding actions are DTE specific error recovery actions.

- d) Some of the tests given in this section may not be possible to carry out or may be inappropriate depending on the type of DTE. For instance some DTEs cannot handle Reset Indication, some DTEs can handle Incoming Calls only, some DTEs cannot deal with a second restart sequence, etc...
- e) In this case the testing laboratory should, with the aid of the questionnaire, carry out those tests which it considers appropriate. For all tests it is necessary that the Link Level is in the Information Transfer Phase at the start of each of the tests in this section.
- f) Unexpected behaviour of the DTE on Link Level may affect the Packet Level tests.
- g) All packets sent by the DTE should conform with the format given in section 5 of CCITT Recommendation X.25 (1984) [1] and unless otherwise specified the contents of the fields in a packet sent by the tester are assumed to be correct.
- h) The term "Discard" is used to indicate that the DTE ignores the received packet and takes no subsequent action as a direct result of receiving that packet, the DTE remains in the same state. The test may be considered met if the DTE has not responded within a time equal to twice the DTE's declared T1.
- j) Each test case is comprised of sent and received packets. The state resulting from the transmission of a packet is enclosed in parenthesis.
- k) All tests in this section are carried out with a window size of 2 and a DTE must be able to implement a window size of 2 in order to comply with this section.
- l) The support of the A bit in the GFI of call set-up and call clearing packets is optional for networks. Therefore no requirements are specified in this NET for the use of this bit. As a consequence, this bit should always be set to 0.

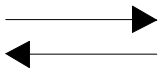
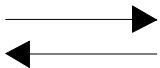
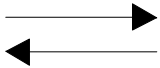

10.1 Restart

In this section tests are described dealing with the Restart procedures.

Test condition: The interface must be in state r1.



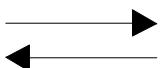
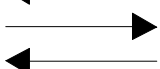

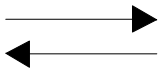
Tests:

	Tester		Expected behaviour from the DTE
10.1.1	Restart Indication (r3)		Restart Confirmation (r1)
10.1.2	Restart Confirmation		Restart Request (r2)
	Restart Confirmation (r1)		
10.1.3	Restart Confirmation		Restart Request (r2)
	Restart Indication (r3)		


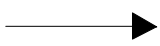

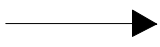


10.2 State r2

In this section tests are described while the interface is in state r2.

Test condition: The interface must be in state r2.

	Tester		DTE
IS:	Restart Indication (r3)		Restart Confirmation (r1)
	Restart Confirmation		Restart Request (r2)
VS:	Restart Confirmation (r1)		
	Restart Indication (r3)		Restart Confirmation (r1)

Tests:

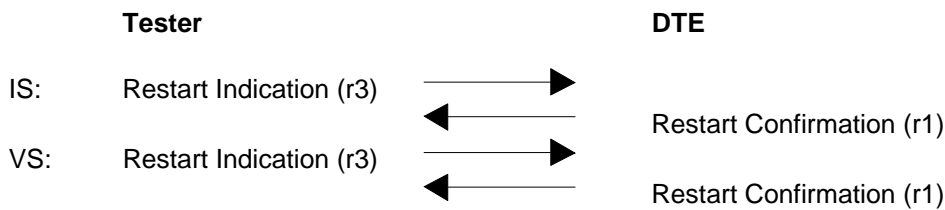
	Tester		Expected behaviour from the DTE	NOTE
10.2.1	Clear Indication		Discard (r2)	1)
10.2.2	Clear Confirmation		Discard (r2)	1)
10.2.3	Incoming Call		Discard (r2)	1)
10.2.4	Call Connected		Discard (r2)	1)
10.2.5	Packet with PTI = 83 hex		Discard (r2)	1)
10.2.6	Restart Confirmation GFI = 3		Discard (r2)	

NOTE 1: On an assigned LC.

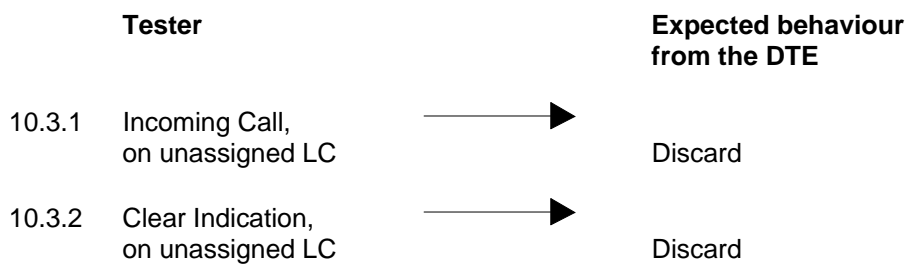
10.3 Unassigned Logical Channels

In this section tests are described dealing with unassigned logical channels.

Test condition: The interface should be in state r1.



Tests:

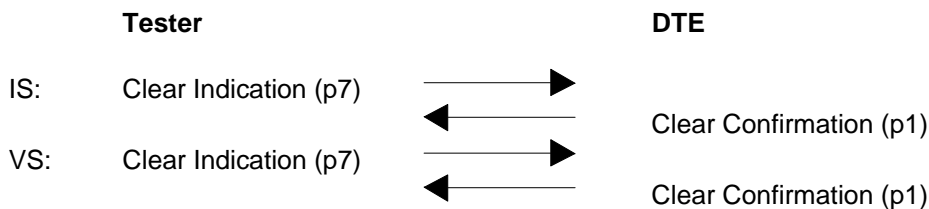


Tests 10.3.1 and 10.3.2 should be carried out on logical channel group (lcg) numbers 0 and 1. Where a logical channel 1 has been assigned in lcg 0 but not in lcg 1 then logical channel 1 in lcg 1 should be tested, using 10.3.1 and 10.3.2. This also applies if vice versa.

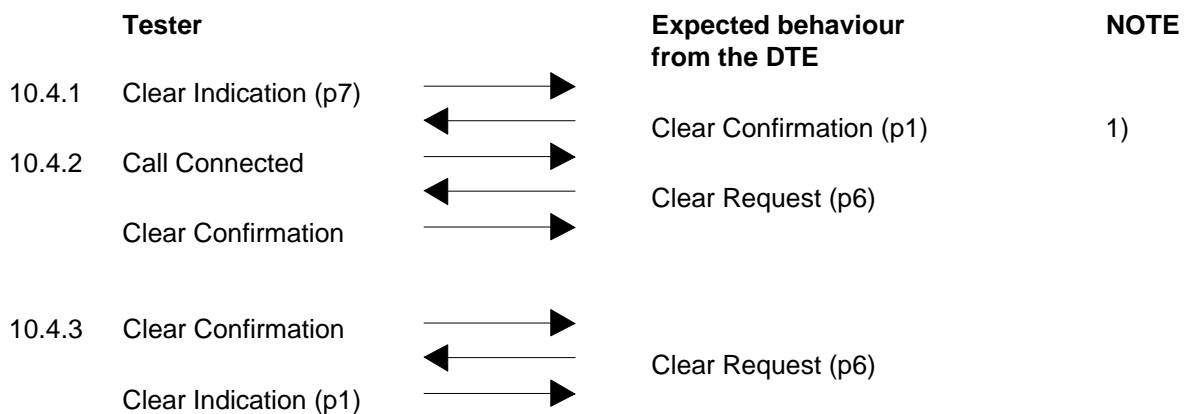
10.4 State p1

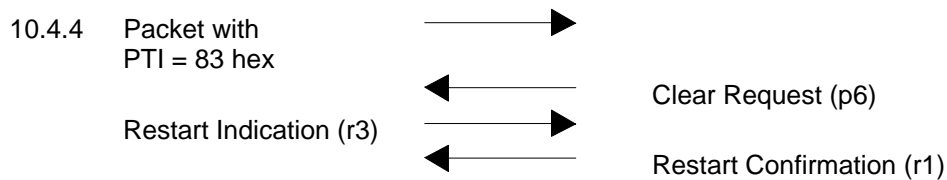
In this section tests are described while the interface is in state p1, but not dealing with the Call set-up.

Test condition: The LC should be in state p1.



Tests:



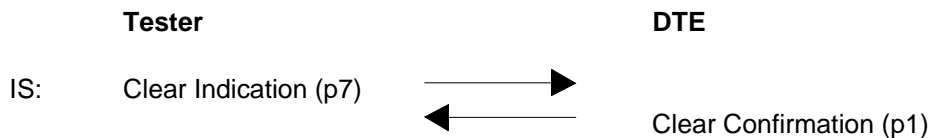


NOTE 1: DTE may also send Clear Request.

10.5 Incoming Call

In this section tests dealing with Incoming Call packets are described.

Test condition: The LC should be in state p1.



Tests:

	Tester		Expected behaviour from the DTE	NOTE
10.5.1	Incoming Call, with Calling address length = 6 (p3)	→		
		←	Call Accepted (p4)	1)
10.5.2	Incoming Call, with Calling address length = 15, first digit = 0 (p3)	→		
		←	Call Accepted (p4)	1)
10.5.3	Incoming Call with D-bit set to one (p3)	→		
		←	Call Accepted (p4)	1)
			DTE may send Clear Request if it does not support the D-bit procedure.	2)
10.5.4	Incoming Call, with some data in the Call User Data Field (p3)	→		
		←	Call Accepted (p4)	1)

NOTE 1: This Incoming Call should contain both the Calling Address and the Called Address.

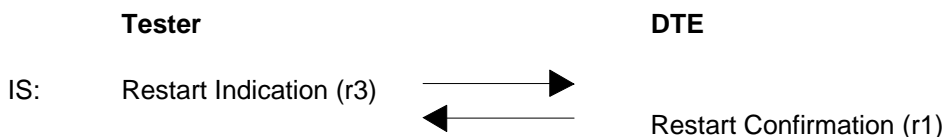
NOTE 2: The D-bit may be set to "1" or "0" in the Call Accepted packet.

It may also be necessary for the tester to meet specific requirements as defined by the DTE supplier. The DTE may send "clear request" if these requirements are not met.

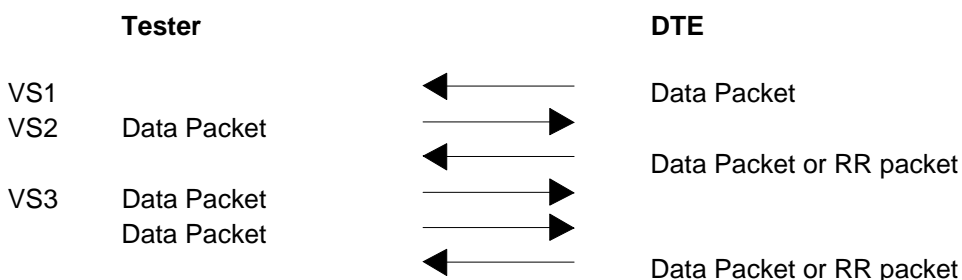
10.6 Call Request

In this section tests dealing with Call Request packets are described. The DTE should use the LC with the highest number being in state p1.

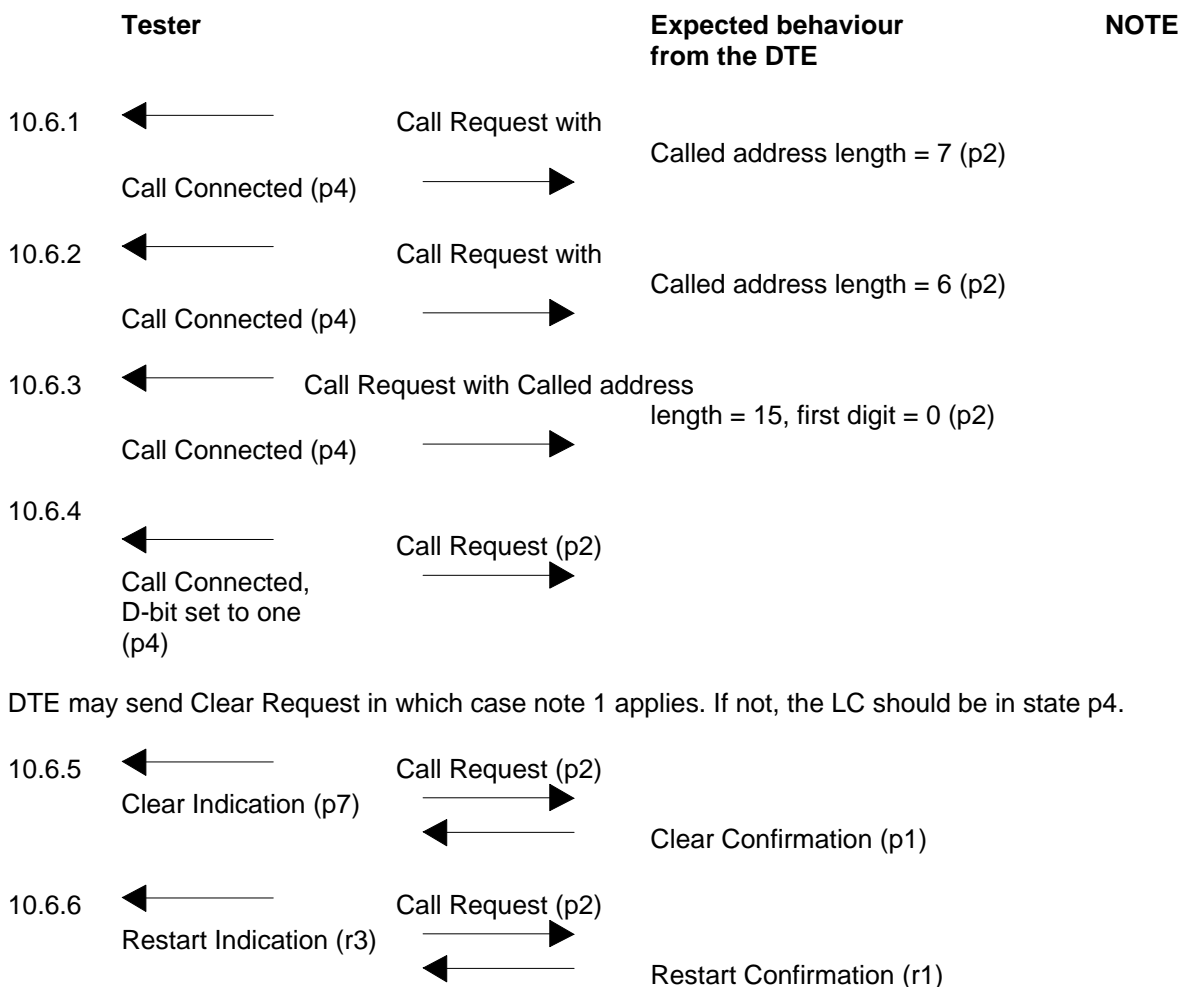
Test condition: The LC should be in state p1.

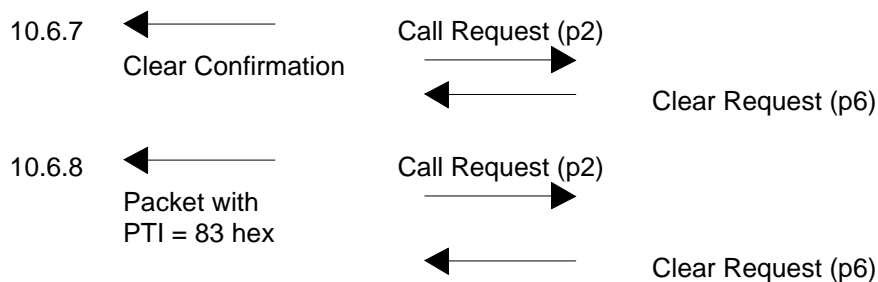


VS: The aim of the VS in this section is to ensure that the DTE enters state p4, d1 and this is the case if the DTE either sends a data packet or an RR packet. Some suggestions follow for verification sequences. The test house has to make a choice, depending on the characteristics of the DTE.



Tests:

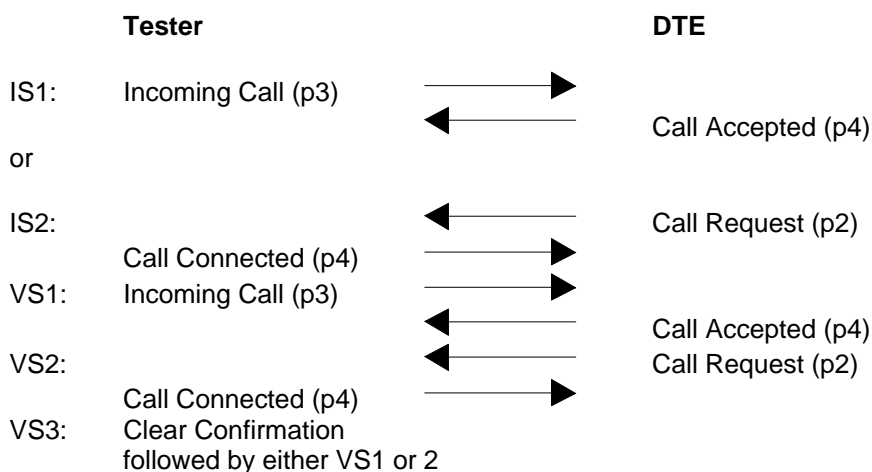




10.7 Call Clearing

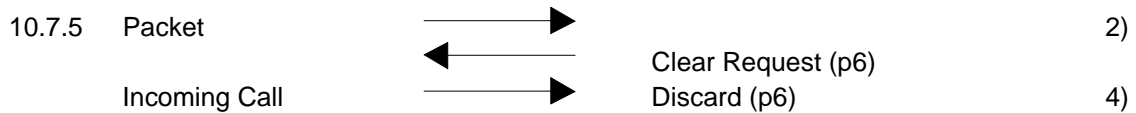
In this section tests dealing with Call Clearing procedures are described.

Test condition: The LC should be in state p4.



Tests:

	Tester		Expected behaviour from the DTE	NOTE
10.7.1	Clear Indication (p7)	→		
		←	Clear Confirmation (p1)	1)
10.7.2	Packet	→		2)
	Clear Confirmation (p1)	→	Clear Request (p6)	3)
10.7.3	Packet	→		2)
	Clear Indication (p1)	→	Clear Request (p6)	3)
10.7.4	Packet	→		2)
	Restart Indication (r2)	→	Clear Request (p6)	
		←	Restart Confirmation (r1)	



NOTE 1: DTE may also send Clear Request.

NOTE 2: Tester may send Incoming Call or Call Connected or Clear Confirmation or use operator intervention in order to cause the DTE to answer with Clear Request.

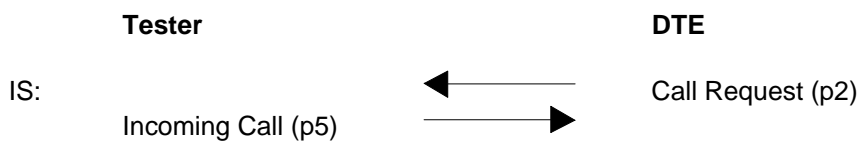
NOTE 3: Either VS1 or 2 should be done.

NOTE 4: VS3 should be done.

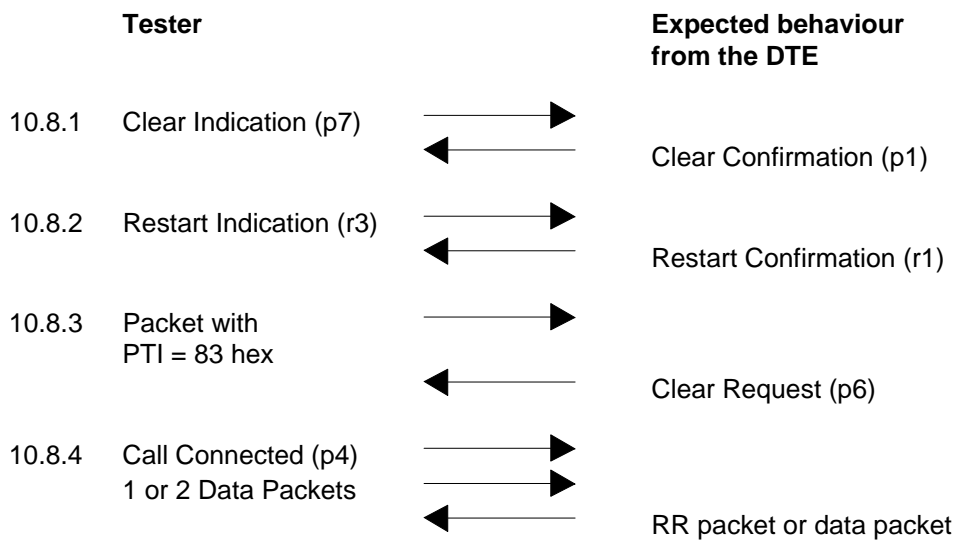
10.8 Call Collision

In this section tests are executed while the LC is in state p5 (Call Collision).

Test condition: The LC should be in state p5.



Tests:



Annex A: Pin Allocation and Circuit Descriptions

Table A-1 (NET 2)

Connector Pin Allocations and Circuit Descriptions for Services up to 9 600 bit/s

CCITT V.24 [17] circuit number	Circuit Description	Pin Allocation
102	Signal ground/Common return	7
103	Transmitted data	2
104	Received data	3
105	Request to send	4
106	Ready for sending	5
107	Data set ready	6
108/1	Connect Data Set to Line	20*
109	Data channel received line signal detector	8
114	Transmitter signal element timing (DCE)	15
115	Receiver signal element timing (DCE)	17
140	Remote loop back for point-to-point circuits	21
141	Local loop back	18
142	Test indicator	25

* Each circuit is optional and not necessarily provided on all PSPDNs.

NOTE: Circuits may conform with CCITT Recommendation V.28 [12] or V.10 [13].

Table A-2 (NET 2)

Connector Pin Allocations and Circuit Descriptions for Service at 48 kbit/s using a V.35 [10] Interface

CCITT circuit number	Circuit Description	Pin Allocation		Electrical Characteristics
		A-wire	B-wire	
102	Signal ground/Common return	B		
103	Transmitted data	P	S	V.35
104	Received data	R	T	V.35
105	Request to send	C		V.28 or V.10
106	Ready for sending	D		V.28 or V.10
107	Data set ready	E		V.28 or V.10
108/1	Connect Data Set to Line	H	*	V.28 or V.10
109	Data channel received line signal detector	F		V.28 or V.10
114	Transmitter signal element timing (DCE)	Y	AA	V.35
115	Receiver signal element timing (DCE)	V	X	V.35
140	Loop back/Maintenance test	N	*	V.28 or V.10
141	Local loop back	L	*	V.28 or V.10
142	Test indicator	NN	*	V.28 or V.10

* Each circuit is optional and not necessarily provided on all PSPDNs.

Table A-3 (NET 2)

Connector Pin Allocations and Circuit Descriptions for Service at 48 kbit/s or at 64 kbit/s using a V.36 [11] Interface

Circuit number	Description	Pin Allocation		Electrical Characteristics
		A-wire	B-wire	
102	Signal ground/Common return	19		
102a	DTE common return	37		
102b	DCE common return	20		
103	Transmitted data	4	22	V.11
104	Received data	6	24	V.11
105	Request to send	7	25	V.11
106	Ready for sending	9	27	V.11
107	Data set ready	11	29	V.11
108/1	Connect Data Set to Line	12	30*	V.11
109	Data channel received line signal detector	13	31	V.11
114	Transmitter signal element timing (DCE)	5	23	V.11
115	Receiver signal element timing (DCE)	8	26	V.11
140	Loop back/Maintenance test	14	*	V.10
141	Local loop back	10	*	V.10
142	Test indicator	18	*	V.10

NOTE 1: Circuits 105, 106, 107, 108/1 and 109 may comply to CCITT Recommendation V.10 [13].

NOTE 2: In order that Incoming X.31 calls to the DTE can be accepted, the provision by the DTE of circuit 108/1 should be implemented.

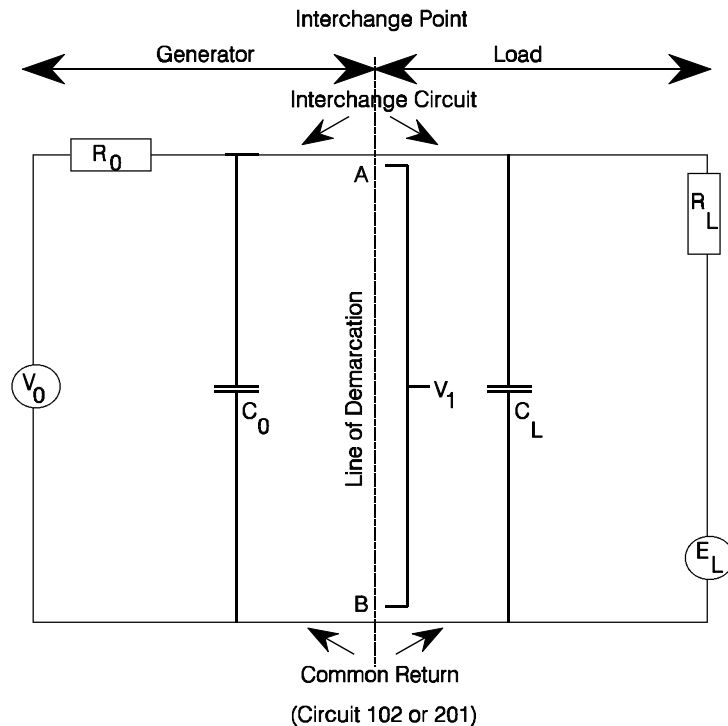
* Each circuit is optional and not necessarily provided on all PSPDNs.

Annex B : Electrical characteristics for unbalanced interchange circuits conforming to CCITT Recommendation V.28 [12]

B.0 Interchange equivalent circuit

Unless otherwise stated, all tests shall be performed with the DTE in the "power-on" condition.

Each interchange circuit may be represented as an equivalent circuit consisting of a generator and load with defined parameters as indicated in Figure B-1 (NET 2).



- V_0 is the open-circuit generator voltage.
- R_0 is the total effective de resistance associated with the generator, measured at the interchange point.
- C_0 is the total effective capacitance associated with the generator, measured at the interchange point.
- V_1 is the voltage at the interchange point with respect to common return.
- C_L is the total effective capacitance associated with the load, measured at the interchange point.
- R_L is the total effective de resistance associated with the load, measured at the interchange point.
- E_L is the open-circuit load voltage (bias).

NOTE 1: The Generator and Load can be the DCE or DTE dependent on the direction of transmission on the interchange circuit.

NOTE 2: The impedance associated with the generator (load) includes any cable impedance on the generator (load) side of the interchange point.

Figure B-1 (NET 2)

B.1 Generator characteristics

B.1.1 Protection against short-circuit conditions. The generator shall not be damaged by the application of the short-circuit tests specified in B.5.

Compliance shall be checked by applying the short-circuit tests specified in B.5, after which the generator shall comply with B.1.3, B.1.4 and B.1.5.

B.1.2 Generator output current limit. The output current of the generator with a short-circuit applied between the generator output pin and common return shall not exceed 0,5 amperes in any state of the DTE.

Compliance shall be checked by measurement.

B.1.3 Generator output voltage limit. The open circuit generator voltage shall not exceed 25 volts.

Compliance shall be checked by measurement.

B.1.4 Generator output voltage limit under maximum load conditions. The output voltage, as measured at the generator output pin with reference to common return, shall not be less than 5 volts when the generator output is terminated in a resistance of 3 000 ohms.

B.1.5 Generator output voltage limit under minimum load conditions. The output voltage, as measured at the generator output pin with reference to common return, shall not exceed 15 volts when the generator output is terminated in a resistance of 7 000 ohms.

B.1.6 Generator output power. The generator shall have an output power sufficient to supply current through all of the capacitance on the generator side (C_G) plus an additional capacitance of 2500 pF. (See B.7.).

B.2 Load characteristics

B.2.1 Load resistance. The load resistance (R_L) shall have a minimum value of 3 000 ohms and a maximum value of 7 000 ohms.

Compliance shall be checked by applying a voltage (V_L) of:

- a) 3 volts,
- b) 15 volts

and measuring the current through the load.

B.2.2 Maximum load open-circuit voltage. The open-circuit (E_L) shall not exceed 2 volts when disconnected from the generator.

Compliance shall be checked by disconnecting the generator and measuring the voltage at the interchange point.

B.2.3 Maximum load shunt capacitance. The total effective load shunt capacitance (C_L), as measured at the interchange point, shall not exceed 2 500 pF. (See B.7.).

Compliance shall be checked by measurement.

B.2.4 Load Impedance. The reactive component of the load impedance shall be capacitive as measured at the interchange point with an open circuit condition, in the frequency range 0-20 kHz.

Compliance shall be checked by measurement.

B.3 Transition between significant signal states

B.3.1 Wave form. Interchange signals entering the transition region shall proceed through this region to the opposite signal state in a monotonic progression; i.e. transition from -3 volts to +3 volts shall have no negative going component in the wave form; a transition from +3 volts to -3 volts shall have no positive going component in the wave form.

Compliance shall be checked by means of an oscilloscope connected across points A and B in both of the following cases:

- a) with a purely resistive load of 7 000 ohms,
- b) with a resistive load of 3 000 ohms in parallel with a capacitance of 2 500 pF. (See B.7.).

B.3.2 Maximum transition time on control interchange circuits. The time required for the signal to traverse the transition region during a change in signal state shall not exceed one millisecond.

Compliance shall be checked by means of an oscilloscope connected across points A and B with the generator terminated in a load of 3 000 ohms in parallel with a capacitance of 2 500 pF. (See B.7.).

B.3.3 Maximum transition time on data and timing interchange circuits. The time required for the signal to traverse the transition region during a change in signal state shall not exceed one millisecond or 3% of the nominal element period on the interchange circuit, whichever is the lesser.

Compliance shall be checked by means of an oscilloscope connected across points A and B with the generator terminated in a load of 3 000 ohms in parallel with a capacitance of 2 500 pF. (see B.7.).

B.3.4 Maximum instantaneous rate of voltage change. It shall not be possible for an interchange circuit to produce an instantaneous rate of voltage change of more than 30 volts per microsecond.

Compliance shall be checked by means of an oscilloscope connected across points A and B with the generator terminated in a resistive load of 7 000 ohms.

B.4 Power off conditions with minimum load

In the power off state the resistance of the generator side of circuit 108 shall not be less than 300 ohms.

Compliance shall be checked by applying a positive or negative voltage not greater than 2 volts with reference to the common return (circuit 102) and measuring the current.

B.5 Short-circuit tests

Each of the following tests shall be performed on an appropriate generator:

- a) Generator in the Binary 0 (ON) state. The following two tests shall each be applied sequentially for a period of 10 minutes.
 - i) The generator output (A) shall be connected to common return.
 - ii) The generator output shall be connected to a load of 3 000 ohms, where the open-circuit voltage (E) of the load is - 2 volts.
- b) Generator in the Binary 1 (OFF) state. The following two tests shall each be applied sequentially for a period of 10 minutes.
 - i) The generator output (A) shall be connected to common return.
 - ii) The generator output shall be connected to a load of 3 000 ohms, where the open-circuit voltage (E_L) of the load is +2 volts.

NOTE 1: An ammeter may be connected at point A to measure the steady state maximum current for each test.

NOTE 2: a)i/ii and b)i/ii do not represent the worst case where multiple short circuits occur.

NOTE 3: Where the generator would not normally produce a particular binary state for a period of 10 minutes, the tests in that state need not be performed.

B.6 Test equipment requirements

Voltages shall be measured with a voltmeter having a minimum internal resistance of 5 Mohms.

The oscilloscope used for wave form tests shall have a slewing rate greater than 50 volts/microsecond and an input impedance in excess of 5 Mohms.

B.7 Allowance for capacitance of connection leads

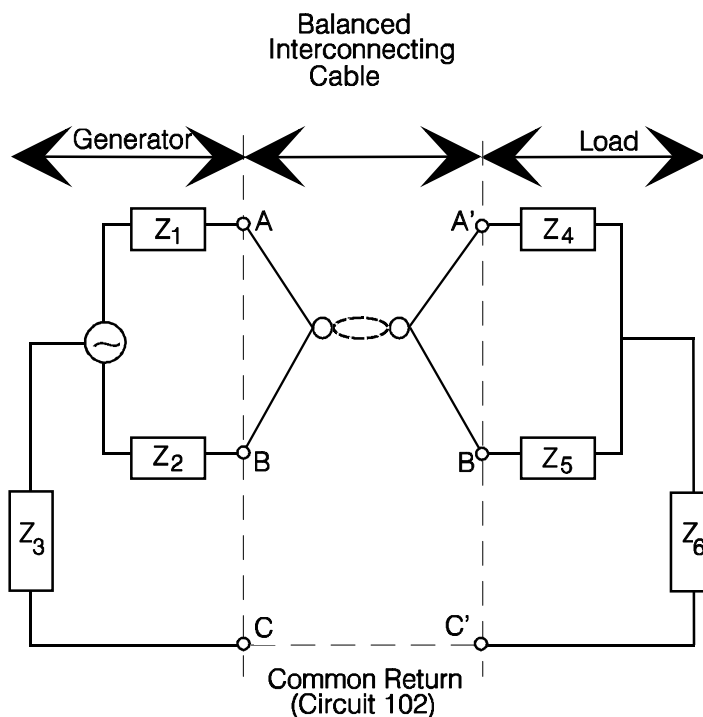
The value of 2 500 pF specified throughout this Annex includes the capacitance of the connection leads and may, at the request of the supplier, be modified to take account of the capacitance of the integral connection leads or the attached cable. The supplier shall provide the test laboratory with the value to be allowed for the capacitance of the DTE output circuits including, for example, internal wiring, cable, connector and any capacitance associated with line driving devices.

Annex C: Electrical characteristics for balanced double current interchange circuits confirming to CCITT Recommendation V.35 [10]

C.0 Interchange equivalent circuit

Unless otherwise stated, all tests shall be performed with the DTE in the "power-on" condition.

Each interchange circuit may be represented as an equivalent circuit consisting of a generator, balanced interconnection cable and a load as shown in Figure C-1 (NET 2).



NOTE: Point C may be connected to C by Common Return (Circuit 102).

Figure C-1 (NET 2)

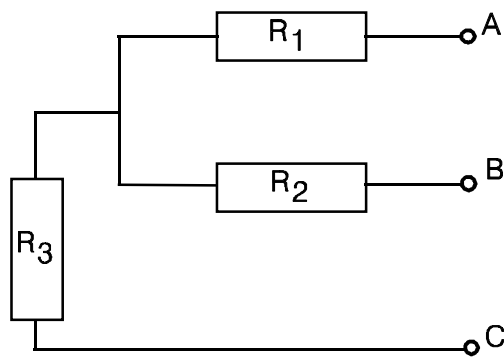
C.1 Generator characteristics

C.1.1 Source impedance. The source impedance of each generator shall be $100 \text{ ohms} \pm 50 \text{ ohms}$ at the data rate under consideration.

Compliance shall be checked by measurement.

C.1.2 The resistance between short-circuited terminals A and B and the common return (circuit 102) shall be $150 \text{ ohms} \pm 15 \text{ ohms}$.

Compliance shall be checked by measuring the change in current drawn when voltages of + 2V and - 2V respectively are applied at the terminals.



$$R_3 + \frac{R_1 R_2}{R_1 + R_2} = 150 \pm 15 \text{ ohms}$$

(to minimise crosstalk
 R_1 should equal R_2)

Figure C-2 (NET 2)

C.1.3 When terminated with a 100 ohm resistive load the terminal to terminal voltage (at A and B) shall be 0,55 volts \pm 0,11 volts.

Compliance shall be checked by measurement.

C.1.4 With a 100 ohm resistive load at A, B the rise time between the 10% and 90% points of any change of state shall be less than 1% of the nominal duration of a signal element, or 40 nanoseconds, whichever is the greater.

Compliance shall be checked by means of an oscilloscope connected across points A and B.

C.2 Balanced interconnecting cable

The interconnection cable shall be balanced twisted multi-pair type with a nominal characteristic impedance of 100 ohms \pm 20 ohms at the data rate under consideration.

Compliance shall be checked by inspection.

C.3 Load characteristics

C.3.1 The input impedance across terminals A and B shall be 100 ohms \pm 10 ohms at the data rate under consideration.

Compliance shall be checked by measurement.

C.3.2 The resistance between short-circuited terminals A and B and the common return (circuit 102) shall be 150 ohms \pm 15 ohms.

Compliance shall be checked by measuring the change in current drawn when voltages of + 2V and - 2V respectively are applied at the terminals.

$$R_6 + \frac{R_4 R_5}{R_4 + R_5} = 150 \pm 15 \text{ ohms}$$

(to minimise crosstalk
 R_4 should equal R_5)

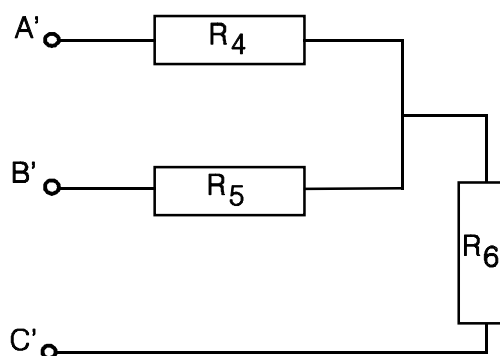


Figure C-3 (NET 2)

C.4 Generator and load protection

Neither generator nor load shall be damaged by connection to earth potential, short-circuiting or cross connection to other interchange circuits.

Annex D

Administrations that do not apply the technical requirements in Clauses 9 and 10 (the Link and Packet level requirements) before a DTE is given permission to connect to their PSPDNs.

Denmark¹⁾

France

Iceland

Portugal

Sweden

Switzerland

United Kingdom

NOTE 1: In Denmark Administrations and RPOAs do not require a DTE to have been tested in respect of the technical requirements given in Clause 8.

Annex E: Questionnaire

The following questions are required to be answered when submitting a DTE for approval. In some cases it may be necessary for the testing laboratory to ask additional questions.

E.1 Physical Level

E.1.1 Please state which type of CCITT interface and ISO connector are used.

Service	Interface Type	Connector	Please Tick
Up to 9 600 bit/s	V.24 [17]/V.28 [12]	ISO 2110 [5]	
48 Kbit/s	V.35 [10]	ISO 2593 [6]	
48 or 64 kbit/s	V.36 [11]	ISO 4902 [7]	
up to 64 kbit/s	X.21 [8]	ISO 4903 [18]	

E.1.2 For each of the interfaces supported in E-1.1 above please state;

- a) which connections in the DTE-DCE interconnection cable are unused;
- b) which connections in the DTE-DCE interconnection cable are terminated by means other than an appropriate generator or load;
- c) which generators will be held at a steady state.

E.2 Link Level

E.2.1 In the following list of parameters, please indicate the values which can be selected.

Parameters	Range of values	Nominal Value				
		2,4 kbit/s	4,8 kbit/s	9,6 kbit/s	48 kbit/s	64 kbit/s
48 kbit/s						
T1 (ms)						
T2 (ms)						
T3 (ms)						
N1 (in bits)						
N2						
k						

E.2.2 Which method(s) given in section 9.1 is (are) implemented.

E.2.3 What action if any is taken by DTE at packet level after a link level reset.

E.2.4 Can the DTE disconnect link level.

E.2.5 Is the disconnected phase a transient phase for the DTE?

E.2.6 The capability to subscribe to LAPB extended (module 128) operation is implemented in the DTE?

E.2.7 The capability to subscribe to multilink operation is implemented in the DTE?

E.3 Packet Level

E.3.1 Format of Packets

Does your equipment have any specific requirements:

- a) for the call set-up packets?
- b) data packets?

e.g.: protocol identifier field in Incoming Call packet or higher level protocol element in the call user data field of Incoming Call packets.

If YES to either a) or b) then please give details.

E.3.2 Logical Channels

What type(s) of logical circuits does your equipment support?

- a) Permanent Virtual Circuits (PVC).
- b) One way Incoming virtual call.
- c) Two way virtual call.
- d) One way outgoing virtual call.

Annex H: Requirements applicable to DTEs subscribing to Link Access Procedure Balanced (LAPB) extended (module 128) operation

This Annex contains the attachment requirements applicable to packet mode Data Terminal Equipment (DTEs) which subscribe to the optional application of the LAPB extended (module 128) operation. These attachment requirements are additional to those contained in the main body of this NET.

H.1 Symbols and abbreviations

LAPB	Link Access Procedure Balanced
SABME	Set Asynchronous Balanced Mode Extended
SABM	Set Asynchronous Balanced Mode
FRMR	Frame Reject
DM	Disconnected Mode
DISC	Disconnect

H.2 LAPB extended (Module 128) operation

A DTE which subscribes to LAPB extended operation shall satisfy the following requirements:

H.2.1 General

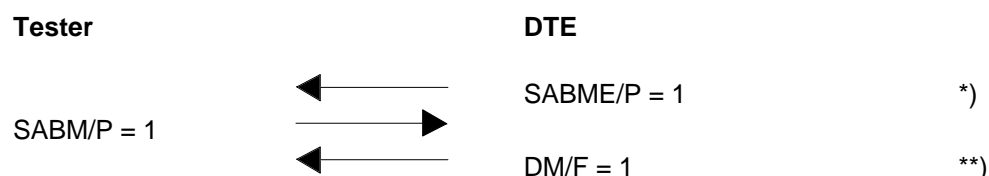
All tests provided in section 9 [1] shall apply with the following changes:

- a) Command SABME shall be used instead of SABM;
- b) Control field of frames that contain sequence numbers shall consist of 2 octets as specified in table 4 of CCITT Recommendation X.25 [2];
- c) Information field of FRMR frame shall consist of 5 octets as specified in table 8 of CCITT Recommendation X.25 [2];
- d) Test 9.3 (see section 9 [1]) shall be performed, the tester transmitting an I frame 128 times.

H.2.2 Additional tests

H.2.2.1 Link set-up mode establishment collision

Test condition - the DTE shall be in the Disconnected Mode (DM).



NOTE *: This frame is optional depending on the link initialisation method supported by the DTE.

NOTE **: DISC may be transmitted.

Annex I: Requirements applicable to DTEs subscribing to Multilink operation

This Annex contains the attachment requirements applicable to packet mode Data Terminal Equipment (DTEs) which subscribe to the optional application of the multilink operation. These attachment requirements are additional to those contained in the main body [1].

I.1 Symbols and abbreviations

SLP	Single Link Procedure
MLP	Multilink Procedure
PDU	Protocol Data Unit
sut	system under test
RNR	Receive Not Ready
RR	Receive Ready

I.2 Multilink procedure (MLP)

I.2.1 General

This subclause contains the additional requirements to be satisfied by a DTE which subscribes to the multilink procedure.

The requirements established for Single Link Procedure (SLP) in section 9 [1] or in the supplement for module 128 operation are applicable. The only difference is in respect of the address field of (LAPB) frames where the encoding shall be as reflected in CCITT Recommendation X.25 (1984), paragraph 2.4.2 [2], for multilink operation.

I.2.2 Tests

To execute a test, the tester shall attempt to force the DTE to an appropriate phase or condition by transmitting a particular Protocol Data Unit (PDU) or a sequence of PDUs. However, some DTEs may initialise the link or send a particular PDU that requires an appropriate answer from the tester to be in accordance with the protocol procedures.

To represent those situations in the test descriptions, the following notation shall be used:

- PDUs within [] denote optional PDUs from the DTE that shall not require a specific answer from the tester;
- PDUs within () denote optional PDUs from the DTE that shall require a specific answer from the tester according to the protocol procedures.

The following requirements shall be applied along the whole section:

- a) in many tests the DTE has to transmit an I-frame. The DTE can be forced to transmit an I-frame, e.g. by receiving:
 - RESTART INDICATION (in state r1),
 - RESET INDICATION on an LC, as assigned as a PVC, in any state except d2 and d3,
 - CLEAR INDICATION on an LC, assigned as an SVC, in any state except p.6 and p.7.

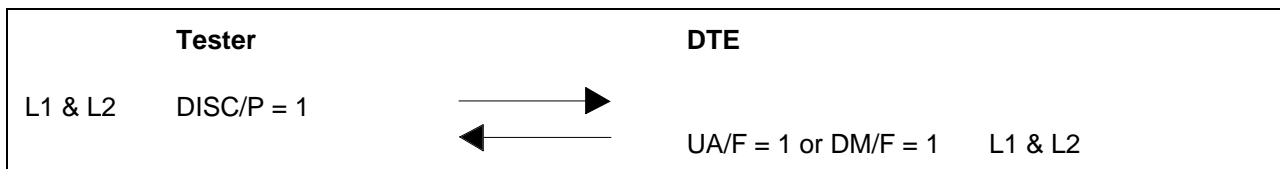
It depends on the characteristics of the DTE what packet should be used.

- b) if for any reason both SLPs become in Disconnected Mode (DM), the MLP resetting can be possible. If MLP were reset then MLP frames to be transmitted by the DTE may be lost.

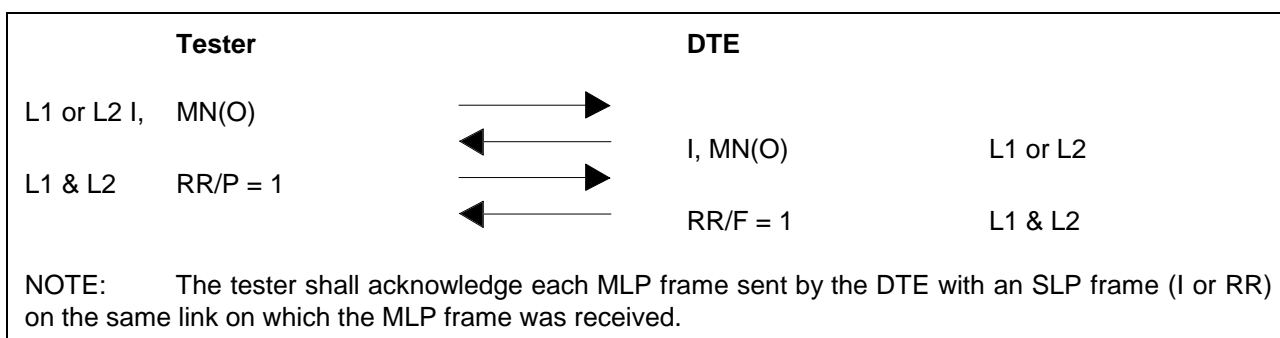
- c) the following tests are defined under the assumption that both SLPs are configured with the same system parameters.

I.2.2.1 Verification of MLP set-up phase

A preamble verification sequence shall be executed before each test in both lines (L1 and L2) which link the DTE and the Tester:

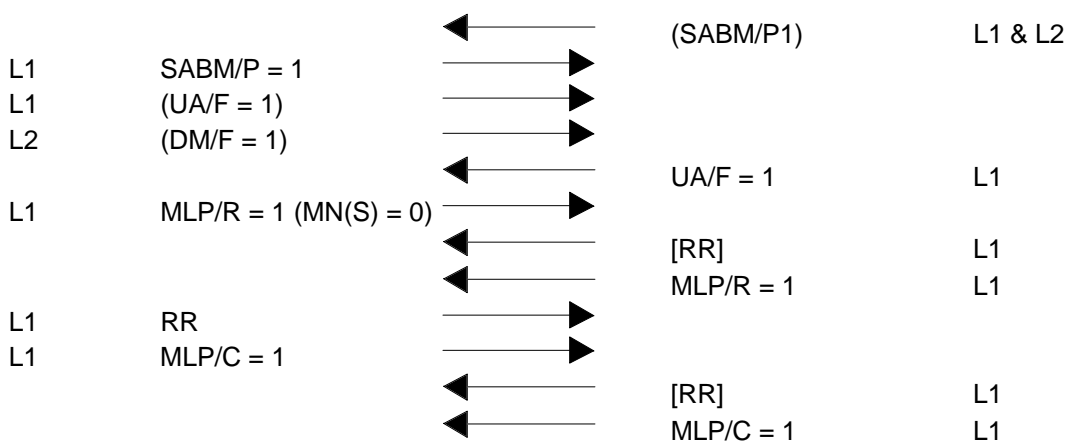


A post-test sequence shall be executed after each test to verify the correct status of the DTE:

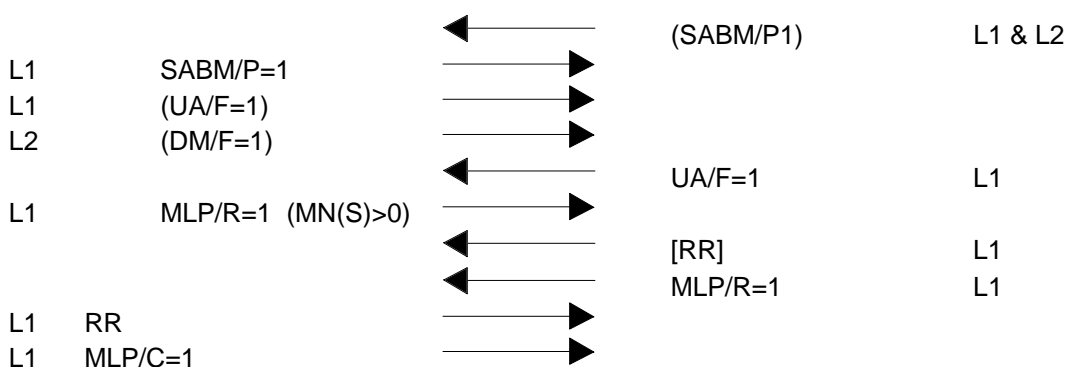


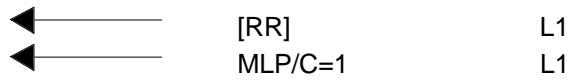
I.2.2.1.1 The system under test (sut) does not initialise the MLP

I.2.2.1.1.1 Initialisation through L1, L2 in DM. (MN(S) = 0)

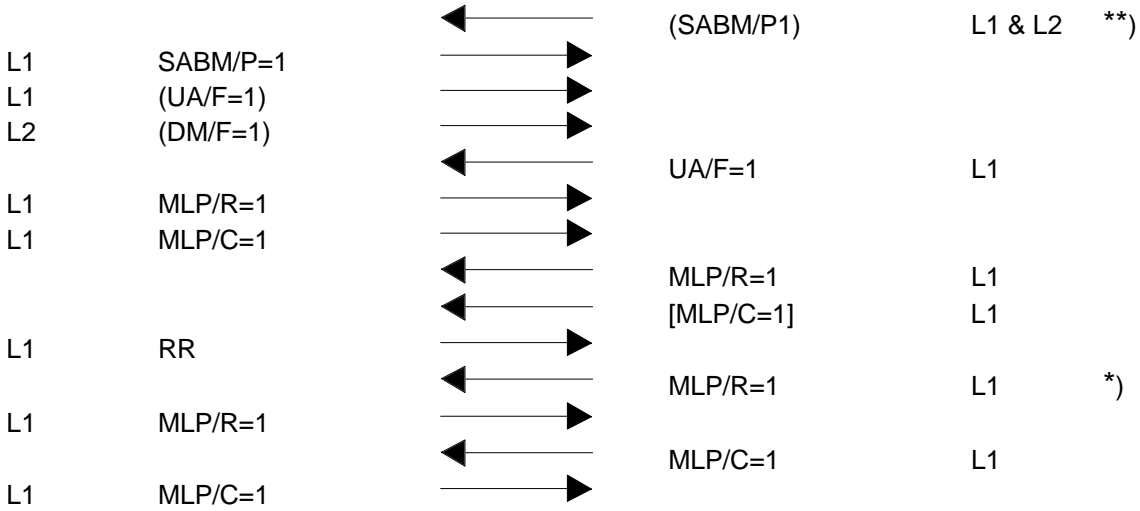


I.2.2.1.1.2 Initialisation through L1, L2 in DM.(MN(S)>0)





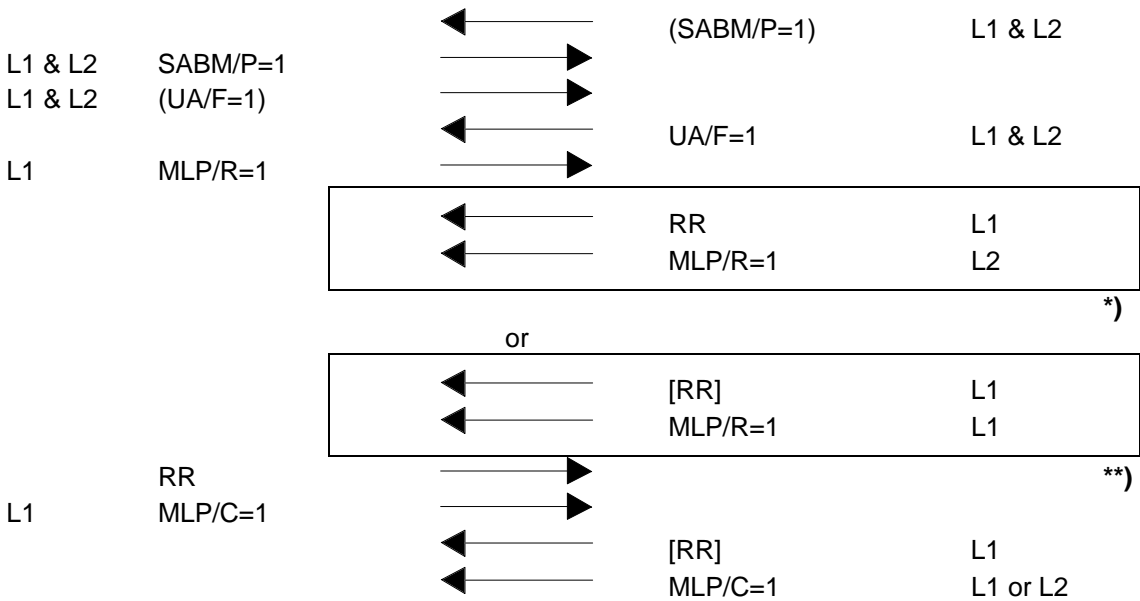
I.2.2.1.1.3 Initialisation through L1, MLP frame with C=1 is sent immediately after MLP frame when R=1. L2 in DM



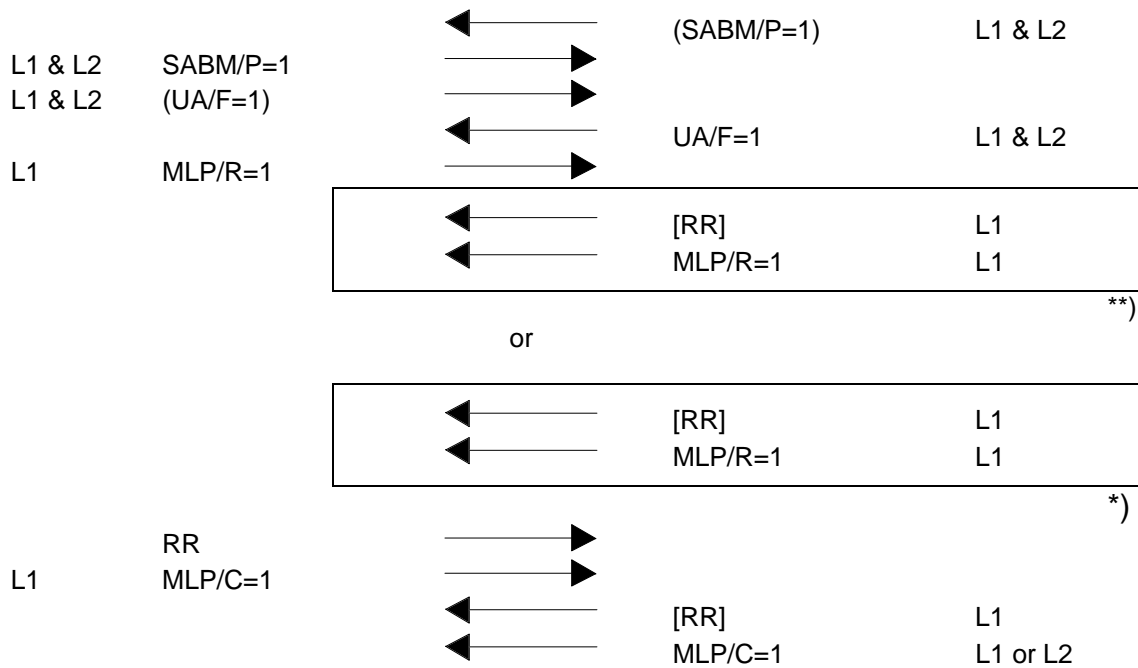
NOTE *: MT3 expires.

NOTE **: If the DTE reacts on R=1 MLP frame before treating C=1 MLP frame MT3 shall not expire. In that case the test shall be considered successful.

I.2.2.1.1.4 Initialisation through L1, L2 active



I.2.2.1.1.5 Initialisation through L1, confirmation by L2

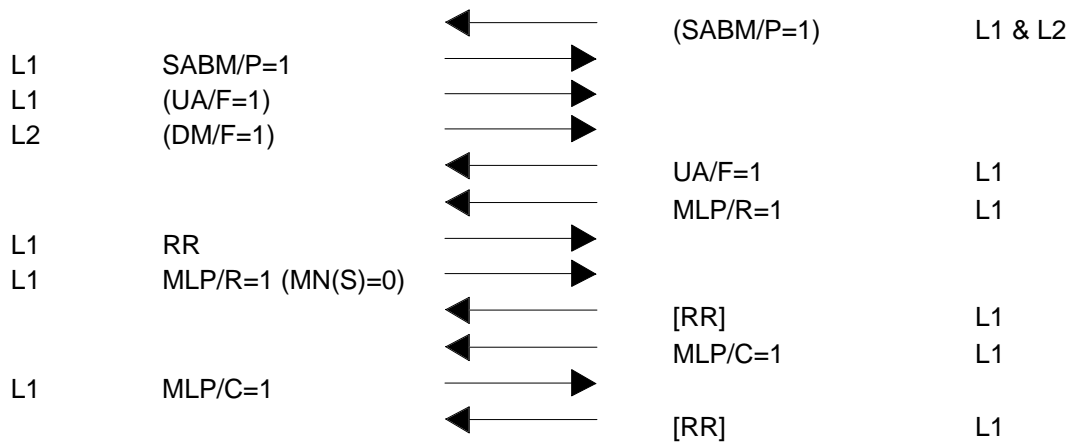


NOTE *: The tester sends the frame through the line which received the frame MLP/R=1.

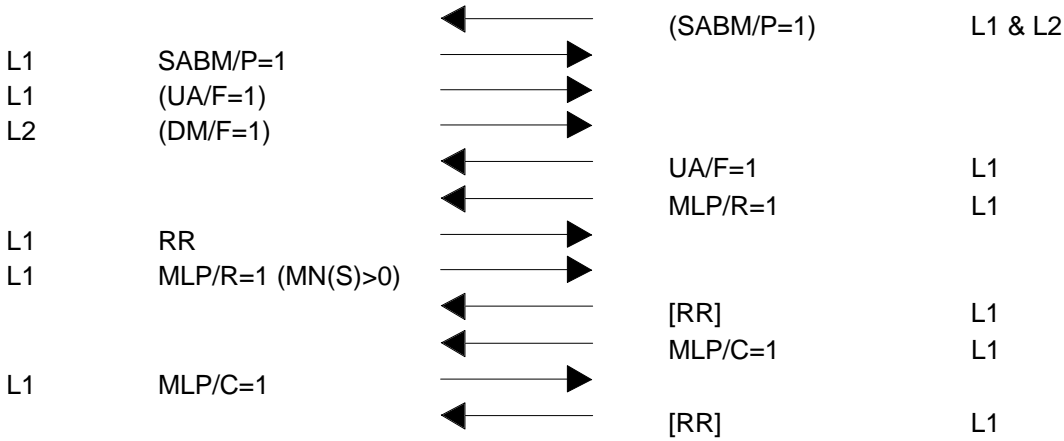
NOTE **: The time ordering of both frames can be reversed.

I.2.2.1.2 The sut does not initialise the MLP

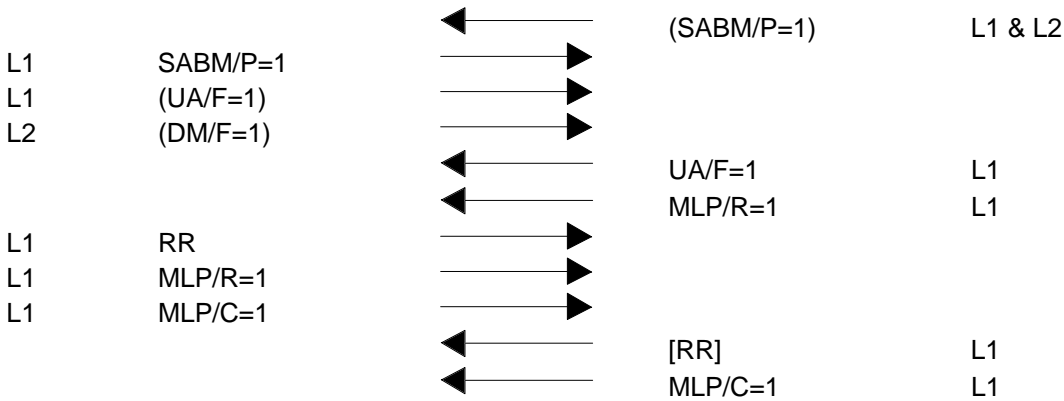
I.2.2.1.2.1 Initialisation through L1, L2 in DM. (MN(S) = 0)



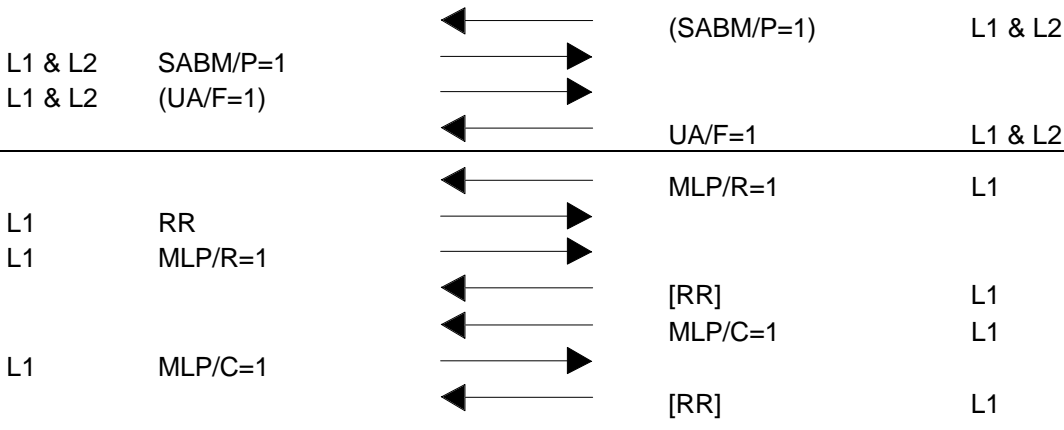
I.2.2.1.2.2 Initialisation through L1, L2 in DM. (MN(S)>)



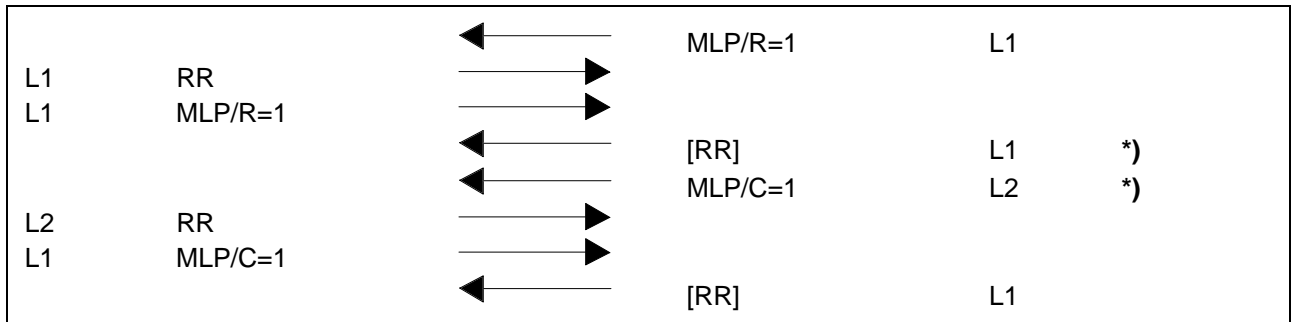
I.2.2.1.2.3 Initialisation through L1, MLP frame when C=1 is sent immediately after MLP frame when R=1. L2 in DM



I.2.2.1.2.4 Initialisation through L1, L2 active



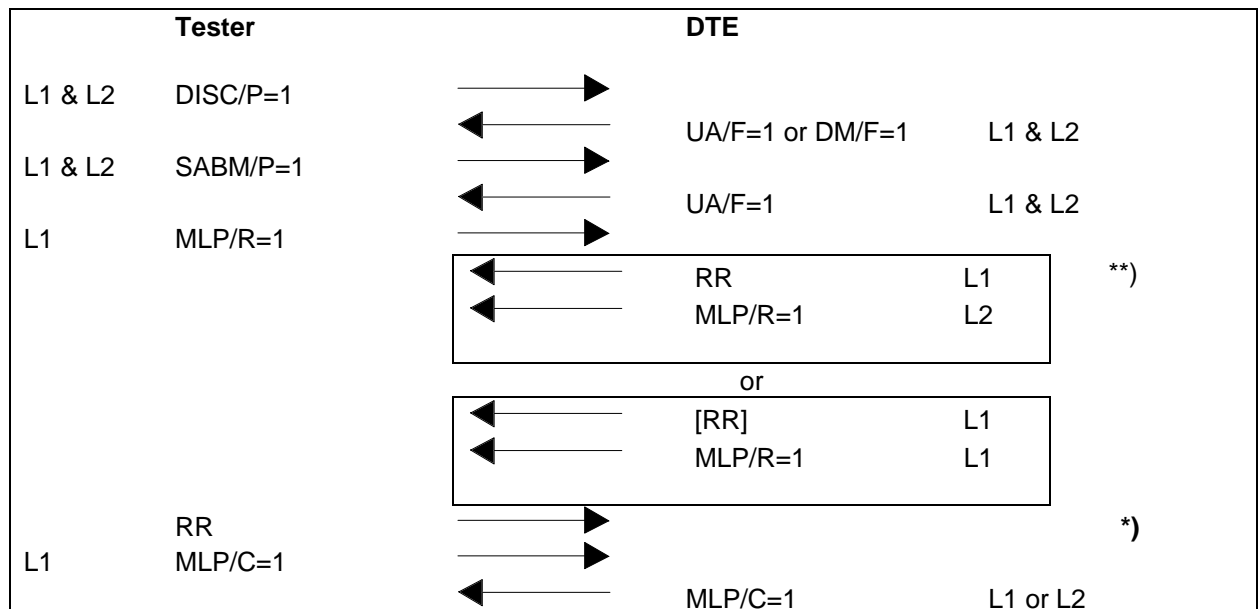
or



NOTE *: The time ordering of both frames could be reversed.

I.2.2.2 Verification of MLP re-routing conditions

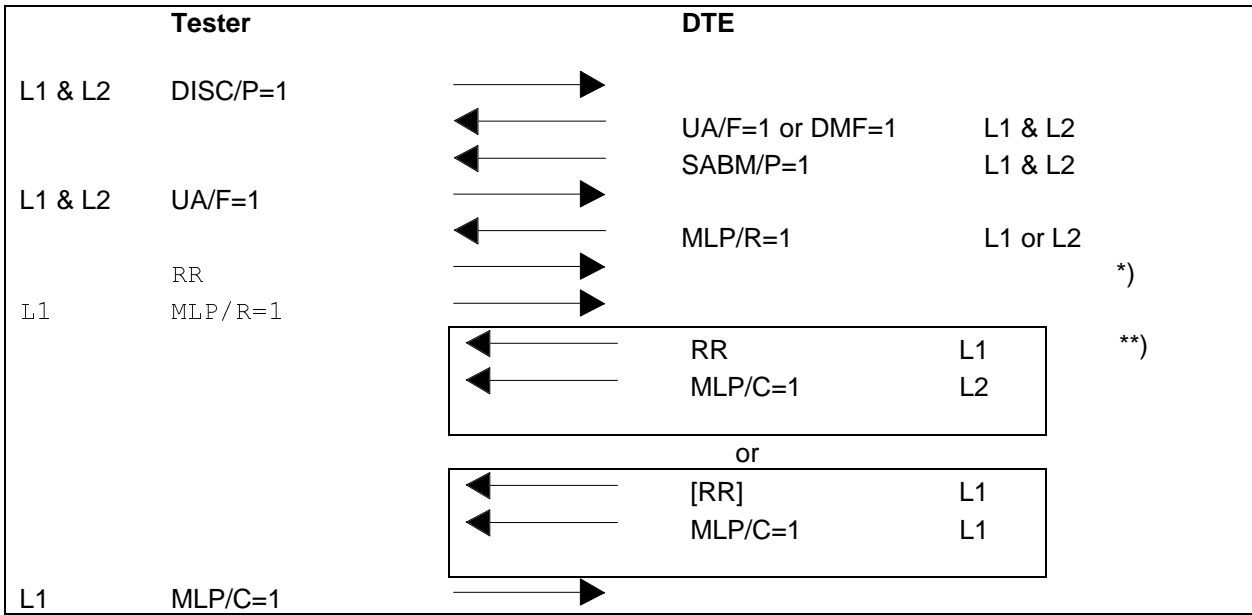
A preamble sequence such as one of the following shall be executed before each test. The objective is to get the DTE into the Information Transfer Phase, with the two links L1 & L2 active, and then produce the re-routing conditions.



NOTE *: The tester sends the frame through the line which received the frame MLP/R=1.

NOTE **: The time ordering of both frames may be reversed.

or,

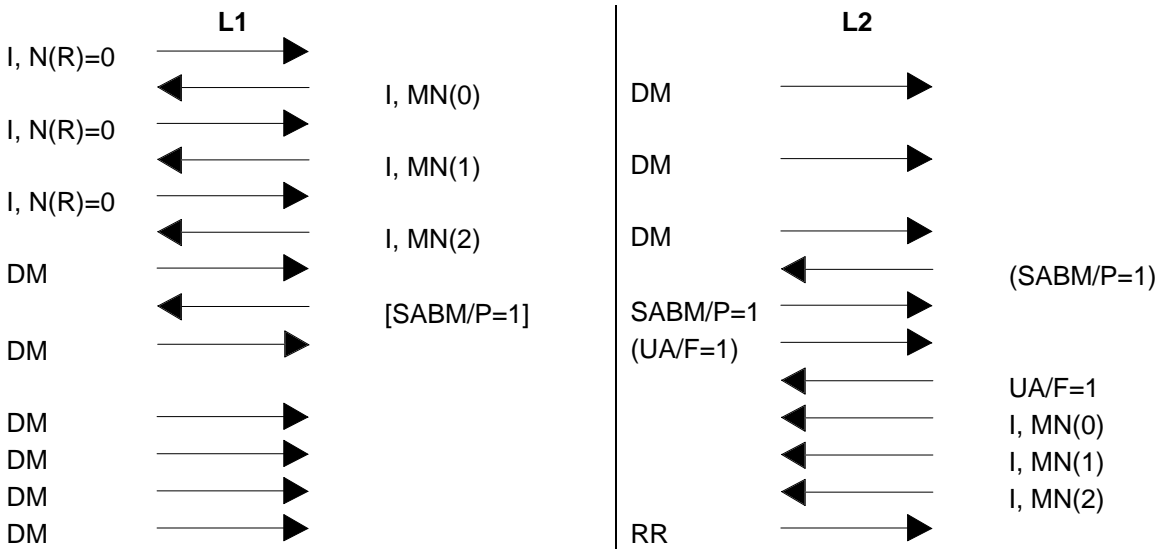


NOTE *: The tester sends the frame through the line which received the frame MLP/R=1.

NOTE **: The time ordering of both frames can be reversed.

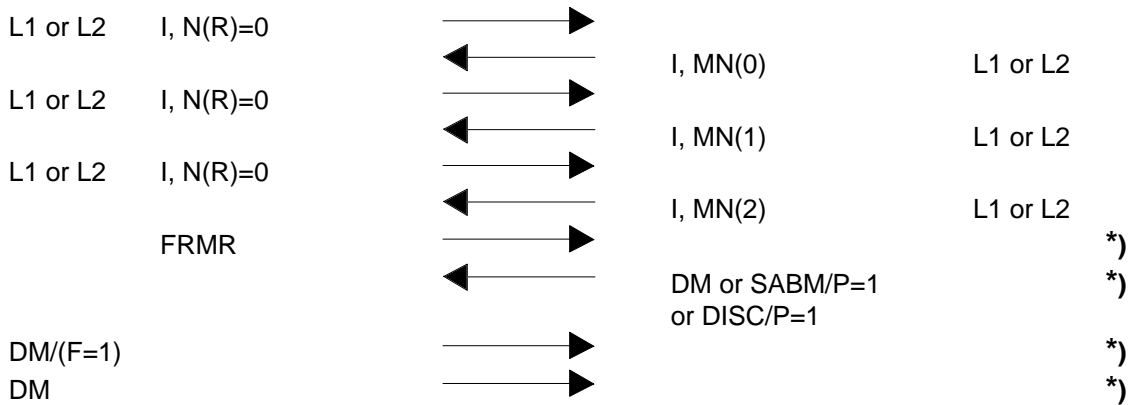
I.2.2.2.1 Disconnect Mode (DM) condition

The tester sends a DM frame. This test requires that the DTE transmits I frames.

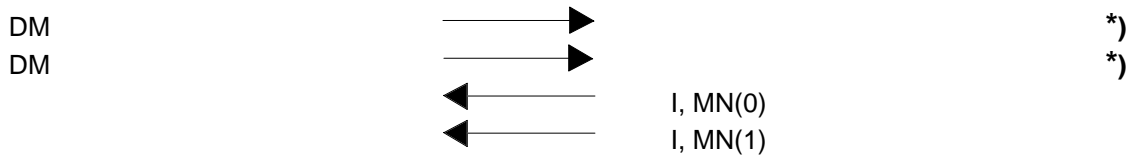


I.2.2.2.2 Frame reject (FRMR) condition

The tester sends a FRMR frame. This test requires that the DTE transmits I frames through L1 and L2.



(The DTE sends the frames through a different line)



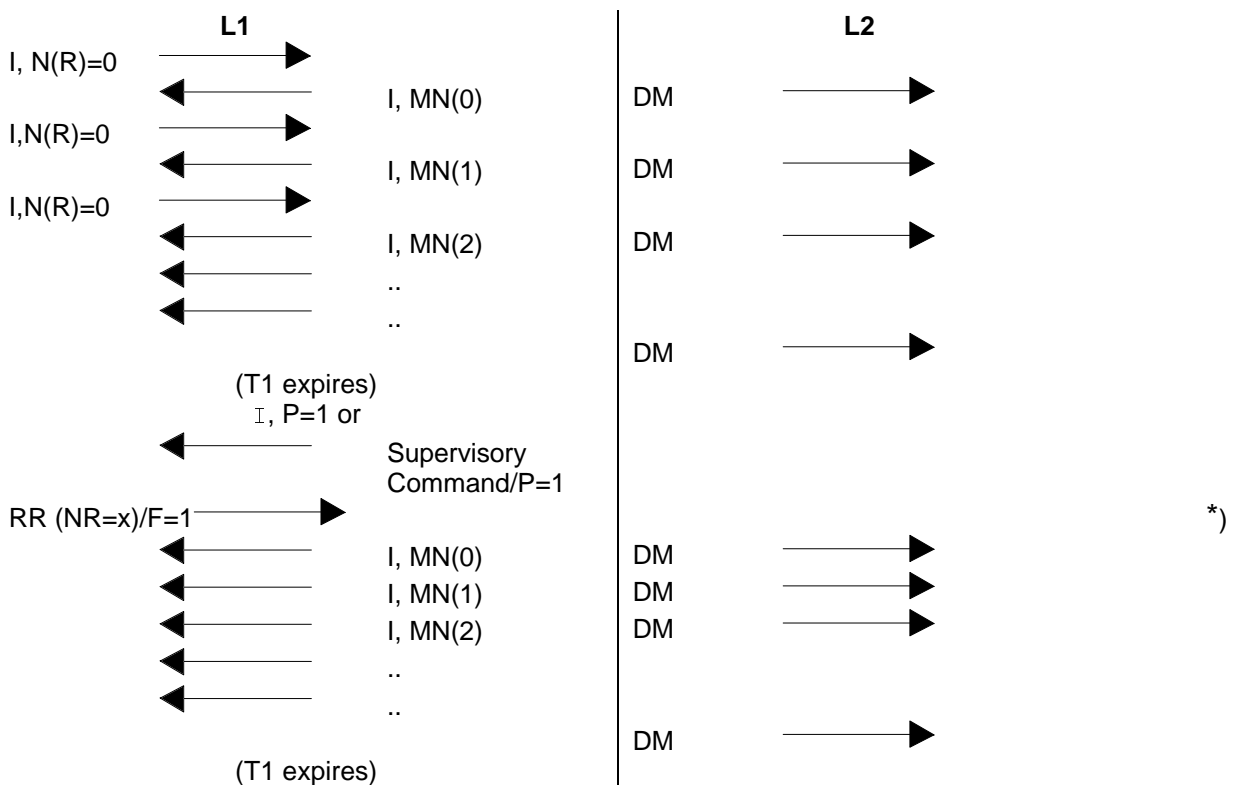
(The tester sends an RR frame when receiving the I frame)

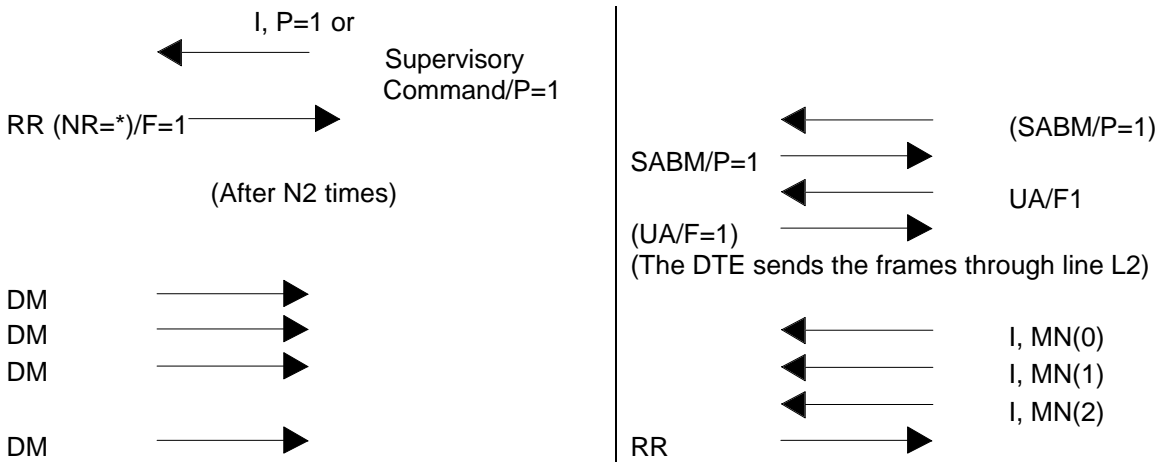


NOTE *: The tester/DTE sends the frames through the line which received/transmitted the frame I, MN(0).

I.2.2.2.3 Retransmission condition

The tester forces retransmission of I frames N2 times. The test requires that the DTE transmits I frames.

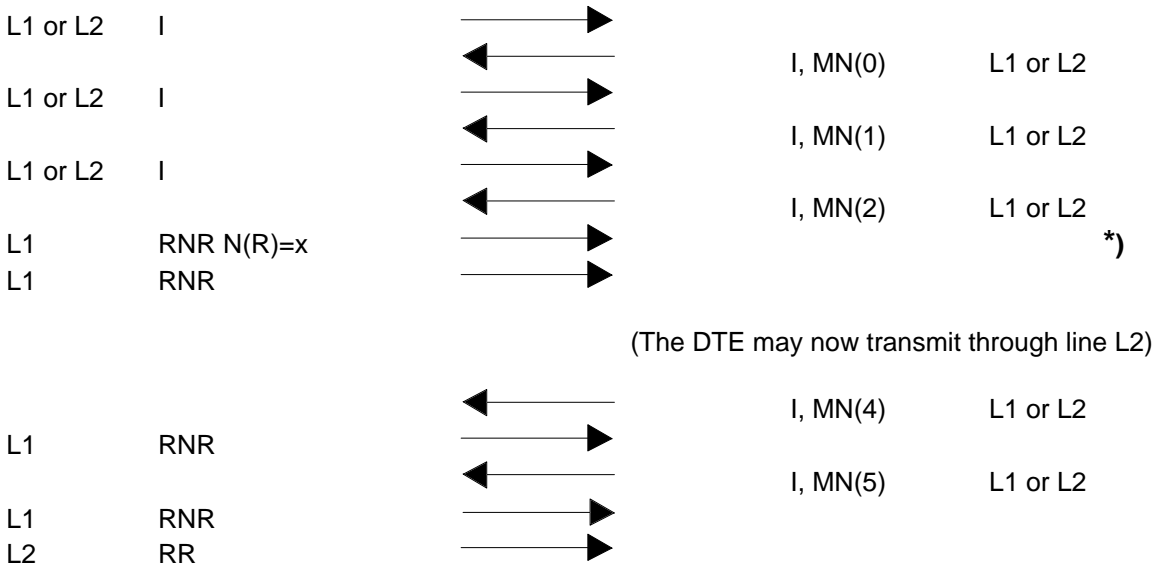




NOTE *: The value of N(R) corresponds to the I, MN(0)

1.2.2.2.4 Busy condition

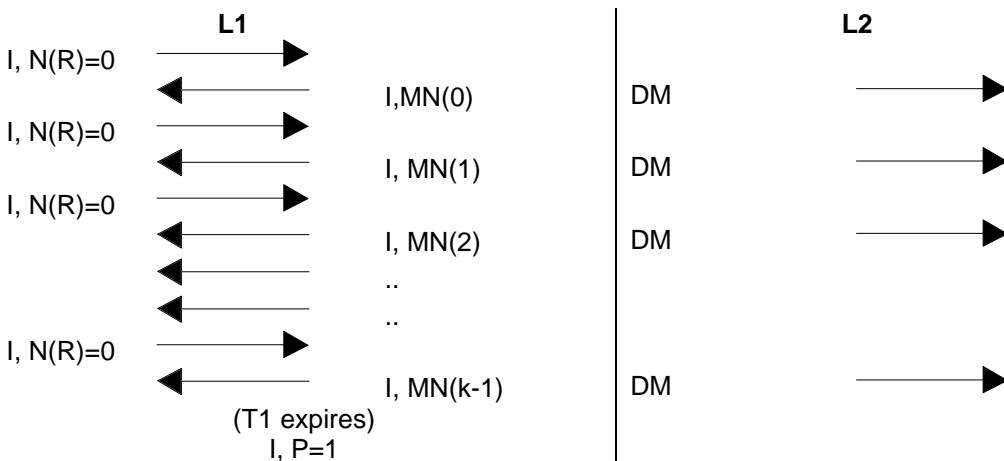
The tester sends Received Not Ready (RNR). This test requires that the DTE transmits I frames.

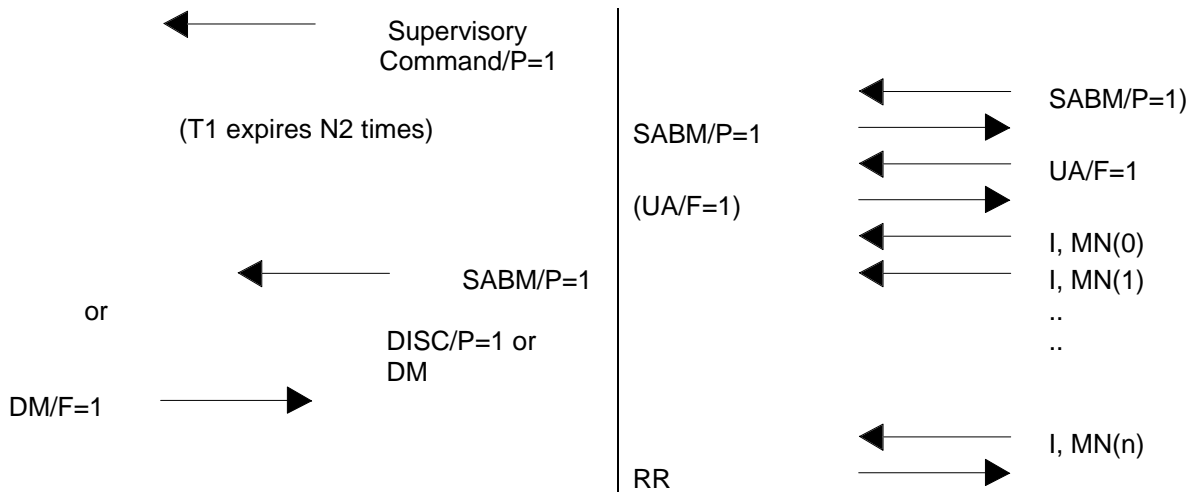


NOTE *: The value of N(R) corresponds to the next I frame.

1.2.2.2.5 Waiting acknowledgement condition

This test requires that the DTE transmits I frames to reach the k value.

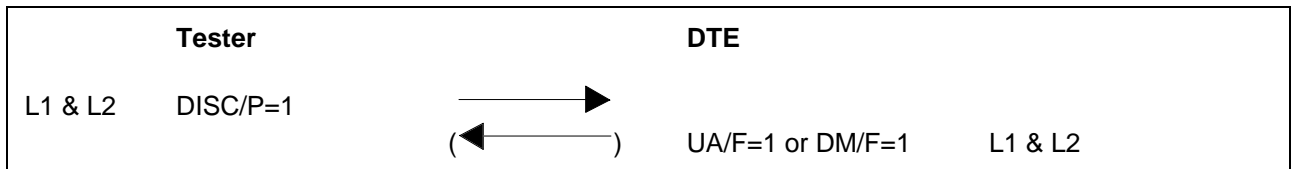




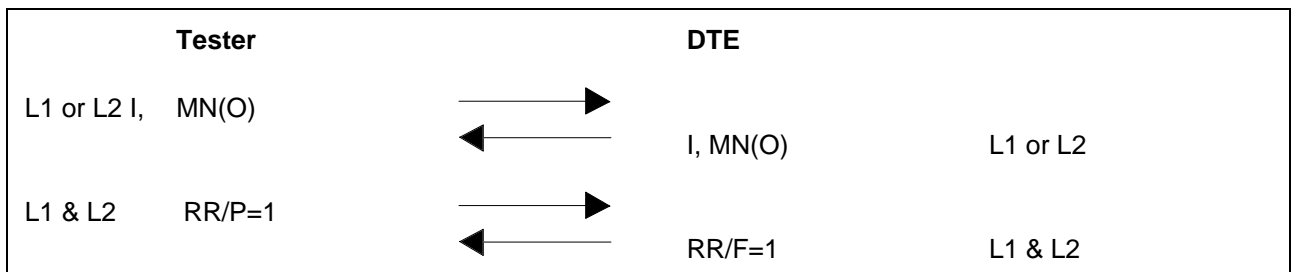
NOTE: $n \geq k-1$

I.2.2.3 Verification of MLP timers

A preamble verification sequence shall be executed before each test in both lines (L1 and L2) which link the DTE and the Tester:

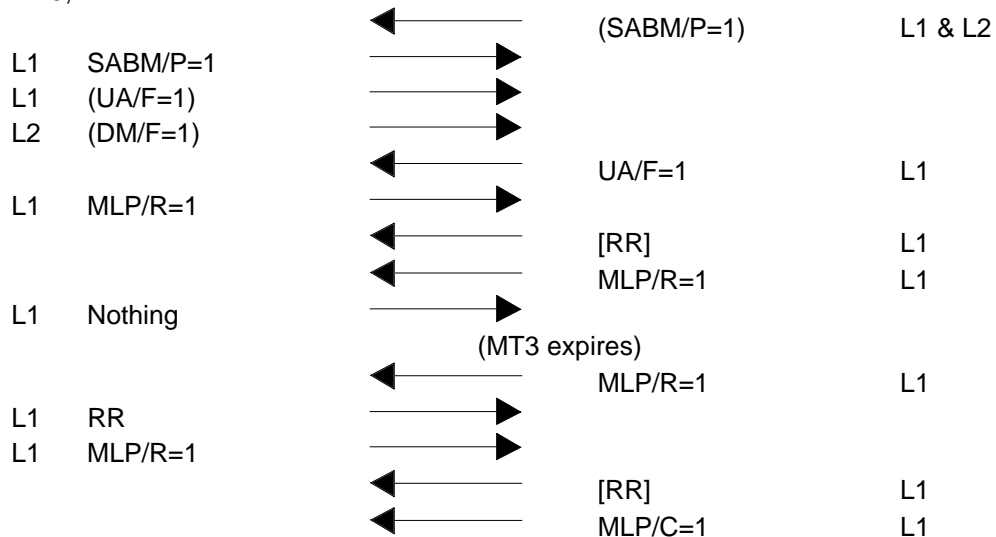


A post-test sequence shall be executed after each test to verify the correct status of the DTE



I.2.2.3.1 The DTE does not initialise the MLP

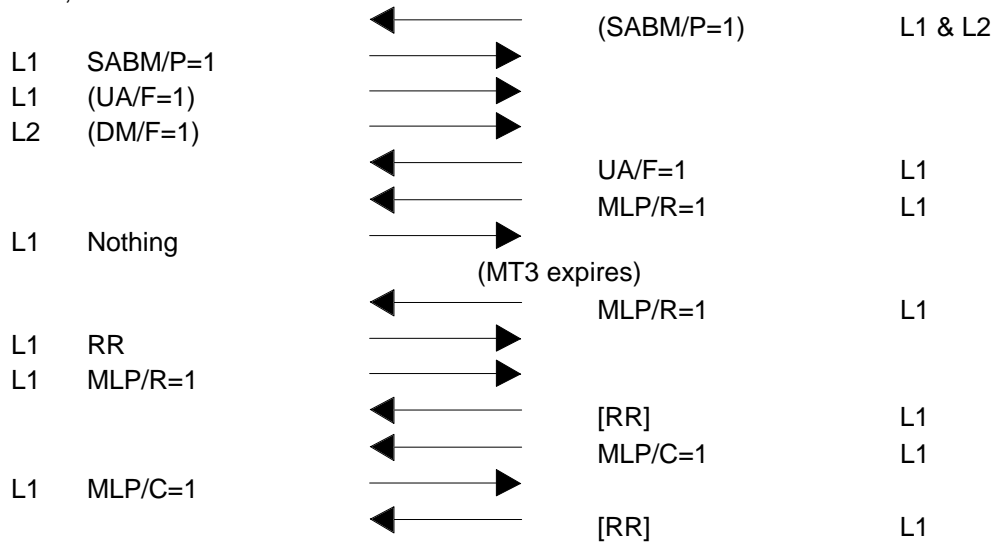
Timer MT3, L2 in DM





I.2.2.3.2 The DTE does initialise the MLP

Timer MT3, L2 in DM



Appendix I: Background Information

This appendix is provided for explanatory purposes and is not an integral part of this NET.

I.1 Scope

The Scope Statement is intended to make clear that:

- a) This NET covers technical requirements; there may be additional non-technical requirements (NTR) which must be met before permission to connect to a PSPDN can be granted. An example of an NTR could be rules for the labelling of equipment.
- b) An objective is to "minimise", to an acceptable level, disturbance to a PSPDN". This takes into account both the costs involved in testing and the likelihood of a particular disturbance occurring. To ensure no disturbance to a network would require a limitless number of tests.
- c) Satisfying the technical requirements does not guarantee that a CCITT Recommendation X.25 DTE will work to every PSPDN. Further information will be required on such matters as the services provided by a PSPDN, method of link initialisation to be used etc.
- d) If permission is given to connect to a PSPDN, then the DTE is allowed to invoke the essential (E) facilities of that PSPDN without further testing. It may not be successful but it is allowed to try. It should be noted that terminal NETs may include tests of (E) facilities, e.g. reverse charging, and/or (A) facilities if related to the service provided by the terminal.

I.2 Data Transmission

Because of the scope of this NET no tests covering the transmission of data packets have been included. It is envisaged that such tests, if considered appropriate, would be included in terminal NETs.

I.3 Testing Conditions

Information on testing conditions is given in section 7.2 of this NET. Eventually testing conditions will be contained in a single, separate document.

I.4 Conformance Testing

The conformance testing studies in CTS-WAN refers to a project sponsored by the Commission of the European Economic Community (EEC) for the development of Conformance Testing Services applicable to the verification and certification of conformity to standards. CTS-WAN covering the implementation of OSI standards over Wide Area Networks (which includes the preparation of a test suite for full conformance testing applicable to CCITT Recommendation X.25), and the studies taking place in ISO TC 97 on OSI Conformance Testing, both have been noted but there were no published results related to CCITT Recommendation X.25 available at the time of drafting.

It is recognised that some equivalence is to be expected (but not total equivalence as the objectives are not identical, the CEPT Recommendation being limited to the requirements defined for an ACCESS NET).

It is believed that the tests given in this recommendation are not in conflict with the tests produced within the CTS-WAN project.

I.5 Maintenance

It is recognised that in the light of implementation experience there will be a need to modify this NET from time to time. Such a procedure is currently under study. It is hoped that many of the more general sections in this NET such as safety, testing environment, guidance to test houses, will eventually be moved to separate documents and only reference to them made in this NET. This removal will be handled under the maintenance procedures.

I.6 PICS and PIXIT

Due to lack of time it has not been possible to include PICS and PIXIT as defined in ISO DP 8882 in this NET. However, it is agreed that such "questionnaires" would be helpful and should be included at a later date.

I.7 Approval of CCITT Recommendation X.25 DTE using this NET

In writing this NET it has been assumed that the person carrying out the tests will be an experienced tester of CCITT Recommendation X.25 DTEs. This NET is not suitable for use by an inexperienced CCITT Recommendation X.25 DTE tester or by fully automatic test equipment.

Appendix II: CCITT Recommendation X.25 [2] (1980) DTEs

This appendix is provided for explanatory purposes and is not an integral part of this NET.

Physical, link level and packet level tests as given in this NET could apply to DTEs implemented according to CCITT Recommendation X.25 [2] (1980) with the following changes.

- a) In the method of link initialisation (sections 9.1.2, 9.1.3, 9.1.4) and in the collisions of U-commands (section 9.2) DTEs will be allowed to send SABM/P = X and DISC/P = X commands. The tester will answer accordingly.
- b) For tests 9.7.1, 9.7.2 and 9.7.3 expected behaviour from the DTE will be SABM/P = X, DISC/P = X, DM, DISCARD.
- c) All packets sent by the DTE should conform with the format given in section 6 of CCITT Recommendation X.25 [2] (1980).

History

Document history	
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