

**Access and Terminals (AT);
Multiple 64 kbit/s digital unrestricted leased lines with
octet integrity presented at a structured 2 048 kbit/s
interface at either or both ends (D64M);
Connection characteristics and
network interface presentation**



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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Access and Terminals (AT), and is now submitted for the ETSI standards One-step Approval Procedure.

The present document resulted from a mandate from the Commission of the European Community (CEC) to provide standards for the support of the Directive on Open Network Provision (ONP) of leased lines (92/44/EEC).

There are six other standards directly related to the present document:

- EN 300 288: "Access and Terminals (AT); 64 kbit/s digital unrestricted leased line with octet integrity (D64U); Network interface presentation";
- EN 300 289: "Access and Terminals (AT); 64 kbit/s digital unrestricted leased line with octet integrity (D64U); Connection characteristics";
- EN 300 290: "Access and Terminals (AT); 64 kbit/s digital unrestricted leased line with octet integrity (D64U); Terminal equipment interface";
- EN 300 418: "Access and Terminals (AT); 2 048 kbit/s digital unstructured and structured leased lines (D2048U and D2048S); Network interface presentation";
- EN 300 419: "Access and Terminals (AT); 2 048 kbit/s digital structured leased lines (D2048S); Connection characteristics";
- EN 300 420: "Access and Terminals (AT); 2 048 kbit/s digital structured leased lines (D2048S); Terminal equipment interface".

The present document is based on information from ITU-T Recommendations and ETSI publications and the relevant documents are quoted where appropriate.

The present document has been written as a "delta" document to the existing standards for 64 kbit/s and 2 048 kbit/s leased lines. It uses requirements from these standards by cross-reference with modifications as necessary to the test. The configurations covered by the present document could have been addressed by modifying the existing standards for 64 kbit/s and 2 048 kbit/s leased lines to make them more modular so that the 64 kbit/s connection characteristics could be used in conjunction with the 2 048 kbit/s structured interface. In some ways this would have been a tidier solution, but it would involve considerable additional activity because the existing standards for 64 kbit/s and 2 048 kbit/s leased lines were, at the time of creation of the present document (see also the introduction of the present document), the subject of regulation and references to them in the annex of the ONP leased line Directive would have to be changed.

Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	6 months after doa

Introduction

The Council Directive on the application of ONP to leased lines (92/44/EEC) concerns the harmonization of conditions for open and efficient access to, and use of, the leased lines provided over public telecommunications networks and the availability throughout the European Union (EU) of a minimum set of leased lines with harmonized technical characteristics.

Other countries outside the EU may also choose to provide leased lines according to the standards produced to support the Directive.

The consequence of the Directive is that telecommunications organizations within the EU shall make available a set of leased lines between points in these countries with specified connection characteristics and specified interfaces. Under the Directive 91/263/EEC (see annex B), later replaced by 98/13/EC (see annex B), Terminal Equipment (TE) for connection to these leased lines was required to fulfil certain essential requirements.

The present version of the present document has been produced to introduce some necessary changes.

The leased line specified in the present document is not included in the minimum set whose provision is required under Directive 92/44/EEC (see annex B), however the present document is written as a "delta" document based on the specifications for the 2 048 kbit/s digital structured ONP leased line (D2048S) and 64 kbit/s digital unrestricted ONP leased line with octet integrity (D64U) leased lines.

ETS 300 166 and ITU-T Recommendation G.703 (see annex B) were used as the basis for the interface presentation requirements. ETS 300 167, ITU-T Recommendations G.704 and G.706 (see annex B) were used as the basis for the structure of the 2 048 kbit/s interface.

The present document does not apply to terminal equipment. EN 300 290 [4] applies without modification to TE intended for connection to the 64 kbit/s interface of the leased line. In theory EN 300 420 [6] should be modified to define the time slot structure for terminals intended for connection to 2 048 kbit/s interfaces that present 64 kbit/s leased lines. However, the modification is too trivial to be worth implementing.

1 Scope

The present document specifies the technical requirements and test principles for the connection characteristics and network interface presentations of a 64 kbit/s point-to-point digital unrestricted leased line with octet integrity that is provided between either:

- two 2 048 kbit/s structured network interfaces; or
- a 2 048 kbit/s structured network interface and a 64 kbit/s co-directional network interface.

More than one leased line of the type described in the present document may be provided at any 2 048 kbit/s network interface. Such leased lines may connect to the same or different destinations.

The present document is written as a "delta" document based on the following standards:

- EN 300 288 [1]: "Access and Terminals (AT); 64 kbit/s digital unrestricted leased line with octet integrity (D64U); Network interface presentation".
- EN 300 289 [2]: "Access and Terminals (AT); 64 kbit/s digital unrestricted leased line with octet integrity (D64U); Connection characteristics".
- EN 300 418 [3]: "Access and Terminals (AT); 2 048 kbit/s digital unstructured and structured leased lines (D2048U and D2048S); Network interface presentation".
- EN 300 419 [5]: "Access and Terminals (AT); 2 048 kbit/s digital structured leased lines (D2048S); Connection characteristics".

The present document is applicable to leased lines, including part time leased lines, whose establishment or release does not require any protocol exchange or other intervention at the Network Termination Point (NTP).

The present document covers the connection characteristics, and the mechanical and electrical characteristics (except safety, overvoltage and EMC aspects) of the network interface, and specifies conformance tests. Some of the tests for the interface presentation described in the present document are not designed to be applied to the interface of an installed leased line; such tests may be applied to equipment of the kind used to provide the interface. The present document does not include details concerning the implementation of the tests nor does it include information on any regulations concerning testing.

NOTE: There is no requirement for each leased line to be tested in accordance with the present document before it is brought into, or returned into, service.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

[1] ETSI EN 300 288: "Access and Terminals (AT); 64 kbit/s digital unrestricted leased line with octet integrity (D64U); Network interface presentation".

[2] ETSI EN 300 289: "Access and Terminals (AT); 64 kbit/s digital unrestricted leased line with octet integrity (D64U); Connection characteristics".

[3] ETSI EN 300 418: "Access and Terminals (AT); 2 048 kbit/s digital unstructured and structured leased lines (D2048U and D2048S); Network interface presentation".

- [4] ETSI EN 300 290: "Access and Terminals (AT); 64 kbit/s digital unrestricted leased line with octet integrity (D64U) Terminal equipment interface".
- [5] ETSI EN 300 419: "Access and Terminals (AT); 2 048 kbit/s digital structured leased lines (D2048S); Connection characteristics".
- [6] ETSI EN 300 420: "Access and Terminals (AT); 2 048 kbit/s digital structured leased lines (D2048S); Terminal equipment interface".
- [7] ITU-T Recommendation I.410 (1988): "General aspects and principles relating to Recommendations on ISDN user-network interfaces".
- [8] ITU-T Recommendation O.151 (1992): "Error performance measuring equipment operating at the primary rate and above".
- [9] ITU-T Recommendation O.152 (1992): "Error performance measuring equipment for bit rates of 64 kbit/s and $N \times 64$ kbit/s".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

errored second: a second with one or more bit errors

frame: sequence of 256 bits of which the first 8 bits define the frame structure

leased lines: telecommunications facilities provided by a public telecommunications network that provide defined transmission characteristics between network termination points and that do not include switching functions that the user can control (e.g. on-demand switching)

Network Termination Point (NTP): all physical connections and their technical access specifications which form part of the public telecommunications network and are necessary for access to and efficient communication through that public network

octet slip: slip of one complete octet

PRBS(2^{15-1}): Pseudo Random Bit Sequence (PRBS) as defined in clause 2.1 of ITU-T Recommendation O.151 [8]

PRBS(2^{11-1}): Pseudo Random Bit Sequence (PRBS) as defined in clause 2.1 of ITU-T Recommendation O.152 [9]

severely errored second: a second where at least 0,1 % of the bits are errored

slip: one or more extra or missing consecutive unit intervals in the bit stream

time slot: in the context of the present document, a time slot is a period of nominally 3,90625 μ s (8 bits). Each frame of nominally 125 μ s is subdivided into 32 time slots numbered 0-31

terminal equipment: equipment intended to be connected to the public telecommunications network, i.e.:

- to be connected directly to the termination of a public telecommunication network; or
- to interwork with a public telecommunications network being connected directly or indirectly to the termination of a public telecommunications network, in order to send, process, or receive information.

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

CRC-4	Cyclic Redundancy Check (using four bits)
D2048S	2 048 kbit/s digital structured ONP leased line
D64M	Multiple 64 kbit/s digital unrestricted leased lines with octet integrity at a structured 2 048 kbit/s interface at either or both ends
D64U	64 kbit/s digital unrestricted ONP leased line with octet integrity
EMC	ElectroMagnetic Compatibility
NTP	Network Termination Point
ONP	Open Network Provision
PRBS	Pseudo Random Bit Sequence
TE	Terminal Equipment

4 Overview (informative)

The present document applies to 64 kbit/s leased lines where at least one end is presented in a 2 048 kbit/s interface. This includes leased lines in a wide variety of cases and configurations such as:

- a number of 64 kbit/s leased lines presented in a single 2 048 kbit/s interface at one location but each connecting to a different location;
- a single 64 kbit/s leased line presented in a single 2 048 kbit/s interface at each end where other time slots in the interfaces are used for other services;
- a number of 64 kbit/s leased lines between the same 2 048 kbit/s interfaces. In this case there is no guarantee that the leased lines will follow the same route and have the same transmission delay, i.e. octets of data that share the same frame at the input will not necessarily share the same frame at the output. An example is shown in figure 1.

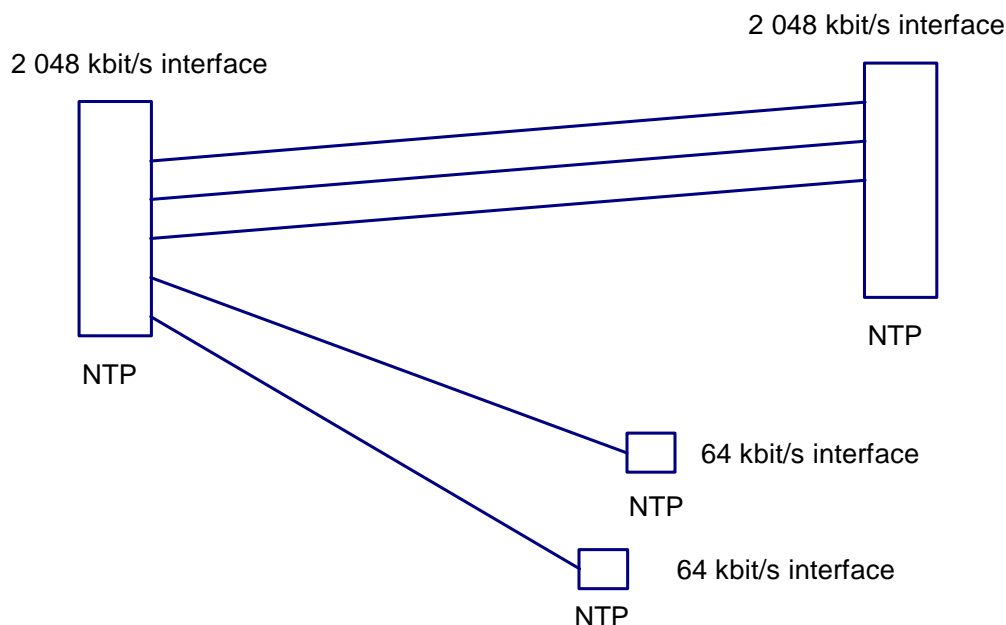


Figure 1

Where there are 64 kbit/s leased lines to different destinations, each of the leased lines is point-to-point; there is no broadcasting or point-to-multipoint capability.

The present document has been written as a "delta" document to the existing standards for 64 kbit/s and 2 048 kbit/s leased lines. It uses requirements from these standards by cross-reference with modifications as necessary to the test. The configurations covered by the present document could have been addressed by modifying the existing standards for 64 kbit/s and 2 048 kbit/s leased lines to make them more modular so that the 64 kbit/s connection characteristics could be used in conjunction with the 2 048 kbit/s structured interface. In some ways this would have been a tidier solution, but it would involve considerable additional activity because the existing standards for 64 kbit/s and 2 048 kbit/s leased lines are currently the subject of regulation and references to them in the annex of the ONP leased line Directive would have to be changed.

5 Connection characteristics

The performance of the leased line shall comply with the requirements of this clause, only if the conditions of supply of the network equipment that provides the NTP are met, (e.g. if the equipment is connected to an appropriate power supply on the customer's premises).

The ITU-T attribute technique is used to express the connection requirements. The following attributes from ITU-T Recommendation I.140 [7] are considered relevant for the present document:

- information transfer rate;
- information transfer susceptance;
- structure;
- establishment of connection;
- symmetry;
- network performance.

NOTE: "Bit rate" is equivalent to "information transfer rate" in the present document.

The following network performance sub-attributes are considered relevant for the present document:

- transmission delay;
- jitter;
- octet slip;
- error.

5.1 Summary of attributes

The connection attributes are displayed in table 1. In effect, these attributes define the service being offered. The values and the associated compliance tests can be found in the subsequent clauses.

Table 1: Connection attributes

Connection type attributes	Value	
Description	Nature	Reference clause
Information transfer rate	64 kbit/s	See 5.2
Information transfer susceptance	Unrestricted digital	See 5.3
Structure	Separate octets	See 5.4, 6.2, 7.2
Establishment of connection	Without user intervention	See 5.4
Symmetry	Symmetrical in both directions	See 5.5
Communication configuration	Point-to-point	Scope and 4
Network performance sub-attributes	Value	
Description	Nature	Reference clause
Transmission delay	Terrestrial and satellite options	See 5.7
Jitter	Input and output ports	See 6.8, 6.7, 7.5, 7.9
Octet slip	5 per 24 hour period	See 5.8
Error parameters		
Time interval with errored blocks	Value	
Description	Nature	Reference clause
Errored seconds	5 324 per 24 hour period	See 5.9
Severely errored seconds	105 per 24 hour period	See 5.10

5.2 Information transfer rate

Requirement: The connection shall be capable of transferring information at a nominal information rate of 64 kbit/s.

Test: The test shall be conducted according to clause A.2.

5.3 Information transfer susceptance

Requirement: The leased line connection shall be capable of transferring unrestricted digital information.

Test: The test shall be conducted according to clause A.2.

5.4 Structure and octet integrity

Where there is a 2 048 kbit/s interface at each end of the leased line, it is not a requirement that the leased line shall be presented in the same time slot at each interface.

Requirement: For each direction of transmission, the leased line shall convey each octet of information from its input bit stream, or in the case of a 2 048 kbit/s interface at the input, each octet of information in the time slot assigned to the leased line, and present each octet as a single and complete octet in the same order at the output. In the case where there is a 2 048 kbit/s interface at the leased line output, this octet shall be wholly contained in a single timeslot.

Where there is a 2 048 kbit/s interface at one end of the leased line and a 64 kbit/s interface at the other end, for each direction of transmission, the bit at the start (i.e. closest to the lower numbered time slot) of the time slot assigned to the leased line at of the 2 048 kbit/s interface shall correspond to the bit at the start of each octet in the 64 kbit/s interface.

The order of the bits within each octet and the order of octets shall be maintained

NOTE: This requirement is illustrated in figure 2. Time slot x is assigned to the leased line at the input. Time slot y is assigned to the leased line at the output where the output uses a 2 048 kbit/s interface. The octet of bits contained in time slot x is required to be transmitted wholly within time slot y at the output, and not to overlap into other time slots or time slots in other frames. At a 64 kbit/s output the octet is required to be wholly contained between "octet timing marks" (for clarification see EN 300 288 [1]).

Within each octet, the order of the bits is required to be maintained (this is called bit sequence integrity).

The order of the octets is required to be maintained (this is called octet sequence integrity).

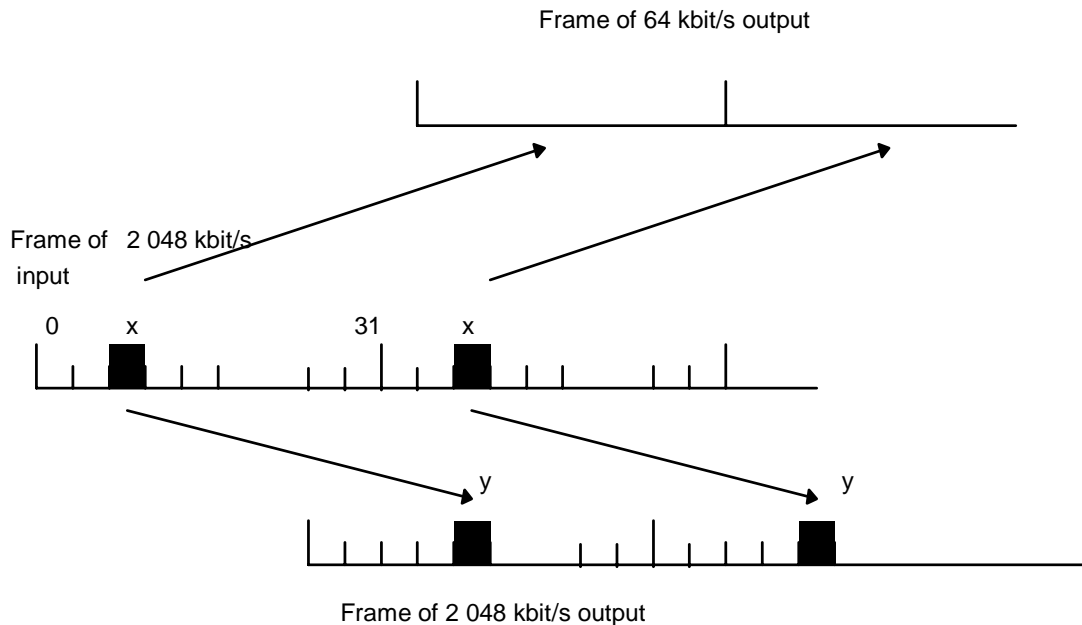


Figure 2

Test: The test shall be conducted according to clause A.2.

5.5 Establishment of connection

Requirement: Establishment or release of the leased line connection shall not require any protocol exchange or other intervention at the NTP by the user.

Test: By visual inspection.

5.6 Symmetry

Requirement: The connection shall be symmetrical, i.e. each direction of transmission shall have the same information transfer capability.

Test: The test shall be conducted according to clause A.2.

5.7 Transmission delay

Requirement: The leased line connection shall meet the requirement stated in clause 5.1.7.1 of EN 300 289 [2].

Test: The test shall be conducted according to clause A.2.2 of EN 300 289 [2].

5.8 Controlled slip

Requirement: The leased line connection shall meet the requirements stated in clause 5.1.7.3 of EN 300 289 [2].

Test: The test shall be conducted according to clause A.2.4 of EN 300 289 [2] with the following modification. Where the leased line is presented at a 2 048 kbit/s interface:

- the stimulus shall be an HDB3 encoded bit stream complying with a waveform shape as defined in EN 300 418 [3], structured according to annex B of EN 300 419 [5], containing a PRBS (2^{11-1}) in the time slot assigned to the leased line;
- the signal monitored shall be the signal in the time slot assigned to the leased line.

5.9 Errored seconds

Requirement: The leased line connection shall meet the requirements stated in clause 5.1.7.4.1 of EN 300 289 [2].

NOTE: When microwave links are used in the connections, it may not be possible to meet the requirement in rare periods with very adverse propagation conditions.

Test: The test shall be conducted according to clause A.2.4 of EN 300 289 [2] with the following modification. Where the leased line is presented at a 2 048 kbit/s interface:

- the stimulus shall be an HDB3 encoded bit stream complying with a waveform shape as defined in EN 300 418 [3], structured according to annex B of EN 300 419 [5], containing a PRBS (2^{11-1}) in the time slot assigned to the leased line;
- the input jitter shall be as defined in clause 4.1.7.2.1 of EN 300 419 [5];
- the signal monitored shall be the signal in the time slot assigned to the leased line.

5.10 Severely errored seconds

Requirement: The leased line connection shall meet the requirements stated in clause 5.1.7.4.2 of EN 300 289 [2].

NOTE: When microwave links are used in the connections, it may not be possible to meet the requirement in rare periods with very adverse propagation conditions.

Test: The test shall be conducted according to clause A.2.4 of EN 300 289 [2] with the following modification. Where the leased line is presented at a 2 048 kbit/s interface:

- the stimulus shall be an HDB3 encoded bit stream complying with a waveform shape as defined in EN 300 418 [3], structured according to annex B of EN 300 419 [5], containing a PRBS (2^{11-1}) in the time slot assigned to the leased line;
- the input jitter shall be as defined in clause 4.1.7.2.1 of EN 300 419 [5];
- the signal monitored shall be the signal in the time slot assigned to the leased line.

5.11 Availability

There is no requirement on availability under the present document.

NOTE: Annex D of EN 300 419 [5] provides guidelines on the approach to the specification of availability and recommendations for 2 048 kbit/s leased lines.

6 Interface characteristics -2 048 kbit/s interface

The requirements of this clause shall apply where the leased line is presented at a 2 048 kbit/s interface.

6.1 Connection arrangements

Requirement: The interface shall meet the requirements stated in clause 4.1 of EN 300 418 [3].

Test: There is no test, all subsequent tests are carried out using the specified connection arrangements

6.2 Frame structure

6.2.1 General

Requirement: The interface shall accept an input bit stream with the frame and multiframe structure defined in annex B of EN 300 419 [5]. The leased line provider and the user should agree on the time slot to be assigned to the leased line. The same time slot shall be used for each direction of transmission. The output bit stream shall conform to the frame and multiframe structure defined in annex B of EN 300 419 [5].

NOTE: There is no requirement under the present document for time slots that are not assigned to 64 kbit/s leased lines. These time slots may be used for other services.

Test: The test shall be conducted according to clause A.2.

6.2.2 2 048 kbit/s digital structured ONP leased line (CRC-4)

Requirement: The output signal shall meet the requirements stated in clause 4.1.3.1 of EN 300 419 [5].

NOTE: The CRC-4 calculation applies to all the time slots at the 2 048 kbit/s interface, not just to the ones assigned to 64 kbit/s leased lines.

Test: The test shall be conducted according to clause A.2.

6.2.3 Use of the E-bits

Requirement: The output signal shall meet the requirements stated in clause 4.1.3.2 of EN 300 419 [5].

Test: The test shall be conducted according to clause A.2.5.2 of EN 300 419 [5].

6.2.4 Frame synchronization and data transmission capability

Requirement: The output signal shall meet the requirements stated in clause 4.1.3.3 of EN 300 419 [5].

Test: The test shall be conducted according to clause A.2.5.3 of EN 300 419 [5]. In this test the test configuration shall be replaced by the configuration in clause A.2 and the data transmission capability shall refer to the 64 kbit/s leased line only.

6.2.5 Multiframe alignment

Requirement: The output signal shall meet the requirements stated in clause 4.1.3.3.1 of EN 300 419 [5].

Test: The test shall be conducted according to clause A.2.5.4 of EN 300 419 [5]. In this test the test configuration shall be replaced by the configuration in clause A.2 and the regaining of multiframe alignment shall refer to the regaining of data transmission capability for the 64 kbit/s leased line.

NOTE: There are no requirements in respect of the use of the A-bit and the Sa bits.

6.3 Output signal coding

Requirement: The interface shall meet the requirements stated in clause 4.2.1.1 of EN 300 418 [3].

Test: The test shall be conducted according to clause A.2.1 of EN 300 418 [3].

6.4 Output waveform shape

Requirement: The interface shall meet the requirements stated in clause 4.2.1.2 of EN 300 418 [3].

Test: The test shall be conducted according to clause A.2.2 of EN 300 418 [3].

6.5 Output timing

Recommendation: The output timing should be synchronized to the network timing.

NOTE 1: This is a recommendation rather than a requirement because no test is practicable.

NOTE 2: Network timing is timing that is derived from the source or sources of timing that are used for the whole network. Thus the timing provided by the leased line will be similar to that provided by other digital services.

6.6 Output timing under failure conditions

Requirement: The interface shall meet the requirements stated in clause 4.2.1.3 of EN 300 418 [3].

Test: The test shall be conducted according to clause A.2.7 of EN 300 418 [3].

6.7 Output impedance towards ground

Requirement: The interface shall meet the requirements stated in clause 4.2.1.4 of EN 300 418 [3].

Test: The test shall be conducted according to clause A.2.6 of EN 300 418 [3].

6.8 Output jitter

Requirement: The interface shall meet the requirements stated in clause 4.1.7.2.2 of EN 300 419 [5].

Test: The test shall be conducted according to clause A.2.3 of EN 300 419 [5]. Where the input to the leased line is presented at a 64 kbit/s interface, the stimulus shall be replaced by the stimulus specified in clause A.2.3 of EN 300 289 [2].

6.9 Input signal coding

Requirement: The interface shall meet the requirements stated in clause 4.2.2.1 of EN 300 418 [3].

Test: The test shall be conducted according to clause A.2.5 of EN 300 418 [3].

6.10 Input return loss

Requirement: The interface shall meet the requirements stated in clause 4.2.2.2 of EN 300 418 [3].

Test: The test shall be conducted according to clause A.2.3 of EN 300 418 [3].

6.11 Input loss tolerance

Requirement: The interface shall meet the requirements stated in clause 4.2.2.3 of EN 300 418 [3].

Test: The test shall be conducted according to clause A.2.4 of EN 300 418 [3].

6.12 Input immunity against reflections

Requirement: The interface shall meet the requirements stated in clause 4.2.2.4 of EN 300 418 [3].

Test: The test shall be conducted according to clause A.2.4 of EN 300 418 [3].

6.13 Tolerable longitudinal voltages

Requirement: The interface shall meet the requirements stated in clause 4.2.2.5 of EN 300 418 [3].

Test: The test shall be conducted according to clause A.2.5 of EN 300 418 [3].

6.14 Impedance towards ground

Requirement: The interface shall meet the requirements stated in clause 4.2.2.6 of EN 300 418 [3].

Test: The test shall be conducted according to annex A, clause A.2.6 of EN 300 418 [3].

6.15 Input jitter tolerance

Requirement: The interface shall meet the requirements stated in clause 4.1.7.2.1 of EN 300 419 [5].

Test: This requirement is tested by the test specified in clause 5.9. Where the input to the leased line is presented at a 64 kbit/s interface, the stimulus shall be replaced by the stimulus specified in clause A.2.3 of EN 300 289 [2].

7 Interface characteristics -64 kbit/s interface

The requirements of this clause shall apply where the leased line is presented at a 64 kbit/s interface.

7.1 Connection arrangements

Requirement: The interface shall meet the requirements stated in clause 5.1 of EN 300 288 [1].

Test: There is no test, all subsequent tests are carried out using the specified connection arrangements.

7.2 Output signal coding and octet structure

Requirement: The interface shall meet the requirements stated in clause 5.2.1.1 of EN 300 288 [1].

Test: The test shall be conducted according to clause A.2.1 of EN 300 288 [1].

7.3 Output waveform shape

Requirement: The interface shall meet the requirements stated in clause 5.2.1.2 of EN 300 288 [1].

Test: The test shall be conducted according to clause A.2.2 of EN 300 288 [1].

7.4 Output timing

Recommendation: The output timing should be synchronized to the network timing.

NOTE 1: This is a recommendation rather than a requirement because no test is practicable.

NOTE 2: Network timing is timing that is derived from the source or sources of timing that are used for the whole network. Thus the timing provided by the leased line will be similar to that provided by other digital services.

7.5 Output timing under failure conditions

Requirement: The interface shall meet the requirements stated in clause 5.2.1.4 of EN 300 288 [1].

Test: The test shall be conducted according to clause A.2.3 of EN 300 288 [1].

7.6 Output jitter

Requirement: The interface shall meet the requirements of EN 300 289 [2], clause 5.1.7.2.2.

Test: The test shall be conducted according to clause A.2.3 of EN 300 289 [2]. Where the input to the leased line is presented at a 2 048 kbit/s interface, the stimulus shall be replaced by the stimulus clause A.2.3 of EN 300 419 [5].

7.7 Impedance towards ground

Requirement: The interface shall meet the requirements stated in clause 5.2.1.6 of EN 300 288 [1].

Test: The test shall be conducted according to clause A.2.7 of EN 300 288 [1].

7.8 Longitudinal conversion loss

Requirement: The interface shall meet the requirements stated in clause 5.2.1.7 of EN 300 288 [1].

Test: The test shall be conducted according to clause A.2.6 of EN 300 288 [1].

7.9 Input signal coding and octet structure

Requirement: The interface shall meet the requirements stated in clause 5.2.2.1 of EN 300 288 [1].

Test: The test shall be conducted according to clause A.2.4 of EN 300 288 [1].

7.10 Input jitter tolerance

Requirement: The interface shall meet the requirements stated in clause 5.1.7.2.1 of EN 300 289 [2].

Test: The test shall be conducted according to clause A.2.3 of EN 300 289 [2]. Where the input to the leased line is presented at a 2 048 kbit/s interface, the stimulus shall be replaced by the stimulus specified in clause A.2.3 of EN 300 419 [5].

7.11 Input return loss

Requirement: The interface shall meet the requirements stated in clause 5.2.2.3 of EN 300 288 [1].

Test: The test shall be conducted according to clause A.2.5 of EN 300 288 [1].

7.12 Input loss tolerance

Requirement: The interface shall meet the requirements stated in clause 5.2.2.4 of EN 300 288 [1].

Test: The test shall be conducted according to clause A.2.4 of EN 300 288 [1].

7.13 Immunity against reflections

Requirement: The interface shall meet the requirements stated in clause 5.2.2.5. of EN 300 288 [1].

Test: The test shall be conducted according to clause A.2.4 of EN 300 288 [1].

7.14 Impedance towards ground

Requirement: The interface shall meet the requirements stated in clause 5.2.2.6 of EN 300 288 [1].

Test: The test shall be conducted according to clause A.2.7 of EN 300 288 [1].

7.15 Longitudinal conversion loss

Requirement: The interface shall meet the requirements stated in clause 5.2.2.7 of EN 300 288 [1].

Test: The test shall be conducted according to clause A.2.6 of EN 300 288 [1].

8 Safety

Requirements for safety are outside the scope of the present document.

Safety standards are published by CENELEC.

NOTE 1: An example of such a CENELEC product safety standard is EN 60950 (see annex B).

NOTE 2: For safety categories of interfaces, see EG 201 212 (see annex B). This document is also available from CENELEC as ROBT-002.

9 ElectroMagnetic Compatibility (EMC)

EMC requirements are outside the scope of the present document.

10 Overvoltage

Overvoltage aspects are outside the scope of the present document.

Annex A (normative): Test methods

A.1 General

This annex describes an additional principle to determine the compliance of a leased line against the requirements of the present document. There is no requirement for each leased line to be tested in accordance with the present document before it is brought into, or returned into, service.

It is outside the scope of the present document to identify the specific details of the implementation of the tests.

Details of test equipment accuracy and the specification tolerance of the test devices are not included in all cases. Where such details are provided, they shall be complied with, but the way they are expressed shall not constrain the method of implementing the test.

NOTE: Attention is drawn to the issue of measurement uncertainty which may be addressed in future documents. Not all the required test results make allowance for spurious events during testing (e.g. errors due to EMC effects), which may make it necessary to repeat a test.

The test configurations given do not imply a specific realization of the test equipment or test arrangement, or the use of specific test devices. However any test configuration used shall provide those test conditions specified under "interface state", "stimulus" and "monitor" for each individual test.

The test equipment shall be a device, or group of devices that is capable of generating a stimulus signal conforming to the present document and capable of monitoring the signal received from the network interface.

A.1.1 Additional information to support the test

The following facilities shall be provided:

- a) an ability to configure the interface such that it provides a transparent loopback of the input to the output; and
- b) an ability to transmit a given bit pattern, e.g. PRBS(2^{11-1}) for the 64 kbit/s interface, or PRBS(2^{15-1}) for the 2 048 kbit/s interface, or PRBS(2^{11-1}) applied only to the assigned time slot in the 2 048 kbit/s interface; or
- c) where a) or b) cannot be provided, an alternative means of performing the test.

A.1.2 Equipment connection

Testing shall be performed at the point of connection in accordance with clause 4.1 of EN 300 418 [3] or clause 5.1 of EN 300 288 [1] as applicable

A.2 Main test

Purpose: To verify the following requirements:

- information transfer rate;
- information transfer susceptibility;
- symmetry;
- frame structure and octet integrity;
- CRC-4.

Test configuration: The test shall be conducted from a 2 048 kbit/s interface. The signal shall be looped back at the distant interface. The distant interface may be either 2 048 kbit/s or 64 kbit/s. Where it is 2 048 kbit/s, the leased line signal (at 64 kbit/s) shall be looped between the time slots assigned to the leased line at that interface.

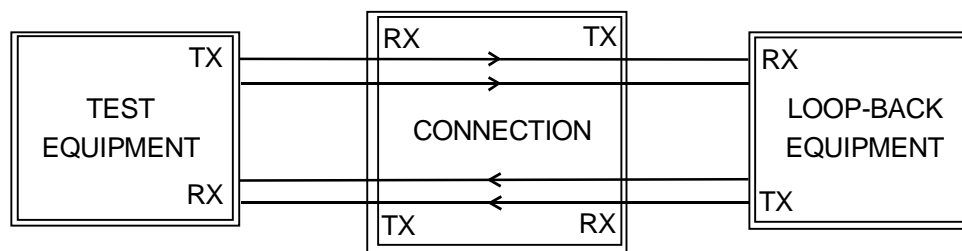


Figure A.1

Connection state: Available

Stimulus: A bit stream with the following characteristics shall be applied to the input of the 2 048 kbit/s interface:

- Coding according to annex B of EN 300 418 [3];
- Waveform shape according to clause 4.2.1.2 of EN 300 418 [3];
- Frame structure according to annex B of EN 300 419 [5];
- Timing synchronized to the network.

The following signals in the time slot assigned to the leased line:

- PRBS(2^{11-1});
- sequence of successive binary zeros;
- sequence of successive binary ones.

Monitor: The output bit stream at the 2 048 kbit/s interface to which the input stimulus is applied.

Results: The output structure shall conform to annex B of EN 300 419 [5].

For a period of at least 100 iterations of the PRBS, the CRC-4 shall correspond to the data in the previous sub-multiframe, as defined in annex B, clause B.2.1 of EN 300 419 [5].

For each of the signals applied to the time slot assigned to the leased line, for a continuous period of at least one second no alterations in the binary content shall occur.

For the PRBS signal, the integrity of the frame structure shall be maintained.

Annex B (informative): Bibliography

- Council Directive 91/263/EEC of 29 April 1991 on the approximation of the laws of Member States concerning telecommunications terminal equipment, including the mutual recognition of their conformity.
- Council Directive 92/44/EEC of 5 June 1992 on the application of Open Network Provision to leased lines.
- Directive 98/13/EC of the European Parliament and of the Council of 12 February 1998 relating to telecommunications terminal equipment and satellite earth station equipment, including the mutual recognition of their conformity.
- ITU-T Recommendation G.703 (1998): "Physical/electrical characteristics of hierarchical digital interfaces".
- ITU-T Recommendation G.704 (1998): "Synchronous frame structures used at 1 544, 6 312, 2 048, 8 488 and 44 736 kbit/s hierarchical levels".
- ITU-T Recommendation G.706 (1991): "Frame alignment and cyclic redundancy check (CRC) procedures relating to basic frame structures defined in Recommendation G.704".
- ETSI ETS 300 166 (1993): "Transmission and Multiplexing (TM); Physical and electrical characteristics of hierarchical digital interfaces for equipment using the 2 048 kbit/s - based plesiochronous or synchronous digital hierarchies".
- ETSI ETS 300 167 (1993): "Transmission and Multiplexing (TM); Functional characteristics of 2 048 kbit/s interfaces".
- CENELEC EN 60950: "Safety of information technology equipment".
- ETSI EG 201 212: "Electrical safety; Classification of interfaces for equipment to be connected to telecommunication networks". This document is also available from CENELEC as ROBT-002.

History

Document history		
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