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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 final draft European Telecommunication Standard (ETS) has been produced by the Business Telecommunications (BTC) Technical Committee of the European Telecommunications Standards Institute (ETSI), and is now submitted for the Voting phase of the ETSI standards approval procedure.

This ETS resulted from a mandate from the Commission of the European Community (CEC) to provide harmonized 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 this ETS:

ETS 300 288: "Business Telecommunications (BTC); 64 kbit/s digital unrestricted leased line with octet integrity (D64U); Network interface presentation";

ETS 300 289: "Business Telecommunications (BTC); 64 kbit/s digital unrestricted leased line with octet integrity (D64U); Connection characteristics";

ETS 300 290: "Business Telecommunications (BTC); 64 kbit/s digital unrestricted leased line with octet integrity (D64U); Terminal equipment interface";

ETS 300 418 (1995): "Business Telecommunications (BTC); 2 048 kbit/s digital unstructured and structured leased lines (D2048U and D2048S); Network interface presentation".

ETS 300 419 (1995): "Business Telecommunications (BTC); 2 048 kbit/s digital structured leased lines (D2048S); Connection characteristics".

ETS 300 420 (1995): "Business Telecommunications (BTC); 2 048 kbit/s digital structured leased lines (D2048S); Terminal equipment interface".

This ETS is based on information from CCITT Recommendations and ETSI publications and the relevant documents are quoted where appropriate.

This ETS 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 this ETS 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.

Proposed transposition dates	
Date of latest announcement of this ETS (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this ETS (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 Second Phase Directive (91/263/EEC), Terminal Equipment (TE) for connection to these leased lines will be required to fulfil certain essential requirements.

The leased line specified in this ETS is not included in the minimum set whose provision is required under Directive 92/44/EEC, however this standard 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 CCITT Recommendation G.703 are used as the basis for the interface presentation requirements. ETS 300 167, CCITT Recommendations G.704 and G.706 are used as the basis for the structure of the 2 048 kbit/s interface.

This ETS does not apply to terminal equipment. ETS 300 290 applies without modification to TE intended for connection to the 64 kbit/s interface of the leased line. In theory ETS 300 420 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

This European Telecommunication Standard (ETS) 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 this ETS may be provided at any 2 048 kbit/s network interface. Such leased lines may connect to the same or different destinations.

This ETS is written as a "delta" document based on the following ETSs:

- ETS 300 288: "Business TeleCommunications (BTC); 64 kbit/s digital unrestricted leased line with octet integrity (D64U); Network interface presentation". [1]
- ETS 300 289: "Business TeleCommunications (BTC); 64 kbit/s digital unrestricted leased line with octet integrity (D64U); Connection characteristics". [2]
- ETS 300 418: "Business TeleCommunications (BTC); 2 048 kbit/s digital unstructured and structured leased lines (D2048U and D2048S); Network interface presentation". [3]
- ETS 300 419: "Business TeleCommunications (BTC); 2 048 kbit/s digital structured leased lines (D2048S); Connection characteristics". [4]

This ETS 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).

This ETS covers the connection characteristics, and the mechanical and electrical characteristics of the network interface, and specifies conformance tests. Some of the tests for the interface presentation described in this ETS 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. This ETS 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 this ETS before it is brought into, or returned into, service.

## 2 Normative references

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

- [1] ETS 300 288 (1994) including Amendment 1 (1995): "Business TeleCommunications (BTC); 64 kbit/s digital unrestricted leased line with octet integrity (D64U); Network interface presentation".
- [2] ETS 300 289 (1994): "Business TeleCommunications (BTC); 64 kbit/s digital unrestricted leased line with octet integrity (D64U); Connection characteristics".
- [3] ETS 300 418 (1995): "Business TeleCommunications (BTC); 2 048 kbit/s digital unstructured and structured leased lines (D2048U and D2048S); Network interface presentation".

- [4] ETS 300 419 (1995): "Business TeleCommunications (BTC); 2 048 kbit/s digital structured leased lines (D2048S); Connection characteristics".
- [5] EN 60950: "Safety of information technology equipment, including electrical business equipment".
- [6] ETS 300 046-4 (1992): "Integrated Services Digital Network (ISDN); Primary rate access - safety and protection, Part 4: Interface Ib - safety".
- [7] CCITT Recommendation I.410 (1988): "General aspects and principles relating to Recommendations on ISDN user-network interfaces".
- [8] CCITT Recommendation O.151 (1992): "Error performance measuring equipment operating at the primary rate and above".
- [9] CCITT Recommendation O.152 (1988): "Error performance measuring equipment for bit rates of 64 kbit/s and  $N \times 64$  Kbits/s"

NOTE: This ETS also contains a number of informative references which have been included to indicate the sources from which various material has been derived, hence they do not have an associated normative reference number. Details of these publications are given in annex B. In some cases the same publication may have been referenced in both a normative and an informative manner.

### 3 Definitions and abbreviations

#### 3.1 Definitions

For the purposes of this ETS, the following definitions apply:

**errored second:** A second with one or more bit errors.

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

**leased lines:** The 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:** a slip of one complete octet.

**PRBS(2<sup>15</sup>-1):** A Pseudo Random Bit Sequence (PRBS) as defined in subclause 2.1 of CCITT Recommendation O.151 [8].

**PRBS(2<sup>11</sup>-1):** A Pseudo Random Bit Sequence (PRBS) as defined in subclause 2.1 of CCITT Recommendation O.152 [9].

**Safety Extra-Low Voltage (SELV) circuit:** A secondary circuit which is so designed and protected that under normal and single fault conditions, the voltage between any two accessible parts and, for class 1 equipment, between any accessible part and the equipment protective earthing terminal does not exceed a safe value (subclause 1.2.8.5 of EN 60950 [5]).

**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 this ETS, a time slot is a period of nominally 3,90625  $\mu$ s (8 bits). Each frame of nominally 125  $\mu$ 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 this ETS, 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
SELV	Safety Extra-Low Voltage
TE	Terminal Equipment

## 4 Overview (informative)

This ETS 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.

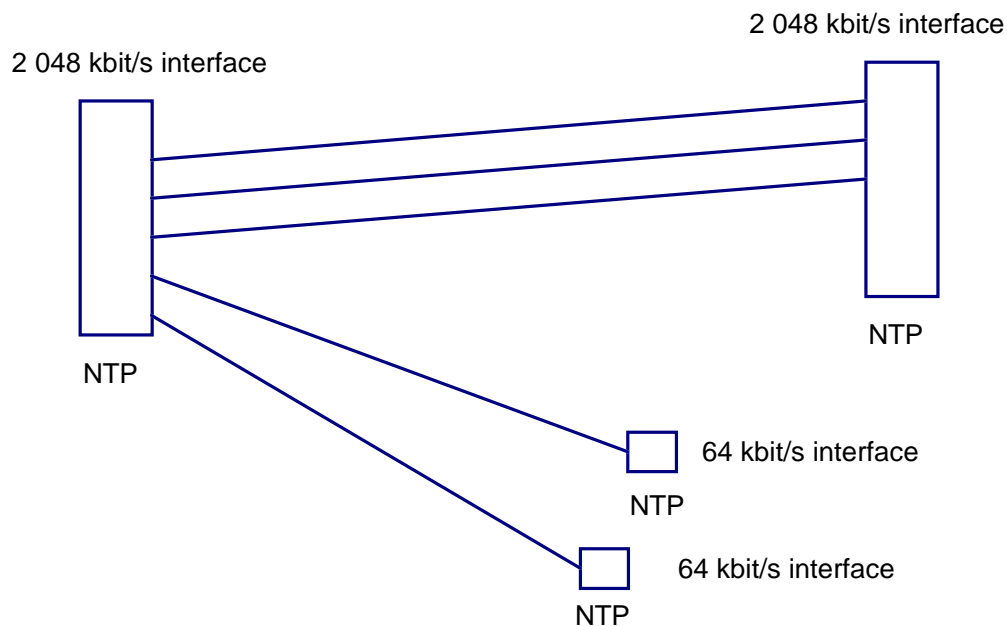


Figure 1

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.

This ETS 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 this ETS 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 CCITT Recommendation I.140 [7] are considered relevant for this ETS:

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

NOTE: "Bit rate" is equivalent to "information transfer rate" in this ETS.

The following network performance sub-attributes are considered relevant for this ETS:

- 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 subclauses.

**Table 1: Connection attributes**

<b>Connection type attributes</b>		<b>Value</b>	
<b>Description</b>	<b>Nature</b>	<b>Reference subclause:</b>	
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	
<b>Network performance sub-attributes</b>			
<b>Description</b>	<b>Nature</b>	<b>Reference subclause:</b>	
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	
<b>Error parameters</b>			
<b>Time interval with errored blocks</b>	<b>Value</b>		
<b>Description</b>	<b>Nature</b>	<b>Reference subclause:</b>	
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 annex A, subclause 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 annex A, subclause 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 ETS 300 288 [1], annex B).

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).

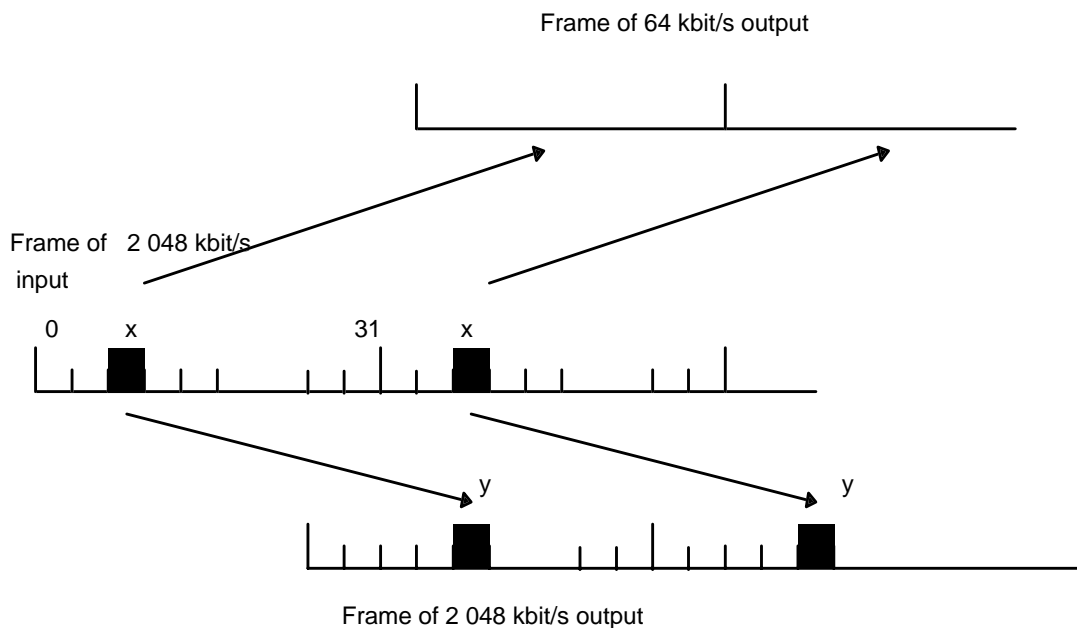


Figure 2

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

### 5.7 Transmission delay

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

**Test:** The test shall be conducted according to annex A, subclause A.2.2 of ETS 300 289 [2].

## 5.8 Controlled slip

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

**Test:** The test shall be conducted according to annex A, subclause A.2.4 of ETS 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 ETS 300 418 [3], structured according to annex B of ETS 300 419 [4], 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 subclause 5.1.7.4.1 of ETS 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 annex A, subclause A.2.4 of ETS 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 ETS 300 418 [3], structured according to annex B of ETS 300 419 [4], containing a PRBS ( $2^{11}-1$ ) in the time slot assigned to the leased line;
- the input jitter shall be as defined in subclause 4.1.7.2.1 of ETS 300 419 [4];
- 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 subclause 5.1.7.4.2 of ETS 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 annex A, subclause A.2.4 of ETS 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 ETS 300 418 [3], structured according to annex B of ETS 300 419 [4], containing a PRBS ( $2^{11}-1$ ) in the time slot assigned to the leased line;
- the input jitter shall be as defined in subclause 4.1.7.2.1 of ETS 300 419 [4];
- 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 this ETS.

NOTE: Annex D of ETS 300 419 [4] 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 subclause 4.1 of ETS 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 ETS 300 419 [4]. 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 ETS 300 419 [4].

**NOTE:** There is no requirement under this ETS 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 annex A, subclause 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 subclause 4.1.3.1 of ETS 300 419 [4].

**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 annex A, subclause A.2.

### 6.2.3 Use of the E-bits

**Requirement:** The output signal shall meet the requirements stated in subclause 4.1.3.2 of ETS 300 419 [4].

**Test:** The test shall be conducted according to annex A, subclause A.2.5.2 of ETS 300 419 [4].

### 6.2.4 Frame synchronization and data transmission capability

**Requirement:** The output signal shall meet the requirements stated in subclause 4.1.3.3 of ETS 300 419 [4].

**Test:** The test shall be conducted according to annex A, subclause A.2.5.3 of ETS 300 419 [4]. In this test the test configuration shall be replaced by the configuration in annex A, clause A.2 below 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 subclause 4.1.3.3.1 of ETS 300 419 [4].

**Test:** The test shall be conducted according to annex A, subclause A.2.5.4 of ETS 300 419 [4]. In this test the test configuration shall be replaced by the configuration in annex A, subclause A.2 below 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 subclause 4.2.1.1 of ETS 300 418 [3].

**Test:** The test shall be conducted according to annex A, subclause A.2.1 of ETS 300 418 [3].

#### 6.4 Output waveform shape

**Requirement:** The interface shall meet the requirements stated in subclause 4.2.1.2 of ETS 300 418 [3].

**Test:** The test shall be conducted according to annex A, subclause A.2.2 of ETS 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 subclause 4.2.1.3. of ETS 300 418 [3].

**Test:** The test shall be conducted according to annex A, subclause A.2.7 of ETS 300 418 [3].

#### 6.7 Output impedance towards ground

**Requirement:** The interface shall meet the requirements stated in subclause 4.2.1.4 of ETS 300 418 [3].

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

#### 6.8 Output jitter

**Requirement:** The interface shall meet the requirements stated in subclause 4.1.7.2.2 of ETS 300 419 [4].

**Test:** The test shall be conducted according to annex A, subclause A.2.3 of ETS 300 419 [4]. 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 annex A, subclause A.2.3 of ETS 300 289 [2].

#### 6.9 Input signal coding

**Requirement:** The interface shall meet the requirements stated in subclause 4.2.2.1 of ETS 300 418 [3].

**Test:** The test shall be conducted according to annex A, subclause A.2.5 of ETS 300 418 [3].

#### 6.10 Input return loss

**Requirement:** The interface shall meet the requirements stated in subclause 4.2.2.2 of ETS 300 418 [3].

**Test:** The test shall be conducted according to annex A, subclause A.2.3 of ETS 300 418 [3].

#### 6.11 Input loss tolerance

**Requirement:** The interface shall meet the requirements stated in subclause 4.2.2.3 of ETS 300 418 [3].

**Test:** The test shall be conducted according to annex A, subclause A.2.4 of ETS 300 418 [3].

#### 6.12 Input immunity against reflections

**Requirement:** The interface shall meet the requirements stated in subclause 4.2.2.4 of ETS 300 418 [3].

**Test:** The test shall be conducted according to annex A, subclause A.2.4 of ETS 300 418 [3].

### 6.13 Tolerable longitudinal voltages

**Requirement:** The interface shall meet the requirements stated in subclause 4.2.2.5 of ETS 300 418 [3].

**Test:** The test shall be conducted according to annex A, subclause A.2.5 of ETS 300 418 [3].

### 6.14 Impedance towards ground

**Requirement:** The interface shall meet the requirements stated in subclause 4.2.2.6 of ETS 300 418 [3].

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

### 6.15 Input jitter tolerance

**Requirement:** The interface shall meet the requirements stated in subclause 4.1.7.2.1 of ETS 300 419 [4].

**Test:** This requirement is tested by the test specified in subclause 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 annex A, subclause A.2.3 of ETS 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 subclause 5.1 of ETS 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 subclause 5.2.1.1 of ETS 300 288 [1].

**Test:** The test shall be conducted according to annex A, subclause A.2.1 of ETS 300 288 [1].

### 7.3 Output waveform shape

**Requirement:** The interface shall meet the requirements stated in subclause 5.2.1.2 of ETS 300 288 [1].

**Test:** The test shall be conducted according to annex A, subclause A.2.2 of ETS 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 subclause 5.2.1.4 of ETS 300 288 [1].

**Test:** The test shall be conducted according to annex A, subclause A.2.3 of ETS 300 288 [1].



## 7.6 Output jitter

**Requirement:** The interface shall meet the requirements of ETS 300 289 [2], subclause 5.1.7.2.2.

**Test:** The test shall be conducted according to annex A, subclause A.2.3 of ETS 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 in annex A, subclause A.2.3 of ETS 300 419 [4].

## 7.7 Impedance towards ground

**Requirement:** The interface shall meet the requirements stated in subclause 5.2.1.6 of ETS 300 288 [1].

**Test:** The test shall be conducted according to annex A, subclause A.2.7 of ETS 300 288 [1].

## 7.8 Longitudinal conversion loss

**Requirement:** The interface shall meet the requirements stated in subclause 5.2.1.7 of ETS 300 288 [1].

**Test:** The test shall be conducted according to annex A, subclause A.2.6 of ETS 300 288 [1].

## 7.9 Input signal coding and octet structure

**Requirement:** The interface shall meet the requirements stated in subclause 5.2.2.1 of ETS 300 288 [1].

**Test:** The test shall be conducted according to annex A, subclause A.2.4 of ETS 300 288 [1].

## 7.10 Input jitter tolerance

**Requirement:** The interface shall meet the requirements stated in subclause 5.1.7.2.1 of ETS 300 289 [2].

**Test:** The test shall be conducted according to annex A, subclause A.2.3 of ETS 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 annex A, subclause A.2.3 of ETS 300 419 [4].

## 7.11 Input return loss

**Requirement:** The interface shall meet the requirements stated in subclause 5.2.2.3 of ETS 300 288 [1].

**Test:** The test shall be conducted according to annex A, subclause A.2.5 of ETS 300 288 [1].

## 7.12 Input loss tolerance

**Requirement:** The interface shall meet the requirements stated in subclause 5.2.2.4 of ETS 300 288 [1].

**Test:** The test shall be conducted according to annex A, subclause A.2.4 of ETS 300 288 [1].

## 7.13 Immunity against reflections

**Requirement:** The interface shall meet the requirements stated in subclause 5.2.2.5. of ETS 300 288 [1].

**Test:** The test shall be conducted according to annex A, subclause A.2.4 of ETS 300 288 [1].

## 7.14 Impedance towards ground

**Requirement:** The interface shall meet the requirements stated in subclause 5.2.2.6 of ETS 300 288 [1].

**Test:** The test shall be conducted according to annex A, subclause A.2.7 of ETS 300 288 [1].

### 7.15 Longitudinal conversion loss

**Requirement:** The interface shall meet the requirements stated in subclause 5.2.2.7 of ETS 300 288 [1].

**Test:** The test shall be conducted according to annex A, subclause A.2.6 of ETS 300 288 [1].

## 8 Safety

The tests associated with the requirements in this clause are not suitable for use on installed leased lines. Such tests may be applied to equipment of the kind used to provide the interface.

### 8.1 General requirements

**Requirement:** The leased line interface shall comply with the requirements for accessible parts of a Safety Extra-Low Voltage (SELV) circuit.

NOTE: Designers should take into account the minimum impedance towards ground specified in this ETS.

**Test:** The test shall be conducted according to EN 60950 [5].

### 8.2 Touch current

This requirement recognizes the fact that the equipment providing the NTP is likely to have a mains electricity supply interface. If the equipment providing the NTP does not have a mains supply, this requirement is not applicable.

For the purpose of the following requirement the term referred to as Ib in ETS 300 046-4 [6] shall be deemed to be the point of test referred to in annex A, subclause A.1.2.

For the purpose of the following requirement the connection point for the interface cable shield as defined in ETS 300 046-4 [6] shall be the shield connection point as defined in subclause 4.1 of ETS 300 418 [3] or subclause 5.1 of ETS 300 288 [1] as applicable.

**Requirement:** The touch current measured across the leased line interface shall not exceed 0,25 mA.

**Test:** The test shall be according to subclause 5.3 of ETS 300 046-4 [6].

## 9 ElectroMagnetic Compatibility (EMC)

There are no EMC requirements under this ETS.

NOTE 1: EMC requirements are imposed under the EMC Directive (89/336/EEC). Requirements for conducted emissions and immunity to continuous conducted signals may be added to this ETS when appropriate specifications become available if these requirements are not imposed under the EMC Directive.

NOTE 2: It is recommended that the EMC requirements should be met when the electromagnetic environment in which the equipment providing the NTP is placed does not exceed the limits defined in EN 50082-1.

NOTE 3: Protection requirements were previously specified separately in the leased line interface ETSS. Under new guidance these requirements are now deemed to be EMC issues.

## 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 this ETS. There is no requirement for each leased line to be tested in accordance with this ETS before it is brought into, or returned into, service.

It is outside the scope of this ETS 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 realisation 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 this ETS 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 subclause 4.1 of ETS 300 418 [3] or subclause 5.1 of ETS 300 288 [1] as applicable

### A.2 Main test

**Purpose:** To verify the following requirements:

- information transfer rate;
- information transfer susceptance;
- 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.

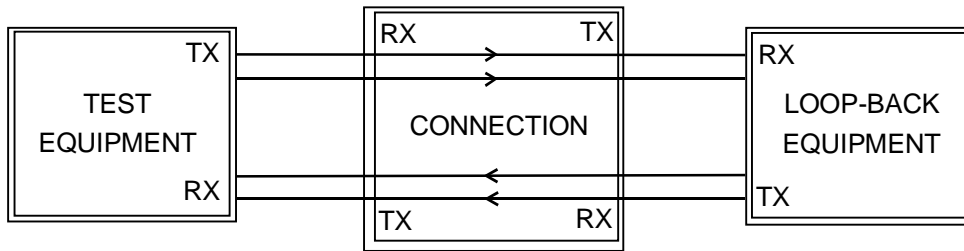


Figure A.1

**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 ETS 300 418 [3]

Waveform shape according to subclause 4.2.1.2 of ETS 300 418 [3]

Frame structure according to annex B of ETS 300 419 [4]

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 ETS 300 419 [4].

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, subclause B.2.1 of ETS 300 419 [4].

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

- 89/336/EEC: "Council Directive of 3 May 1989 on the approximation of the laws of Member States relating to electromagnetic compatibility".
- 91/263/EEC: "Council Directive of 29 April 1991 on the approximation of the laws of Member States concerning telecommunications terminal equipment, including the mutual recognition of their conformity".
- 92/44/EEC: "Council Directive of 5 June 1992 on the application of Open Network Provision to leased lines".
- CCITT Recommendation G.703 (1991): "Physical/electrical characteristics of hierarchical digital interfaces".
- ITU-T Recommendation G.704 (1995): "Synchronous frame structures used at 1 544, 6 312, 2 048, 8 488 and 44 736 kbit/s hierarchical levels".
- CCITT Recommendation G.706 (1991): "Frame alignment and cyclic redundancy check (CRC) procedures relating to basic frame structures defined in Recommendation G.704".
- EN 50082-1 (1992): "Electromagnetic compatibility generic immunity standard; Generic standard class: Domestic, commercial and light industry".
- ETS 300 166 (1993): "Transmission and Multiplexing (TM); Physical/electrical characteristics of hierarchical digital interfaces for equipment using the 2 048 kbit/s-based plesiochronous or synchronous digital hierarchies".
- ETS 300 167 (1993): "Transmission and Multiplexing (TM); Functional characteristics of 2 048 kbit/s interfaces".
- ETS 300 290 (1994): "Business TeleCommunications (BTC); 64 kbit/s digital unrestricted leased line with octet integrity (D64U) Terminal equipment interface".
- ETS 300 420 (1995): "Business TeleCommunications (BTC); 2 048 kbit/s digital structured leased lines (D2048S); Terminal equipment interface".

## History

Document history			
August 1996	Public Enquiry	PE 111:	1996-08-05 to 1996-11-29
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