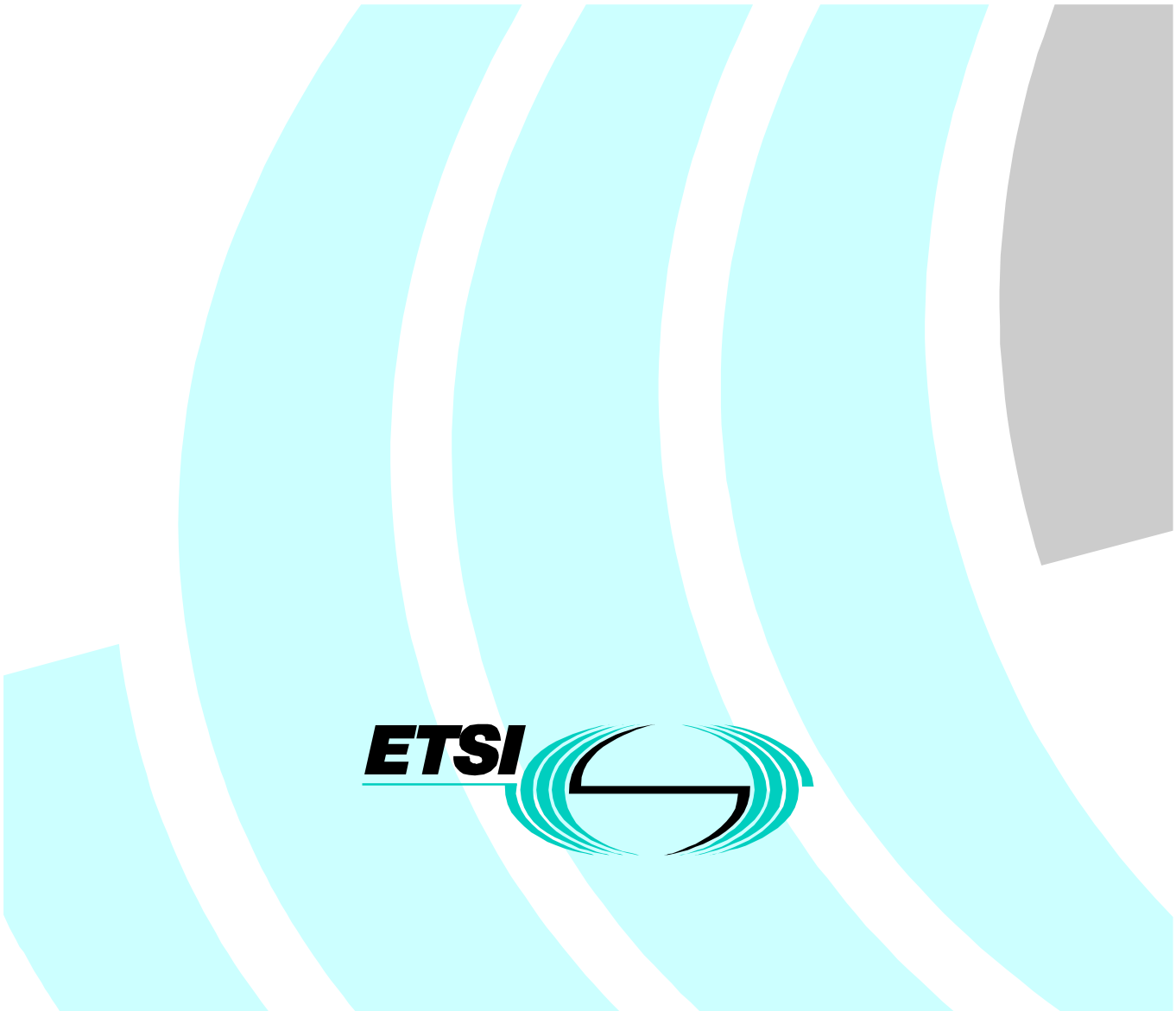
ETSI EN 300 418 V1.2.1 (2001-07)

European Standard (Telecommunications series)

Access and Terminals (AT);
2 048 kbit/s digital unstructured and structured leased lines (D2048U and D2048S);
Network interface presentation



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Contents

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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Access and Terminals (AT).

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).

In the case of the unstructured leased line, the present document supersedes ETS 300 246 (withdrawn) (see annex C).

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

- EN 300 247: "Access and Terminals (AT); 2 048kbit/s digital unstructured lease line (D2048U); Connection characteristics";
- EN 300 248: "Access and Terminals (AT); 2 048 kbit/s digital unstructured leased line (D2048U); Terminal equipment interface";
- 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.

National transposition dates	
Date of adoption of this EN:	29 June 2001
Date of latest announcement of this EN (doa):	30 September 2001
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 March 2002
Date of withdrawal of any conflicting National Standard (dow):	31 March 2002

Introduction

The Council Directive on the application of ONP to leased lines (92/44/EEC) (see annex C) 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.

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 C), later replaced by 98/13/EC (see annex C), terminal equipment 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.

ETS 300 166 (see annex C) and ITU-T Recommendation G.703 [1] were used as the basis for the network interface presentation requirements.

1 Scope

The present document specifies the technical requirements and test principles for the network interface presentations of ONP 2 048 kbit/s digital leased lines using 120 Ω interfaces. This includes:

- the 2 048 kbit/s digital unstructured leased line; and
- the 2 048 kbit/s digital structured leased line with an information transfer rate of 1 984 kbit/s without restriction on binary content.

A connection is presented via interfaces at Network Termination Points (NTP). The present document defines the network interface as presented by the leased line provider and should be used in conjunction with the appropriate companion standard, EN 300 247 [3] or EN 300 419 [5] , specifying the connection characteristics between the NTPs of the leased line. The present document and the appropriate connection characteristics standard together describe the technical characteristics of the leased line.

The present document is applicable to leased lines, including part time leased lines, for which the establishment or release do not require any protocol exchange or other intervention at the NTP.

The present document covers the physical, mechanical and electrical characteristics (except safety, overvoltage and EMC aspects) of the network interface and specifies the conformance tests for equipment of the kind that provides the interface presentation. Some of the tests 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. 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] ITU-T Recommendation G.703 (1998): "Physical/electrical characteristics of hierarchical digital interfaces".

[2] ITU-T Recommendation O.151 (1992): "Error performance measuring equipment operating at the primary rate and above".

[3] ETSI EN 300 247: "Access and Terminals (AT); 2 048kbit/s digital unstructured lease line (D2048U); Connection characteristics".

[4] ETSI EN 300 248: "Access and Terminals (AT); 2 048 kbit/s digital unstructured leased line (D2048U) 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".

3 Definitions and abbreviations

3.1 Definitions

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

leased lines: telecommunications facilities provided by a public telecommunications network that provide defined transmission characteristics between NTPs 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

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

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:

AIS	Alarm Indication Signal
AMI	Alternate Mark Inversion
CRC-4	Cyclic Redundancy Check-4 bit
D2048S	2 048 kbit/s digital structured leased line
D2048U	2 048 kbit/s digital unstructured leased line
dc	direct current
EMC	ElectroMagnetic Compatibility
HDB3	High Density Bipolar code of order 3 (see annex B)
ISDN	Integrated Services Digital Network
NTP	Network Termination Point
ONP	Open Network Provision
ppm	parts per million
PRBS	Pseudo Random Bit Sequence
rms	root mean square
RX	RX is a signal input (at either the leased line interface or the test equipment, see figure 1)
TX	TX is a signal output (at either the leased line interface or the test equipment, see figure 1)

4 Requirements

These requirements define the network interface presentation for:

- the 2 048 kbit/s digital unstructured leased line (D2048U) which provides a bidirectional point-to-point digital connection with a usable bit rate of 2 048 kbit/s where timing is not provided from the network. The provision of circuit timing is the responsibility of the user. No structuring of the data is provided, or shall be required, by the network and any structuring is the responsibility of the user; and
- the 2 048 kbit/s digital structured leased line (D2048S) which provides a bidirectional point-to-point digital connection with an information transfer rate of 1 984 kbit/s without restriction on binary content. The frame structure in the 2 048 kbit/s bit stream is defined in EN 300 419 [5]. Any structuring of the data within the transparent 1 984 kbit/s part of the frame is the responsibility of the user.

NOTE 1: The network interface is not designed for power feeding.

NOTE 2: If equipment providing the interface requires a mains supply, the leased line provider should bring this to the attention of the user so that the user can provide mains supply back-up facilities, if required.

4.1 Physical characteristics

The connection arrangements provided by the leased line interface shall be suitable for hardwired connection (see clause 4.1.1); however, with the agreement of the user, an alternative means of connection, using a socket, may be provided (see clause 4.1.2).

The transmit pair is the output from the network interface. The receive pair is the input to the network interface, as shown in figure 1. Where the terms "output" and "input" are used without qualification in the present document, they refer to the network interface.

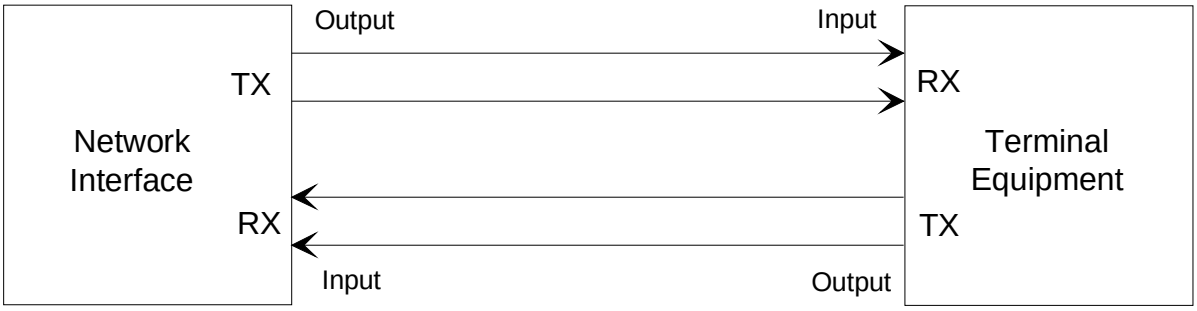


Figure 1

The use on the terminal equipment side of the interface of shielded cables may be necessary to meet radiation and immunity requirements defined in ElectroMagnetic Compatibility (EMC) standards. Therefore the NTP is required to provide a point for connection of the shield (see clause 4.1.3).

4.1.1 Hardwired connection

Requirement: Where the leased line is being presented as a hardwired connection, the leased line interface shall provide a means of terminating wire with solid conductors having diameters in the range 0,4 mm to 0,6 mm. The leased line provider shall provide information on the configuration of the means of connection.

Test: There is no test. All subsequent tests are carried out via the specified connection method.

4.1.2 Socket specification

There is no constraint on the type of socket that may be used under the present document.

NOTE: The intention is to specify the same socket as is specified for Integrated Services Digital Network (ISDN) primary rate access; however this approach is not practicable at present since connectors conforming to ISO/IEC 10173 (see annex C) are not available. A requirement to use the ISDN primary rate socket may be added to the present document when such connectors are readily available.

4.1.3 Shield connection point

Requirement: The NTP shall provide a point, or points, to which the shield, or shields, of the cable on the terminal side of the interface can be connected.

NOTE: The purpose of these points is to provide a path from the shield to a common reference. The common reference point does not necessarily have to be earthed.

Test: There shall be a visual inspection that a point, or points, for connection of the shield, or shields, is provided.

4.2 Electrical characteristics

4.2.1 Output port

4.2.1.1 Signal coding

Requirement: The signal transmitted at the output port shall comply with the High Density Bipolar code of order 3 (HDB3) encoding rules (see annex B).

Test: The test shall be according to clause A.2.1.

4.2.1.2 Waveform shape

Requirement: The pulse at the output port shall comply with the requirements given in table 1 and figure 2, based on ITU-T Recommendation G.703 [1].

Table 1: Waveform shape at output port

Pulse shape (nominally rectangular)	All marks of a valid signal shall conform to the mask (see figure 2) irrespective of the polarity. The value V corresponds to the nominal peak voltage of a mark.
Test load impedance	120 Ω non-reactive
Nominal peak voltage V of a mark	3 V
Peak voltage of a space	0 ± 0,3 V
Nominal pulse width	244 ns
Ratio of the amplitudes of positive and negative pulses at the centre of the pulse interval	0,95 to 1,05
Ratio of the widths of positive and negative pulses at the nominal half amplitude	0,95 to 1,05

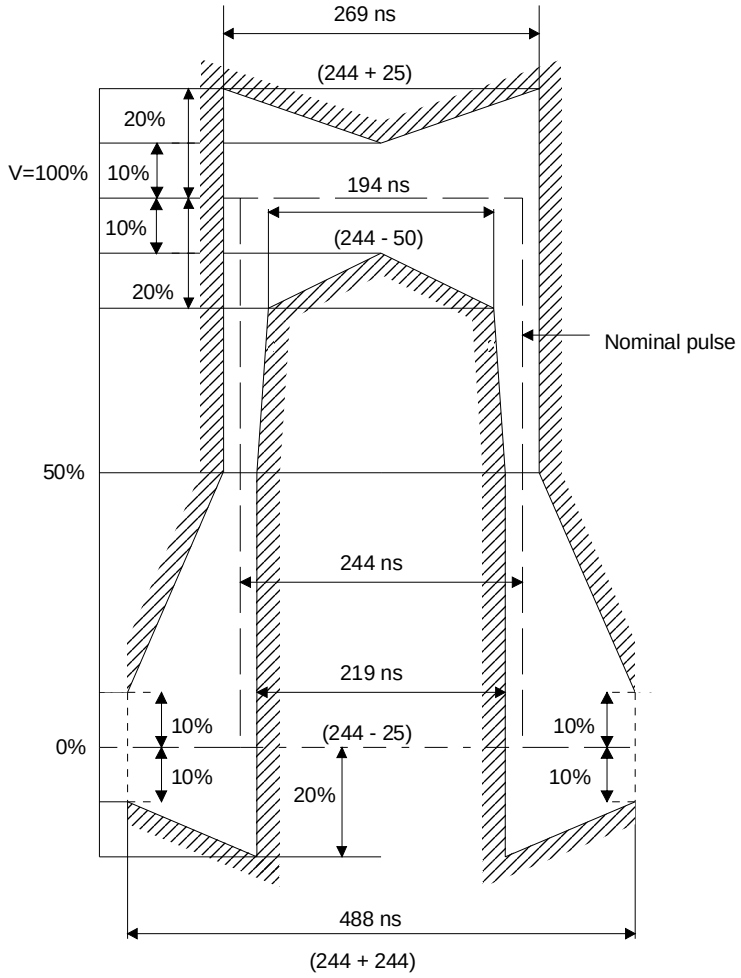


Figure 2: Pulse mask for 2 048 kbit/s pulse

Test: The test shall be according to clause A.2.2.

4.2.1.3 Output timing under failure conditions

Requirement: When there is a failure within the network and if a signal is presented at the interface output (e.g. an Alarm Indication Signal (AIS)), the output timing shall be 2 048 kbit/s ± 50 parts per million (ppm).

NOTE: AIS is encoded as a continuous stream of binary ONEs. It is used to indicate a loss of capability in the direction from the network to the user. When an AIS signal is transmitted by the network interface, its timing may:

- not be derived from network timing in the case where the leased line should be providing network timing; or
- not be the timing provided by the user at the far end where the leased line should be carrying user timing.

Test: The test shall be according to clause A.2.7.

4.2.1.4 Impedance towards ground

Requirement: The impedance towards ground of the output port shall be greater than 1 000 Ω for frequencies in the range 10 Hz to 1 MHz when measured with a sinusoidal test voltage of 2 V root mean square (rms). Ground (in this context) shall be the shield connection point defined in clause 4.1.3.

NOTE: This requirement is included to allow transformerless implementations.

Test: The test shall be according to clause A.2.6.

4.2.1.5 Output return loss

There are no requirements for output return loss under the present document.

NOTE: A requirement for output return loss may be added to the present document when appropriate specifications become available.

4.2.1.6 Output signal balance

There are no requirements for output signal balance under the present document.

NOTE: The effects of the output signal imbalance are covered under the EMC Directive (89/336/EEC) (see annex C).

4.2.1.7 Output timing and jitter

NOTE: Output timing requirements and jitter limits for the leased line are specified in the appropriate connection standard, EN 300 247 [3] or EN 300 419 [5].

4.2.2 Input port

4.2.2.1 Signal coding

Requirement: The input port shall correctly decode HDB3 encoded signals without error in accordance with HDB3 encoding rules (see annex B).

Test: The test shall be according to clause A.2.5.

4.2.2.2 Input return loss

Requirement: The input return loss with respect to 120 Ω at the interface shall be greater than or equal to the values given in table 2, which is taken from clause 9.3 of ITU-T Recommendation G.703 [1].

Table 2: Input port minimum return loss

Frequency range	Return loss
51 kHzto 102 kHz	12 dB
102 kHz to 2 048 kHz	18 dB
2 048 kHz to 3 072 kHz	14 dB

Test: The test shall be according to clause A.2.3.

4.2.2.3 Input loss tolerance

Requirement: The input port shall correctly decode without errors a 2 048 kbit/s signal as defined in clauses 4.2.1.1 and 4.2.1.2 above but modified by a cable or artificial cable with the following characteristics:

- attenuation that follows a $\sqrt{f}$ law with values throughout the range 0 to 6 dB at 1 024 kHz; and
- characteristic impedance of 120 Ω with a tolerance of ± 20% in the frequency range from 200 kHz up to, but not including, 1 MHz, and ± 10% at 1 MHz.

Test: The test shall be according to clause A.2.4.

4.2.2.4 Immunity against reflections

Requirement: When a signal comprising a combination of a normal signal and an interfering signal is applied to the input port, via an artificial cable with a loss in the range 0 dB to 6 dB at 1 MHz, no errors shall result due to the interfering signal.

The normal signal shall be a signal encoded according to HDB3, shaped according to the mask of figure 2 and with a binary content in accordance with a PRBS(2^{15}-1).

The interfering signal shall be the same as the normal signal except that the level shall be attenuated by 18 dB, the bit rate shall be within 2 048 kbit/s ± 50 ppm and the timing shall not be synchronized to the normal signal.

Test: The test shall be according to clause A.2.4.

4.2.2.5 Tolerable longitudinal voltages

Requirement: The receiver shall operate without errors with any input signal in the presence of a longitudinal voltage of magnitude 2 V rms over the frequency range 10 Hz to 30 MHz.

NOTE: This requirement is included to allow transformerless implementations.

Test: The test shall be according to clause A.2.5.

4.2.2.6 Impedance towards ground

Requirement: The impedance towards ground of the input port shall be greater than 1 000 Ω for frequencies in the range 10 Hz to 1 MHz when measured with a sinusoidal test voltage of 2 V rms. Ground (in this context) shall be the shield connection point defined in clause 4.1.3.

NOTE: This requirement is included to allow transformerless implementations.

Test: The test shall be according to clause A.2.6.

4.2.2.7 Input timing and jitter tolerance

NOTE: Input timing and jitter tolerance of the leased line are specified in the appropriate connection standard, EN 300 247 [3] or EN 300 419 [5].

4.3 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 C).

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

NOTE 3: Designers should take into account the minimum impedance towards ground specified in the present document.

4.4 Overvoltage

Overvoltage aspects are outside of the scope of the present document.

4.5 ElectroMagnetic Compatibility (EMC)

EMC requirements are outside the scope of the present document.

Annex A (normative): Test methods

A.1 General

This annex describes the test principles to determine the compliance of a leased line interface 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. The tests in clauses A.2.1, A.2.4, A.2.5 and A.2.7 are not designed for use on installed leased lines. Such tests may be applied to equipment of the kind used to provide the interface.

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^{15}-1).

Where a) or b) cannot be provided, an alternative means of performing the test may be used.

NOTE: Where the leased line uses the E-bits to indicate errored sub-multiframes (see EN 300 419 [5]), this may be used as an alternative to a transparent loopback in order to determine if data at the input has been correctly received.

A.1.2 Equipment connection

Testing shall be performed at the point of connection in accordance with clause 4.1, as this is the point at which compliance with the present document is required.

A.2 Test methods

One test may cover more than one requirement. The scope of each test is defined under the heading "purpose".

A.2.1 Signal coding at output port

Purpose: To verify that the signal coding at the leased line output port complies with the HDB3 coding **rules as required by clause 4.2.1.1.**

Test configuration: Figure A.1.

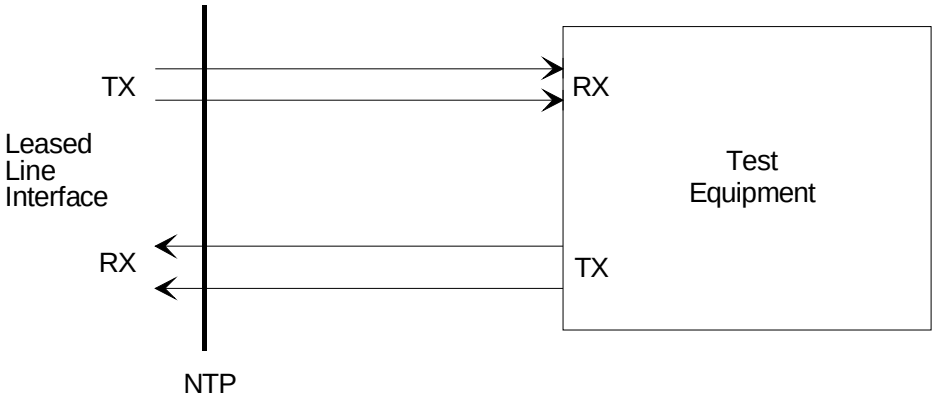


Figure A.1: Signal coding at output port

Interface state: Powered.

Stimulus: The leased line interface shall transmit a bit stream including the sequences <0000><even number of binary ONEs><0000> and <0000><odd number of binary ONEs><0000> which shall be encoded into HDB3; where 0 = space and 1 = mark input to the HDB3 encoder (see note).

Monitor: The output bit stream for a test period of sufficient time to allow transmission of 100 occurrences of the above patterns plus the latency period of the error detection mechanism.

Results: There shall be no errors in the HDB3 encoding.

NOTE: A pseudo random bit sequence, e.g. PRBS(2^{15}-1), will be acceptable if the bit patterns of the above clause are included in the bit stream. For equipment which can generate a framed signal in accordance with ITU-T Recommendation G.704 (see annex C be transmitted in bits 9 to 256 of the frame. For equipment which cannot generate such a framed signal, the PRBS should be transmitted in the whole bit stream.

A.2.2 Waveform shape at output port

Purpose: To verify conformance of the output waveform shape with the requirements of clause 4.2.1.2.

Test configuration: Figure A.2.

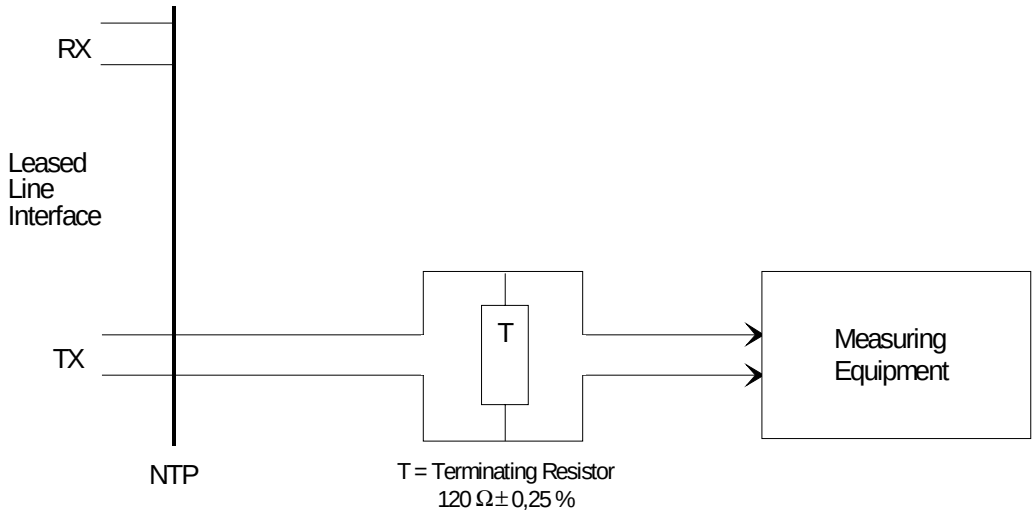


Figure A.2: Waveform shape at output port

Interface state: Powered.

Stimulus: Undefined.

Monitor: Marks and spaces transmitted from the NTP, measuring the amplitude and shape of positive and negative pulses (measured at the centre of the pulse interval) and the time duration of positive and negative pulses (measured at the nominal half of the pulse amplitude, i.e. 1,5 V).

The overall measurement accuracy shall be better than 90 mV. All the measurements shall be performed using measuring equipment capable of recording direct current (dc). A bandwidth of 200 MHz or greater shall be used to ensure the capture of over or undershoot of the pulse.

Results: Both positive and negative pulses shall be within the mask of figure 2, where V = 100 % shall be 3 V.

The bit interval corresponding to a space shall not present voltages higher than ± 0,3 V.

The ratio between the amplitude of positive and negative pulses shall be in the range from 0,95 to 1,05.

The ratio between the pulse widths of positive and negative pulses shall be in the range from 0,95 to 1,05.

A.2.3 Return loss at input port

Purpose: To verify the return loss of the input port of the leased line interface complies with the requirements of clause 4.2.2.2.

Test configuration: Figure A.3.

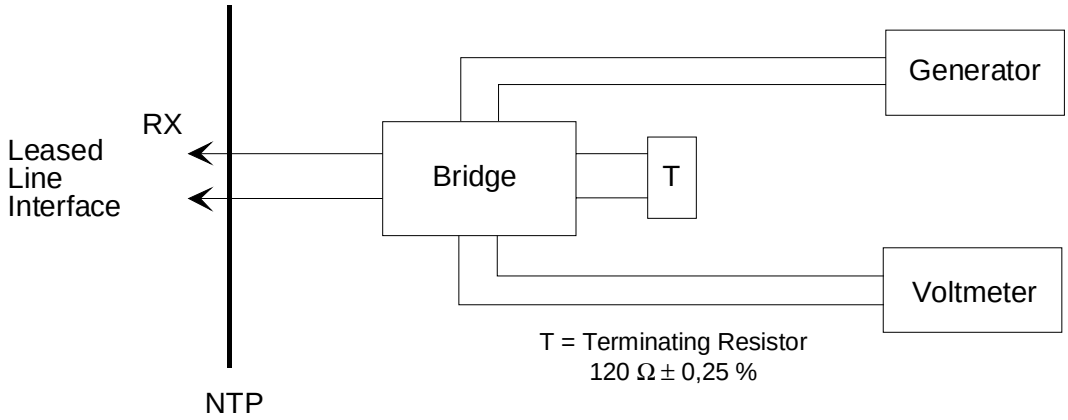


Figure A.3: Return loss at input port

Interface state: Powered.

Stimulus: Sinusoidal signal of 3 V peak at the input to the network interface with a frequency variable between 51 kHz and 3 072 kHz.

Monitor: Voltage measured across the bridge, representing a terminating resistor of 120 Ω, using a selective voltmeter with a bandwidth of less than 1 kHz.

Results: The measured return loss shall be greater than or equal to the values specified in clause 4.2.2.2.

NOTE: The characteristics of the generator and of the voltmeter may be different depending on the implementation of the bridge however the total error of the test set-up should be less than 0,5 dB in the range between 10 dB and 20 dB. When connected to a 120 Ω ± 0,25 % resistor the measured return loss of the bridge should be 20 dB higher than the limits specified for the interface.

A.2.4 Input loss tolerance and immunity against reflections

Purpose: To verify the input port immunity against an interfering signal combined with the input signal, as specified in clause 4.2.2.4, both without cable (i.e. 0 dB attenuation loss) and with a cable attenuation of 6 dB as specified in clause 4.2.2.3.

Test configuration: Figure A.4.

The interfering signal shall be combined with the main signal in a combining network of impedance 120 Ω, with zero dB loss in the main path and an attenuation in the interference path of 18 dB.

The cable simulator shall have an attenuation of 6 dB measured at 1 024 kHz and an attenuation characteristic that follows a √f law over the frequency range 100 kHz to 10 MHz.

The conformance of the interface shall be verified in the following test conditions:

- without cable simulator and without interfering signal; and

- with cable simulator and without interfering signal; and

- without cable simulator and with interfering signal; and

- with cable simulator and with interfering signal.

The test shall be repeated with the wires at the network interface input (RX) reversed.

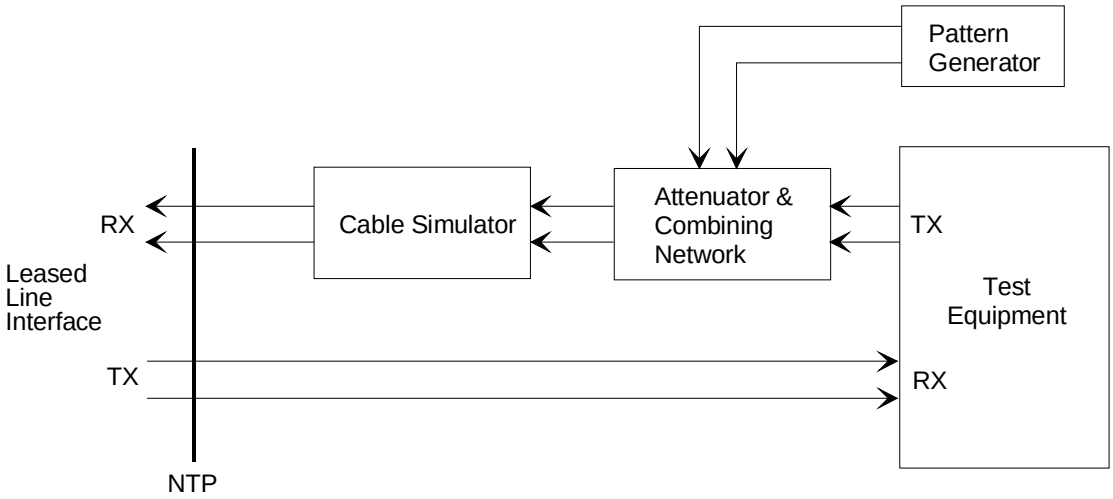


Figure A.4: Immunity against reflections

Interface state: Powered, with received data looped back to the output port.

Stimulus: The output signal of the test equipment shall be HDB3 encoded and conform to a pulse shape as defined in figure 15 of ITU-T Recommendation G.703 [1], which is reproduced in figure 2 of the present document. The binary content shall be a PRBS(2^{15}-1). The bit rate shall be within the limits 2 048 kbit/s ± 50 ppm.

If it is necessary for the correct operation of the leased line interface, the bit stream may be synchronous to the network interface output and/or structured into frames, with the Cyclic Redundancy Check-4 bit (CRC-4), according to EN 300 419 [5]. Within the frames not containing the frame alignment signal, bit 3 (Remote Alarm Indication (RAI)) shall be set to 0 and bits 4 to 8 (S_{a4} to S_{a8}) shall be set to 1. The binary content of the data contained in bits 9 to 256 of the frame shall be a PRBS(2^{15}-1).

The interfering signal from the pattern generator shall:

- be HDB3 encoded and conform to a pulse shape as defined in figure 15 of ITU-T Recommendation G.703 [1], which is reproduced in figure 2 of the present document; and

- have a binary content with a PRBS(2^{15}-1); and

- have a nominal bit rate of 2 048 kbit/s, not synchronized to the output signal of the test equipment.

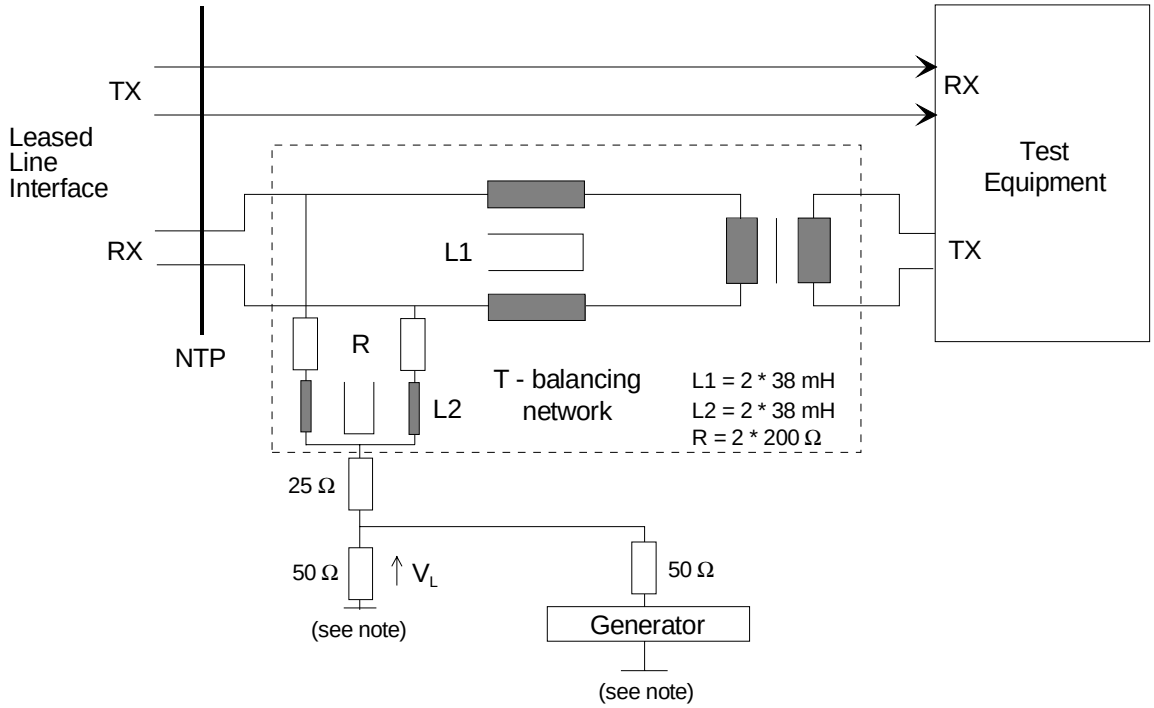
Monitor: Data at output port.

Results: There shall be no bit errors for at least one minute.

A.2.5 Tolerable longitudinal voltage and HDB3 input coding

Purpose: To verify the minimum tolerance to longitudinal voltages at the input of the leased line, as specified in clause 4.2.2.5, and correct recognition of HDB3 code as specified in clause 4.2.2.1.

Test configuration: Figure A.5.



NOTE: Ground (in this context) shall be the shield connection point defined in clause 4.1.3.

Figure A.5: Tolerable longitudinal voltage and HDB3 input coding

Interface state: Powered, with received data looped back to the output port.

Stimulus: The output signal of the test equipment shall be HDB3 encoded and conform to a pulse shape as defined in figure 15 of ITU-T Recommendation G.703 [1], which is reproduced in figure 2 of the present document. The binary content shall be a PRBS(2^{15}-1).

If it is necessary for the correct operation of the leased line interface, the bit stream may be synchronous to the network interface output and/or structured into frames, with the CRC-4, according to EN 300 419 [5]. Within the frames not containing the frame alignment signal, bit 3 (remote alarm indication) shall be set to 0 and bits 4 to 8 (S_{a4} to S_{a8}) shall be set to 1.

The binary content of the data contained in bits 9 to 256 of the frame shall be a PRBS(2^{15}-1).

A longitudinal voltage V_L of 2 V rms, ± 20 mV with a frequency variable between 10 Hz and 30 MHz shall be applied for a minimum of 2 seconds.

Monitor: Data at the output port of the leased line.

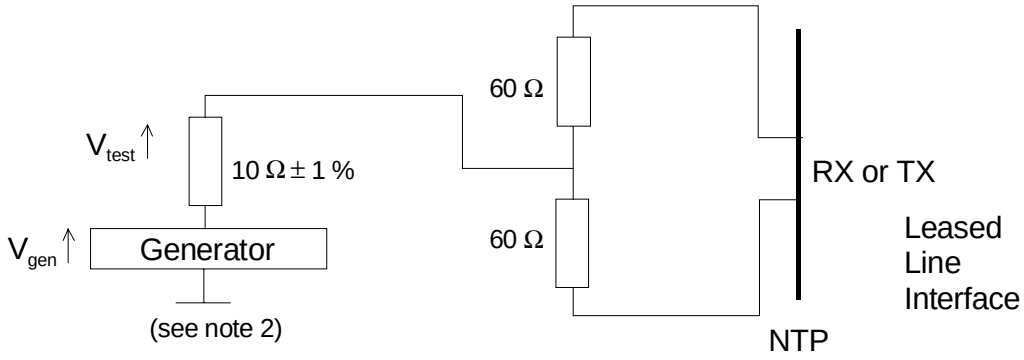
Results: There shall be no bit errors in the PRBS received from the leased line.

NOTE: The inherent longitudinal conversion loss of the T-balancing network should be greater than 30 dB.

A.2.6 Impedance towards ground

Purpose: To verify the leased line interface input and output ports impedance towards ground as specified in clauses 4.2.1.4 and 4.2.2.6.

Test configuration: Figure A.6.



NOTE 1: The 60 Ω resistors should be within 1 % and matched to better than 0,1 %.
NOTE 2: Ground (in this context) shall be the shield connection point defined in clause 4.1.3.

Figure A.6: Impedance towards ground

Interface state: Powered.

Stimulus: Sinusoidal test signal (V_{gen}) of 2 V rms, ± 20 mV applied over the frequency range 10 Hz to 1 MHz.

Monitor: Voltage of V_{test}.

Results: Voltage V_{test} shall be less than 19,2 mV rms.

A.2.7 Output timing under failure conditions

Purpose: To measure the output timing if an output signal is present under network failure conditions as specified in clause 4.2.1.3.

Test Configuration: Figure A.7.

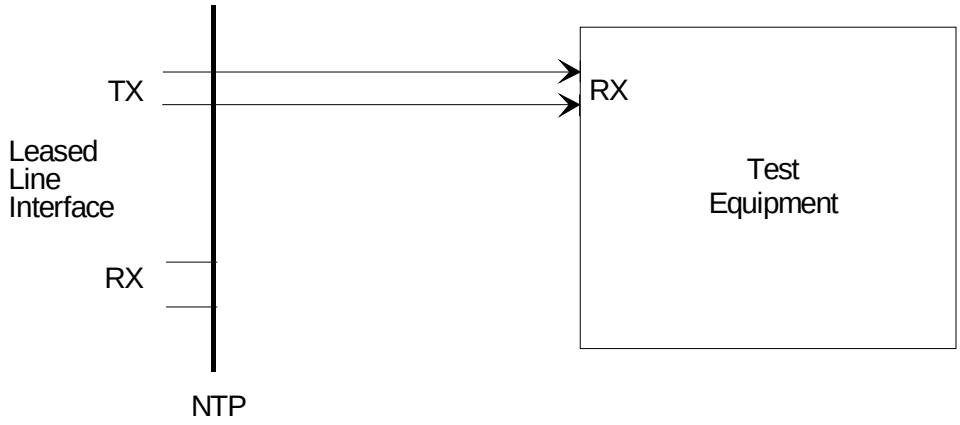


Figure A.7: Output timing under network failure conditions

Interface state: Powered.

Stimulus: The interface shall be configured to provide whatever signal is provided under network failure conditions, e.g. AIS.

Monitor: The output bit rate from the leased line interface.

Results: The output bit rate shall be within the limits of 2 048 kbit/s ± 50 ppm.

Annex B (normative): Definition of HDB3 code

B.1 General

This annex specifies the modified Alternate Mark Inversion (AMI) code HDB3. The contents of this annex are based on annex A of ITU-T Recommendation G.703 [1].

In this code, binary 1 bits are represented by alternate positive and negative pulses, and binary 0 bits by spaces. Exceptions are made when strings of successive 0 bits occur in the binary signal.

In the definition below, B represents an inserted pulse corresponding to the AMI rule, and V represents an AMI violation.

B.2 Definition

Each block of 4 successive zeros is replaced by 000V or B00V. The choice of 000V or B00V is made so that the number of B pulses between consecutive V pulses is odd. In other words, successive V pulses are of alternate polarity so that no dc component is introduced.

Annex C (informative): Bibliography

- Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of Member States relating to electromagnetic compatibility (EMC Directive).
- 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.704 (1998): "Synchronous frame structures used at 1 544, 6 312, 2 048, 8 448 and 44 736 kbit/s hierarchical levels".
- 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".
- ISO/IEC 10173 (1998): "Information technology-Telecommunications and information exchange between systems-Interface connector and contact assignments for ISDN primary rate access connector located at reference points S and T".
- 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

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