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Dostop in terminali (AT) ï Digitalni zakupljeni vodi za prenosno hitrost 140 Mbit/s (D140U, D140S) ï Priključ itvene znaļ ilnosti

Access and Terminals (AT); 140 Mbit/s digital leased lines (D140U and D140S); Connection characteristics

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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 support of the Directive on Open Network Provision (ONP) of leased lines (92/44/EEC).

There is one other standard that is directly related to the present document:

- EN 300 686: "Access and Terminals (AT); 34 Mbit/s and 140 Mbit/s digital leased lines (D34U, D34S, D140U, D140S); Network interface presentation".

The present document is based on information from ITU-T Recommendations and ETSI publications; 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
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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 of a minimum set of leased lines with harmonized technical characteristics.

The 140 Mbit/s unstructured and structured leased lines are not part of the minimum set of leased lines under the Directive, however, the present document is being written with the intention that where 140 Mbit/s leased lines are offered, they will be in accordance with these harmonized standards.

Under the Directive 91/263/EEC (see annex F), later replaced by 98/13/EC (see annex F), 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.

1 Scope

The present document specifies the technical requirements and conformance tests for connection characteristics of point-to-point 140 Mbit/s digital leased lines. These leased lines operate at:

- 139 264 kbit/s providing an information transmission capability, without restriction on binary content, (D140U); and
- 139 264 kbit/s providing an information transmission capability, without restriction on binary content, of 138 240 kbit/s, (D140S); the remaining 1 024 kbit/s provides an 8 kHz framing structure in accordance with ETS 300 337 (ITU-T Recommendation G.832) (see annex F).

A connection is presented via interfaces at Network Termination Points (NTPs) and includes any equipment that may provide the NTP. Signals between NTPs are subject to impairments during their transfer over the connection. The limits to these impairments are stated in the present document. The present document, together with the companion standard EN 300 686 [1], defining the network interface presentation, describes the technical characteristics of the leased line.

The tests specified in the present document cannot be carried out by the leased line provider while the leased line is in service, i.e. carrying users' traffic. Thus the tests are designed for bringing into and returning into service, although there is no obligation to perform these tests each time a leased line is brought into or returned into service. However, if the connection is structured, the error performance may be monitored by the leased line provider while the line is in service.

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

The present document specifies the conformance tests for the connection requirements. The present document does not include details concerning the implementation of the tests, nor does it include information on any relevant regulations.

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 300 686: "Access and Terminals (AT); 34 Mbit/s and 140 Mbit/s digital leased lines (D34U, D34S, D140U, D140S); Network interface presentation".

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

[3] ITU-T Recommendation O.171 (1997): "Timing jitter and wander measuring equipment for digital systems which are based on the plesiochronous digital hierarchy (PDH)".

3 Definitions and abbreviations

3.1 Definitions

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

Background Block Error Ratio (BBER): ratio of errored blocks to total blocks during a fixed measurement interval excluding all blocks during severely errored seconds and while the leased line connection is in the unavailable state

Background Block Error (BBE): errored block not occurring as part of a severely errored second

block: set of consecutive bits equivalent to one frame; each bit belongs to one and only one block. The length of each block corresponds to a period of 125 microseconds

errored block: block in which one or more bits are in error

Errored Second (ES): one-second period with one or more errored blocks

Errored Seconds Ratio (ESR): ratio of errored seconds to total seconds during a fixed measurement interval. The ESR is not evaluated while the leased line connection is in the unavailable state

frame: repetitive set of consecutive bits in which the position of each bit can be identified by reference to a frame alignment signal

frame alignment signal: distinctive signal inserted in every frame always occupying the same relative position within the frame and used to establish and maintain frame alignment

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

PRBS(2^{23}-1): Pseudo Random Bit Sequence (PRBS) (as defined in clause 2.2 of ITU-T Recommendation O.151)

satellite transmission: transmission via an earth orbiting satellite

severely disturbed period: for out-of-service measurements, a severely disturbed period occurs when, over a period of time equivalent to four contiguous blocks, either all the contiguous blocks are affected by a high bit error density of ≥ 10-2, or a loss of signal is observed. For in-service monitoring purposes, a severely disturbed period is estimated by the occurrence of loss of signal or loss of frame alignment

Severely Errored Second (SES): one-second period which contains ≥ 30 % errored blocks or at least one severely disturbed period

Severely Errored Seconds Ratio (SESR): ratio of severely errored seconds to total seconds during a fixed measurement interval. The SESR is not evaluated while the leased line connection is in the unavailable state

unavailability period: unavailability period begins at the onset of 10 consecutive SES. These 10 seconds are considered to be part of the unavailability period. The unavailability period ends at the onset of 10 consecutive non-severely errored seconds. These 10 seconds are not considered part of the unavailability period

unavailable state: leased line connection is in the unavailable state if an unavailability period is occurring in one or both directions of transmission

3.2 Abbreviations

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

AIS	Alarm Indication Signal
BBE	Background Block Error
BBER	Background Block Error Ratio
BIP-8	Bit Interleaved Parity (8 bit)
BIS	Bringing Into Service
CMI	Coded Mark Inversion
D140U	140 Mbit/s digital unstructured leased line
D140S	140 Mbit/s digital structured leased line
EM	Error Monitoring
EMC	ElectroMagnetic Compatibility
ES	Errored Second
ESR	Errored Seconds Ratio
FA1	Frame Alignment byte 1
FA2	Frame Alignment byte 2
GC	General purpose Communications channel
LSB	Least Significant Bit
MA	Maintenance and Adaptation
MSB	Most Significant Bit
NR	Network operator byte
NTP	Network Termination Point
ONP	Open Network Provision
ppm	parts per million
PRBS	Pseudo Random Bit Sequence
RDI	Remote Defect Indication
REI	Remote Error Indication
RPO	Reference Performance Objective
RX	RX is a signal input (at either the leased line interface or the test equipment)
SES	Severely Errored Second
SESR	Severely Errored Seconds Ratio
TM	Timing Marker
TR	TRail trace
TX	TX is a signal output (at either the leased line interface or the test equipment)
UI	Unit Interval

4 Requirements

The performance of the leased line shall comply with these requirements only if the conditions of supply of the network equipment providing 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 (see annex F) are specified in the present document:

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

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

- transmission delay;
- jitter;
- error;
- availability.

4.1 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

	D140U	D140S
Connection type attributes	**Value / nature**	
Transfer rate - leased line timing - information transfer rate	 139 264 kbit/s ± 15 ppm 139 264 kbit/s ± 15 ppm	 139 264 kbit/s ± 15 ppm 138 240 kbit/s ± 15 ppm
Information transfer susceptance	Unrestricted digital	
Structure	Unstructured	Frame integrity
Establishment of connection	Without user intervention	
Symmetry	Symmetrical in both directions	
Connection configuration	Point-to-point	
Transmission delay - terrestrial (for distance G in km) - satellite	≤ (10 + 0,01 G) ms ≤ 350 ms	
Jitter at input port	0,4 UI from 200 Hz to 500 Hz 0,075 UI from 10 kHz to 3 500 kHz	
Jitter at output port	1,5 UI from 200 Hz to 3 500 kHz 0,075 UI from 10 kHz to 3 500 kHz	
Availability	No requirement	
Error parameters	**D140U and D140S**	
	Terrestrial	**Satellite**
End-to-end performance objectives - Errored Seconds Ratio (ESR) - Severely Errored Seconds Ratio (SESR) - Background Block Error Ratio (BBER)	 ≤ 8,00 % ≤ 0,10 % ≤ 0,01 %	 ≤ 12,480 % ≤ 0,156 % ≤ 0,016 %
Performance levels over a 24 hour period - Errored Seconds (ES) - Severely Errored Seconds (SES) - Background Block Errors (BBE)	 ≤ 6 746 ≤ 68 ≤ 68 594	 ≤ 10 575 ≤ 112 ≤ 107 170

4.1.1 Transfer rate

4.1.1.1 Leased line timing

Requirement: The leased line shall be capable of carrying user timing within the range of 139 264 kbit/s ± 15 ppm.

The leased line provider may also offer to the user in certain installations the capability for the leased line to be synchronized to network timing.

NOTE: Network timing is timing that is derived from the source or sources of timing that are used for the network (i.e. a national primary reference clock). Thus the timing provided by the leased line will be similar to that provided by other digital services.

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

4.1.1.2 Information transfer rate

Requirement: The connection shall be capable of transferring a nominal information rate, defined in table 2.

Table 2: Information transfer rate

	D140U	D140S
Information transfer rate	139 264 kbit/s ± 15 ppm	138 240 kbit/s ± 15 ppm

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

4.1.2 Information transfer susceptance

Requirement: The connection shall be capable of transferring unrestricted digital information with bit sequence integrity at the nominal rate, defined in table 3.

Table 3: Information transfer susceptance

	D140U	D140S
Information transfer susceptance	139 264 kbit/s ± 15 ppm	138 240 kbit/s ± 15 ppm

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

4.1.3 Structure

4.1.3.1 Frame integrity

The requirement of this clause applies only to the D140S structured leased line.

Requirement: When a signal with the structure defined in annex B is applied to the input of the D140S leased line, the output signal at the far end shall also conform to the structure defined in annex B and the frame alignment byte (FA1 and FA2) shall be in the same position in relation to the contents of the payload.

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

4.1.3.2 Loss of input signal

Requirement: When there is no input signal to the leased line, the output signal at the far end of the leased line shall be Alarm Indication Signal (AIS) (all ones).

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

4.1.4 Symmetry

Requirement: The connection shall be symmetrical, i.e. each direction of transmission shall have the same information transfer capability (D140U and D140S) and the same frame structure (D140S).

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