SLOVENSKI STANDARD
SIST ETS 300 011-1 E2:2003

01-december-2003

Digitalno omrežje z integriranimi storitvami (ISDN) – Primarni vmesnik uporabnik-omrežje (UNI) – 1. del: Specifikacija prve plasti

Integrated Services Digital Network (ISDN); Primary rate User-Network Interface (UNI); Part 1: Layer 1 specification

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Ta slovenski standard je istoveten z: ETS 300 011-1 Edition 2

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ICS:

33.080	Digitalno omrežje z integriranimi storitvami (ISDN)	Integrated Services Digital Network (ISDN)

SIST ETS 300 011-1 E2:2003 **en**

2003-01.Slovenski inštitut za standardizacijo. Razmnoževanje celote ali delov tega standarda ni dovoljeno.

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EUROPEAN TELECOMMUNICATION STANDARD

ETS 300 011-1

March 1998

Second Edition

Source: TM

Reference: RE/TM-03037-1

ICS: 33.020

Key words: ISDN, layer 1, primary, rate, UNI, transmission

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Integrated Services Digital Network (ISDN); Primary rate User-Network Interface (UNI); Part 1: Layer 1 specification

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Foreword

This second edition European Telecommunication Standard (ETS) was produced by the Transmission and Multiplexing (TM) Technical Committee of the European Telecommunications Standards Institute (ETSI).

This ETS aims to meet urgent requirements of network operators and equipment manufacturers who are designing equipment to operate with an Integrated Services Digital Network (ISDN) primary rate access User Network Interface (UNI).

This ETS is based upon CCITT Recommendation I.431 and provides modifications and further requirements to that document. It also is affected by CCITT Recommendations G.703, G.704 and G.706, and modifications to these CCITT Recommendations are provided within this ETS.

This ETS also takes into account requirements contained in ECMA Standard 104: "Physical layer at the primary rate access interface between data processing equipment and private switching networks (1985)", which are given in annex A.

This ETS consists of 3 parts as follows:

Part 1: "Layer 1 specification";

Part 2: "Conformance test specification for interface I_A and I_B";

Part 3: "Implementation Conformance Statement (ICS) and Implementation eXtra Information for Testing (IXIT) proforma specification for Interface I_A and I_B".

Transposition dates	
Date of adoption of this ETS:	6 March 1998
Date of latest announcement of this ETS (doa):	30 June 1998
Date of latest publication of new National Standard or endorsement of this ETS (dop/e):	31 December 1998
Date of withdrawal of any conflicting National Standard (dow):	31 December 1998

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1 Scope

This second edition European Telecommunication Standard (ETS) specifies requirements and test principles for the ISDN 2 048 kbit/s primary rate UNI including the physical, electrical and functional characteristics and the information exchange with higher layers. Compliance with this ETS ensures that, with regard to layer 1 interface aspects, equipment for use with ISDN primary rate access is portable within countries that adhere to this ETS and, furthermore, that interworking with higher layer protocols for ISDN is supported.

This ETS is applicable to equipment having interface I_A or I_B for the connection to the ISDN primary rate UNI intended to be installed on customers' premises. In accordance with CCITT Recommendation I.411 [1], this ETS is to be applied to interfaces at reference points S, T and S/T (coincident S and T) of the ISDN reference configuration.

This ETS is applicable for ISDN channel arrangements as defined in CCITT Recommendation I.412 [2], as far as the primary rate at 2 048 kbit/s is concerned.

Annex A specifies additional requirements for interfaces at reference point S.

This ETS does not specify:

- safety requirements;
- interface or equipment overvoltage protection requirements;
- immunity requirements against electromagnetic interferences;
- emission limitation requirements.

2 Normative references

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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 applies to this ETS only when incorporated in it by amendments or revision. For undated references the latest edition of the publication referred to applies.

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[1] CCITT Recommendation I.411 (1993): "ISDN user-network interfaces - Reference configurations".

[2] CCITT Recommendation I.412 (1988): "ISDN user-network interfaces- Interface structures and access capabilities".

[3] CCITT Recommendation O.151 (1992): "Error performance measuring equipment operating at the primary rate and above".

[4] EN 60950 (1992): "Safety of information technology equipment including electrically operated business machines".

[5] EN 60603-7 (1993): "Connectors for frequencies below 3 MHz for use with printed boards - Part 7: Detail specification for connectors, 8-way, including fixed and free connectors with common mating features".

[6] EN 50082-1 (1992): "Electromagnetic compatibility - Generic immunity standard - Part 1: Residential, commercial and light industry".

[7] CCITT Recommendation O.162 (1992): "Equipment to perform in-service monitoring on 2048, 8448, 34 368 and 139 264 kbit/s signals".

[8] ITU-T Recommendation M.20: "Maintenance philosophy for telecommunication networks".

[9] ETR 001: "Integrated Services Digital Network (ISDN); Customer access maintenance".

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[10] ETS 300 046-2 (1992): "Integrated Services Digital Network (ISDN); Primary rate access - safety and protection Part 2 : Interface I_A - safety".

[11] ETS 300 046-3 (1992): "Integrated Services Digital Network (ISDN); Primary rate access - safety and protection, Part 3: Interface I_A - protection".

[12] ETS 300 046-4 (1992): "Integrated Services Digital Network (ISDN); Primary rate access - safety and protection, Part 4: Interface I_B - safety".

[13] ETS 300 046-5 (1992): "Integrated Services Digital Network (ISDN); Primary rate access - safety and protection, Part 5: Interface I_B - protection".

[14] ETS 300 125 (1991): "Integrated Services Digital Network (ISDN); User-network interface data link layer specification Application of CCITT Recommendations Q.920/I.440 and Q.921/I.441".

[15] ETS 300 166 (1993): "Transmission and Multiplexing (TM); Physical and electrical characteristics of hierarchical digital interfaces for equipment using the 2048 kbit/s -based plesiochronous or synchronous digital hierarchies".

[16] ETS 300 233 (1994): "Integrated Services Digital Network (ISDN); Access digital section for ISDN primary rate".

[17] ETS 300 247 (1995): "Business Telecommunications (BT); Open Network Provision (ONP) technical requirements; 2 048 kbit/s digital unstructured leased line (D2048U) Connection characteristics".

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

[19] CCITT Recommendation X.200 (1994): "Information technology - Open Systems Interconnection - Basic reference model: The basic model".

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3 Definitions, symbols and abbreviations

3.1 Definitions

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

Alternate Mark Inversion (AMI): Is a code where ONEs are represented by alternate positive and negative pulses, and ZEROs by spaces.

High-Density Bipolar 3 (HDB3): Is a modified AMI code. An exception occurs for blocks of 4 successive ZEROs. Each block of 4 successive ZEROs is replaced by OOOV or BOOV where B represents an inserted pulse conforming to the AMI and V represents an AMI violation. The choice of OOOV or BOOV 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 direct current (dc) component is introduced.

interface I_A: User side of the ISDN UNI for the primary rate access.

interface I_B: Network side of the ISDN UNI for the primary rate access.

network side: NT1, LT and ET functional groups in case of an interface at the T reference point; or relevant parts of the NT2 functional group in case of an interface at the S reference point.

network option 1: The digital link between interface at the T and V reference point does not provide a CRC-4 processing, i.e. the CRC-4 is terminated in the TE and the ET. This digital link is called to be "without CRC processing" (see subclause 7.2.2.2).

NOTE 1: This option is not provided by the public ISDN at the T reference point. However it might be used for Private Telecommunications Network Exchange (PTNX) interconnection using unstructured 2 048 kbit/s leased lines.

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network option 2: The digital link between interface at the T and V reference point provides CRC-4 processing in the NT1 and the ET according ETR 001 [9]. Therefore the combinations of CRC-4 error information and Remote Alarm Indication (RAI) indicate the fault condition; FC1 or FC4 (see subclause 7.2.2.1).

NOTE 2: Option 3 of CCITT Recommendation I.604 with CRC-4 processing in NT1, LT and ET is not relevant for this ETS.

Network Termination (NT): An equipment providing interface I_B.

NOTE 3: This term is used in this ETS to indicate network-terminating aspects of NT1 and NT2 functional groups where these have an I_B interface.

Network Termination Type 1 (NT1): This functional group includes functions broadly equivalent to layer 1 (physical) of the Open System Interconnection (OSI) reference model. These functions are associated with the proper physical and electromagnetic termination of the network. NT1 functions are:

- line transmission termination;
- layer 1 maintenance functions and performance monitoring;
- timing;
- layer 1 multiplexing;
- interface termination.

Network Termination Type 2 (NT2): This functional group includes functions broadly equivalent to layer 1 and higher layers of the CCITT Recommendation X.200 [19] reference model. Private Telecommunication Network Exchanges (PTNXs), local area networks and terminal controllers are examples of equipment or combinations of equipment that provide NT2 functions. NT2 functions include:

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- layer 2 and layer 3 protocol handling;
- layer 2 and layer 3 multiplexing;
- switching;
- concentration;
- maintenance functions;
- interface termination and other layer 1 functions.

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Private Telecommunication Network Exchange (PTNX): A nodal identity in a private telecommunication network which provides autonomous and automatic switching and call handling functions used for the provision of telecommunication services which are based on the definitions for those of the public ISDN.

Private Network Termination (PNT): A remote unit of equipment which terminates a transmission system employed between the PTNX and the interface I_B and the S reference point.

Terminal Adapter (TA): An equipment with interface I_A and one or more auxiliary interfaces that allow non-ISDN terminals to be served by an ISDN UNI.

Terminal Equipment (TE): An equipment providing an interface I_A.

NOTE 4: This term is used in this ETS to indicate terminal-terminating layer 1 aspects of TE1, TA and NT2 functional groups, where these have an I_A interface.

NOTE 5: In annex A, this definition applies with the exception that the NT2 functional grouping is not covered.

Terminal Equipment Type 1 (TE1): This functional group includes functions belonging to the functional group TE, and with an interface that complies with the ISDN UNI standard.

user side: Terminal terminating layer 1 aspects of TE1, TA and NT2 functional groups.

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3.2 Symbols

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

ONE	binary "1"
ZERO	binary "0"

3.3 Abbreviations

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

AIS	Alarm Indication Signal
AMI	Alternate Mark Inversion
CRC	Cyclic Redundancy Check
dc	direct current
EMC	ElectroMagnetic Compatibility
ET	Exchange Termination
FC	Fault Condition
HDB3	High-Density Bipolar 3 (line code)
ISDN	Integrated Service Digital Network
LOS	Loss Of Signal
MPH	Management (entity) - PHysical (layer) [primitive]
MPH-AI	MPH Activate Indication
MPH-EI	MPH Error Indication
MTIE	Maximum Time Interval Error
NOF	Normal Operational Frames
NT	Network Termination
PH	PHysical (layer)
PH-AI	PH - Activate Indication
PH-DI	PH - Deactivate Indication
PNT	Private Network Termination
PRBS	Pseudo-Random Binary Sequence
PTN	Private Telecommunications Network
PTNX	Private Telecommunications Network Exchange
RAI	Remote Alarm Indication
SMF	Sub-MultiFrame
TA	Terminal Adapter
TE	Terminal Equipment
UNI	User Network Interface

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4 Type of configuration

The type of configuration applies only to the layer 1 characteristics of the interface and does not imply any constraints on modes of operation at higher layers.

4.1 Point-to-point

The primary rate shall support only the point-to-point configuration.

Point-to-point configuration at layer 1 implies that for each direction only one source (transmitter) and one sink (receiver) are connected to the interface. The maximum reach of the interface in the point-to-point configuration is limited by specification for the electrical characteristics of transmitted and received pulses and the type of interconnecting cable.

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4.2 Location of interface

The electrical characteristics apply to the interface points I_A and I_B of figure 1.

NOTE: I_A is located at the input and output ports of the TE. I_B is located at the input and output ports of the NT.

Figure 1: Location of interfaces

4.3 Interface wiring

The magnitude of the characteristic impedance of symmetrical type interface cable shall be 120 Ω ± 20 % in a frequency range from 200 kHz to 1 MHz and 120 Ω ± 10 % at 1 MHz.

The use of shielded interface cables may be required to meet radiation emission and immunity requirements. Therefore the Terminal Equipment (TE) and the Network Termination (NT) shall have provided a point on the equipment where a shield of the interface cable can, and if provided shall be connected to.

This point shall be designed respecting EMC requirements providing access to the signal reference for the transmitter and receiver of the equipment interface.

Application of interface cable with individually shielded pairs or with a common shield for both pairs shall be possible.

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4.4 Interface connector

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The interface connector and contact assignments is specified in EN 60603-7 [5] and the contact assignments in table 1. However permanent wiring connections from TE to NT are also permitted.