



**SLOVENSKI STANDARD**  
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**01-december-2003**

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Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH); SDH leased lines; Connection Characteristics

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# ETSI EN 301 165 V1.1.2 (2000-06)

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*European Standard (Telecommunications series)*

**Transmission and Multiplexing (TM);  
Synchronous Digital Hierarchy (SDH);  
SDH leased lines;  
Connection Characteristics**

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# Contents

Intellectual Property Rights .....	4
Foreword .....	4
1 Scope .....	5
2 References .....	6
3 Definitions, symbols and abbreviations .....	7
3.1 Definitions .....	7
3.2 Symbols .....	9
3.3 Abbreviations .....	10
4 Network and terminal interfaces for Virtual Container (VC) leased line connection .....	11
4.1 Section layer functions for Network Termination (NT) and Terminal Equipment (TE) .....	11
4.1.1 STM-1 section layers functions for NT and TE .....	11
4.1.2 STM-4 section layers functions for NT and TE .....	14
4.2 Path layer functions for NT .....	15
4.2.1 Network path layer functions for VC-4 leased line connections .....	15
4.2.2 Network path layer functions for lower order VC leased line connections .....	15
4.3 Path layers functions for TE .....	16
4.3.1 Terminal path layer functions for VC-4 leased line connections .....	16
4.3.2 Terminal path layer functions for lower order VC leased line connections .....	16
4.4 Mechanical characteristics for NT and TE interfaces .....	17
4.4.1 Connectors for the electrical STM-1 interface .....	17
4.4.2 Connectors for optical STM-N interfaces .....	17
4.5 Safety .....	18
4.6 AU/TU numbering scheme .....	18
5 Application of EN 300 417-2-1 .....	18
6 Application of EN 300 417-3-1 .....	20
7 Application of EN 300 417-4-1 .....	22
8 Application of EN 300 417-6-1 .....	28
Bibliography .....	30
History .....	31

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## Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Transmission and Multiplexing (TM).

<b>National transposition dates</b>	
Date of latest announcement of this EN (doa):	30 September 2000
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 March 2001
Date of withdrawal of any conflicting National Standard (dow):	31 March 2001

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# 1 Scope

The present document defines the atomic functions relevant for the interface presentations of Synchronous Digital Hierarchy (SDH) leased lines at the Network Termination Point (NTP) and the Terminal Equipment (TE). It specifies the technical requirements for electrical, optical, regenerator and multiplex section layer and SDH path layers. The specification is presented as a delta information of the equipment specification of:

- EN 300 417-2-1 [8] for STM-1 electrical and optical and STM-4 optical section layer;
- EN 300 417-3-1 [9] for STM-1 and STM-4 regenerator section and multiplex section layer;
- EN 300 417-4-1 [10] for SDH path layers (VC-4, VC-3, VC-2 and VC-12);
- EN 300 417-6-1 [11] for synchronization layer functions.

The following physical section layers are used:

- STM-1 electrical interface;
- STM-1 optical intra-office interface;
- STM-1 optical short haul interfaces at 1 300 nm;
- STM-4 optical intra-office interface;
- STM-4 optical short haul interfaces at 1 300 nm.

The interface margins are defined such, that interconnection of different optical interfaces is possible when an appropriate attenuation is inserted.

A connection is presented via interfaces at NTPs. The present document defines the network interface as presented by the leased line provider and should be used in conjunction with the companion standard, EN 301 164 [5], specifying the connection characteristics between NTPs of the leased line. The present document and the connection characteristic standard together describe the technical characteristics of the leased line.

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 is to ensure that the interface of the terminal equipment is compatible with the SDH leased line interface. The present document is applicable to all interfaces designed for connection to the SDH leased lines.

Customer premises wiring and installation between terminal equipment and the NTP are outside the scope of the present document.

The conformance test of the section and path layer functions will be addressed under work items EN 300 417-x-3 ( $x = 2, 3, 4$  and  $6$ ). Some of the tests described in those ENs 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 extra details concerning the implementation of tests, nor does it include information of any relevant regulations. The present document does not specify the circumstances in which the tests given in EN 300 417-x-3 ( $x = 2, 3, 4$  and  $6$ ) are to be performed.

## 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.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

- [1] EN 60950: "Safety of information technology equipment, including electrical business equipment".
- [2] IEC 60169-8 (1978): "Radio-frequency connectors - Part 8: R.F. coaxial connectors with inner diameter of outer conductor 6.5 mm (0.256 in) with bayonet lock - Characteristic impedance 50  $\Omega$  (Type BNC)".
- [3] IEC 60169-13 (1976): "Radio-frequency connectors - Part 13: R.F. coaxial connectors with inner diameter of outer conductor 5.6 mm (0.22 in) - Characteristic impedance 75  $\Omega$  (Type 1.6/5.6) - Characteristic impedance 50  $\Omega$  (Type 1.8/5.6) with similar mating dimensions".
- [4] 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".
- [5] ETSI EN 301 164: "Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH); SDH leased lines; Connection characteristics".
- [6] ETSI ETS 300 147 (1997): "Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH); Multiplexing structure".
- [7] ETSI EN 300 417-1-1: "Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment; Part 1-1: Generic processes and performance".
- [8] ETSI EN 300 417-2-1: "Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment; Part 2-1: Synchronous Digital Hierarchy (SDH) and Plesiochronous Digital Hierarchy (PDH) physical section layer functions".
- [9] ETSI EN 300 417-3-1: "Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment; Part 3-1: Synchronous Transport Module-N (STM-N) regenerator and multiplex section layer functions".
- [10] ETSI EN 300 417-4-1: "Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment; Part 4-1: Synchronous Digital Hierarchy (SDH) path layer functions".
- [11] ETSI EN 300 417-6-1: "Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment; Part 6-1: Synchronization layer functions".
- [12] ITU-T Recommendation G.825 (1993): "The control of jitter and wander within digital networks which are based on the synchronous digital hierarchy (SDH)".
- [13] 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".
- [14] IEC 60364-5-548 (1996): "Electrical installations of buildings - Part 5: Selection and erection of electrical equipment - Section 548: Earthing arrangements and equipotential bonding for information technology installations".



- [15] ETSI EG 201 212: "Electrical safety; Classification of interfaces for equipment to be connected to telecommunication networks".

## 3 Definitions, symbols and abbreviations

### 3.1 Definitions

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

**process:** generic term for an action or a collection of actions

**function:** "process" defined for digital transmission hierarchies (e.g. Plesiochronous Digital Hierarchy (PDH), Synchronous Digital Hierarchy (SDH)), which acts on a collection of input information to produce a collection of output information. A function is distinguished by the way in which characteristics of the collection, or of members of the collection of output information differ from characteristics of members of the collection of input information

**atomic function:** "function" which if divided into simpler "functions" would cease to be uniquely defined for digital transmission hierarchies. It is therefore indivisible from a network point of view. The following atomic functions are defined in each network layer:

- bi-directional Trail Termination function (...\_TT), Trail Termination Source function (...\_TT\_So), Trail Termination Sink function (...\_TT\_Sk) and Connection function (...\_C);
- between client and server layer networks three adaptation functions are defined: Adaptation Sink function ...\_A\_Sk, Adaptation Source function ...\_A\_So, and the bi-directional Adaptation function ...\_A.

**adaptation function:** "atomic function" which passes a collection of information between layer networks by changing the way in which the collection of information is represented

**trail termination function:** "atomic function" within a layer which generates, adds, and monitors information concerning the integrity and supervision of "adapted information"

**connection function:** "atomic function" within a layer which, if connectivity exists, relays a collection of items of information between groups of atomic functions. It does not modify the members of this collection of items of information although it may terminate any switching protocol information and act upon it. Any connectivity restrictions between inputs and outputs shall be stated

**layer:** concept used to allow the transport network functionality to be described hierarchically as successive levels; each layer being solely concerned with the generation and transfer of its "characteristic information"

**client/server layer:** any two adjacent network layers are associated in a client/server relationship. Each transport network layer provides transport to the layer above and uses transport from the layers below. The layer providing transport is termed a "server", the layer using transport is termed "client"

**Remote Defect Indication (RDI):** signal which conveys the defect status of the characteristic information received by the Trail Termination sink function back to the network element which contains the characteristic information originating trail termination source function.

Examples of RDI signals are the Far End Receive Failure (FERF) bit(s) in SDH signals, the A-bit in ITU-T Recommendation G.704 [13] structured 2 048 kbit/s signals and the alarm indication bit in other PDH multiplex signals

**Remote Error Indication (REI):** signal which conveys either the exact or truncated number of error detection code violations within the characteristic information (as detected by the trail termination sink function) back to the network element which contains the characteristic information originating trail termination source function.

Examples of REI signals are the Far End Block Error (FEBE) bit(s) in SDH signals and the E-bit in ITU-T Recommendation G.704 [13] structured 2 048 kbit/s signals

**all-ONEs:** entire capacity of the adapted or characteristic information is set to logic "1"

**AU-4-AIS:** STM-N signal in which the entire capacity of an Administrative Unit 4 (AU-4) is set to logic "1"

**TU-m-AIS:** STM-N signal in which the entire capacity of a TU-m is set to logic "1"

**Characteristic Information (CI):** signal of specific rate and format which is transferred within and between "sub-networks", and presented to an "adaptation" function for "transport" by the server layer network

**Remote Information (RI):** information flow from sink direction to source direction of the same atomic function in unidirectional representation, containing information to be transported to the remote end, such as RDI and REI

**Access Point (AP):** "reference point" where the output of an "adaptation" source function is bound to the input of a "Trail Termination (TT) source", or where the output of a "trail termination sink" is bound to the input of an "adaptation" sink function. The "access point" is characterized by the adapted client layer "characteristic information" which passes across it. A bi-directional "access point" is formed by an associated contra-directional pair

**Connection Point (CP):** "reference point" where the output of a "trail termination source" or a "connection" is bound to the input of another "connection", or where the output of a "connection" is bound to the input of a "trail termination sink". The "connection point" is characterized by the information, which passes across it. A bi-directional "connection point" is formed by the association of a contra-directional pair

NOTE 1: In the information model the connection point is called Connection Termination Point (CTP).

**Termination Connection Point (TCP):** special case of a "connection point" where a "trail termination" function is bound to an "adaptation" function or a "connection" function

NOTE 2: In the information model the termination connection point is called Trail Termination Point (TTP).

**defect:** density of anomalies has reached a level where the ability to perform a required function has been interrupted. Defects are used as input for performance management, the control of consequent actions, and the determination of fault cause

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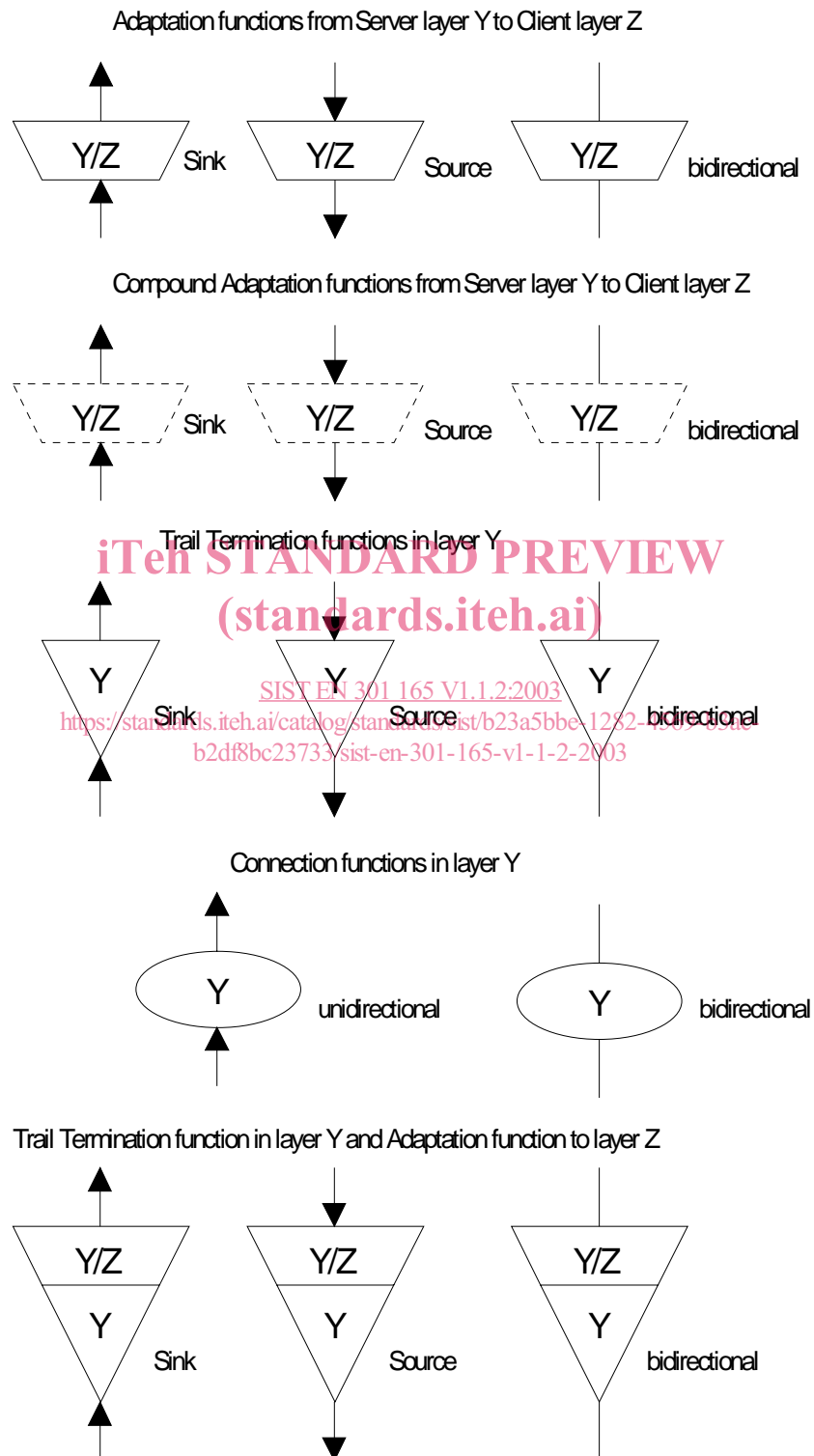
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## 3.2 Symbols

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

The diagrammatic conventions and nomenclature used in the present document for adaptation, termination and connection functions (used to describe the atomic functions) are taken from EN 300 417-1-1 [7] and are shown in Figure 1.



NOTE: If the above symbols are used for generic figures, i.e. not for specific layers, the layer references Y and Z may be omitted. Alternatively, the references may be to the type of function or layer, e.g. supervision, protection.

**Figure 1: Symbols and diagrammatic conventions**

### 3.3 Abbreviations

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

A	Adaptation function
AI	Adapted Information
AIS	Alarm Indication Signal
AP	Access Point
AU	Administrative Unit
AU-n	Administrative Unit, level n
AUG	Administrative Unit Group
C	Connection function
CI	Characteristic Information
CP	Connection Point
CTP	Connection Termination Point
ES	Electrical Section
ES1	STM-1 Electrical Section
FEBE	Far End Block Error
FERF	Far End Receive Failure
I	Informative
LC	Layer Clock
LOF	Loss Of Frame
LOM	Loss Of Multiframe
LOP	Loss Of Pointer
LOS	Loss Of Signal
MS	Multiplex Section
MS1	STM-1 Multiplex Section
MS4	STM-4 Multiplex Section
N	Normative
N/R	Not Relevant
NNI	Network Node Interface
NT	Network Termination Point
NTP	Network Termination Point
OS	Optical Section
OS1	STM-1 Optical Section
OS4	STM-4 Optical Section
PDH	Plesiochronous Digital Hierarchy
PLM	PayLoad Mismatch
RDI	Remote Defect Indication
REI	Remote Error Indication
RI	Remote Information
RS	Regenerator Section
RS1	STM-1 Regenerator Section
RS4	STM-4 Regenerator Section
RSOH	Regenerator Section Overhead
S12	VC-12 path layer
S2	VC-2 path layer
S3	VC-3 path layer
S4	VC-4 path layer
S4/SX	VC-4 path layer to lower order VC path layer
SDH	Synchronous Digital Hierarchy
Sk	Sink
So	Source
SSF	Server Signal Fail
STM	Synchronous Transport Module
STM-N	Synchronous Transport Module, level N
TCP	Termination Connection Point
TE	Terminal Equipment
TI	Timing Information
TSF	Trail Signal Fail