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Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment; Part 5-1: Plesiochronous Digital Hierarchy (PDH) path layer functions

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Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment; Part 5-1: Plesiochronous Digital Hierarchy (PDH) path layer functions

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Foreword

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

The present document is one of a family of documents that has been produced in order to provide inter-vendor and inter-operator compatibility of Synchronous Digital Hierarchy (SDH) equipment.

The present document is part 5-1 of a multi-part EN covering the Generic requirements of transport functionality of equipment, as identified below:

Part 1-1: "Generic processes and performance".

Part 1-2: "General information about Implementation Conformance Statement (ICS) proforma".

Part 1-3 "Generic processes and performance; Abstract Test Suite (ATS)".

Part 2-1: "Synchronous Digital Hierarchy (SDH) and Plesiochronous Digital Hierarchy (PDH) physical section layer functions".

Part 2-2: "Synchronous Digital Hierarchy (SDH) and Plesiochronous Digital Hierarchy (PDH) physical section layer functions; Implementation Conformance Statement (ICS) proforma specification".

Part 2-3: "Synchronous Digital Hierarchy (SDH) and Plesiochronous Digital Hierarchy (PDH) physical section layer functions; Abstract Test Suite (ATS)".

Part 3-1: "Synchronous Transport Module-N (STM-N) regenerator and multiplex section layer functions".

Part 3-2: "Synchronous Transport Module-N (STM-N) regenerator and multiplex section layer functions; Implementation Conformance Statement (ICS) proforma specification".

Part 3-3: "Synchronous Transport Module-N (STM-N) regenerator and multiplex section layer functions; Abstract Test Suite (ATS)".

Part 4-1: "Synchronous Digital Hierarchy (SDH) path layer functions".

Part 4-2: "Synchronous Digital Hierarchy (SDH) path layer functions; Implementation Conformance Statement (ICS) proforma specification".

Part 4-3: "Synchronous Digital Hierarchy (SDH) path layer functions; Abstract Test Suite (ATS)".

Part 5-1: "Plesiochronous Digital Hierarchy (PDH) path layer functions".

Part 5-2: "Plesiochronous Digital Hierarchy (PDH) path layer functions; Implementation Conformance Statement (ICS) proforma specification".

Part 5-3: "Plesiochronous Digital Hierarchy (PDH) path layer functions; Abstract Test Suite (ATS)".

Part 6-1: "Synchronization layer functions".

Part 6-2: "Synchronization layer functions; Implementation Conformance Statement (ICS) proforma specification".

Part 6-3: "Synchronization layer functions; Abstract Test Suite (ATS)".

Part 7-1: "Auxiliary layer functions".

Part 7-2: "Auxiliary layer functions; Implementation Conformance Statement (ICS) proforma specification".

Part 7-3: "Auxiliary layer functions; Abstract Test Suite (ATS)".

Parts 2 to 7 specify the layers and their atomic functions.

NOTE 1: The present document does not currently address configuration management.

NOTE 2: The SDH radio equipment functional blocks are addressed by ETSI WG TM4.

Various of the above parts have previously been published as parts of ETS 300 417.

They have been converted to parts of EN 300 417 without technical changes, but some editorial changes have been necessary (e.g. references). In particular:

- Parts 2-1 and 3-2 have been modified to take account of editorial errors present in edition 1.
- Part 1-1 has had its title change of to align with other parts published at a later date.

Also note that in the meantime parts 8-1, 8-2 and 8-3 have been stopped.

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

Introduction

The atomic PDH path layer functions are defined below used in plesiochronous and synchronous operation. They describe the functionality of PDH multiplex equipments described in the CCITT Recommendations G.751 [6] and G.742 [5] for signal hierarchies P4e, P31e and P22e. In addition they describe the functionality of synchronous PDH equipment described in ETS 300 167 [2] for P12s layer signals, and ETS 300 337 [9] for P31s and P4s signals.

1 Scope

The present document specifies a library of basic building blocks and a set of rules by which they are combined in order to describe a digital transmission equipment. The library comprises the functional building blocks needed to completely specify the generic functional structure of the European digital transmission hierarchy. Equipment which is compliant with the present document can be described as an interconnection of a subset of these functional blocks contained within the present document. The interconnections of these blocks should obey the combination rules given. The generic functionality is described in the EN 300 417-1-1 [8].

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.

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- SIST EN 300 417-5-1 V1.1.2:2003
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- [1] ETS 300 147: "Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH); Multiplexing structure".
 - [2] ETS 300 167: "Transmission and Multiplexing (TM); Functional characteristics of 2 048 kbit/s interfaces".
 - [3] CCITT Recommendation G.703 (1991): "Physical/Electrical characteristics of hierarchical digital interfaces".
 - [4] 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".
 - [5] CCITT Recommendation G.742 (1988): "Second order digital multiplex equipment operating at 8 448 kbit/s and using positive justification".
 - [6] CCITT Recommendation G.751 (1988): "Digital multiplex equipments operating at the third order bit rate of 34 368 kbit/s and the fourth order bit rate of 139 264 kbit/s and using positive justification".
 - [7] ITU-T Recommendation G.823: "The control of jitter and wander within digital networks which are based on the 2 048 kbit/s hierarchy".
 - [8] EN 300 417-1-1: "Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment; Part 1-1: Generic processes and performance".
 - [9] ETS 300 337: "Transmission and Multiplexing (TM); Generic frame structures for the transport of various signals (including Asynchronous Transfer Mode (ATM) cells and Synchronous Digital Hierarchy (SDH) elements) at the ITU-T Recommendation G.702 hierarchical rates of 2 048 kbit/s, 34 368 kbit/s and 139 264 kbit/s".
 - [10] 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] EN 300 417-6-1: "Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment; Part 6-1: Synchronization layer functions".

- [12] EN 301 163: "Transmission and Multiplexing (TM); Generic requirements of Asynchronous Transfer Mode (ATM) transport functionality within equipment".
- [13] ETS 300 166: "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".

3 Definitions, abbreviations and symbols

3.1 Definitions

The functional definitions are described in the EN 300 417-1-1 [8].

3.2 Abbreviations

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

A	Adaptation function
AcSL	Accepted Signal Label
AcTI	Accepted Trace Identifier
AI	Adapted Information
AIS	Alarm Indication Signal
AP	Access Point
APId	Access Point Identifier
ATM	Asynchronous Transfer Mode
Avp	ATM VP layer
BIP	Bit Interleaved Parity
BIP-N	Bit Interleaved Parity, width N
BITS	Building Integrated Timing Supply
C	Connection function
CH	CHannel
CI	Characteristic Information
CK	ClocK
CM	Connection Matrix
CMI	Coded Mark Inversion
Co	Connection
CP	Connection Point
CRC	Cyclic Redundancy Check
CRC-N	Cyclic Redundancy Check, width N
Cs	supervisory-unequipped Connection function
CSES	Consecutive Severely Errored Seconds
CTF	Compound Timing Function
Ctrl	Control
D	Data
DCC	Data Communications Channel
DEC	DECrement
DEG	DEGraded
DEGTHR	DEGraded THReshold
DL	Data Link
DPRING	Dedicated Protection RING
DROP	Decreased Received Optical Power
DXC	Digital Cross Connect
E0	Electrical interface signal 64 kbit/s
E11	Electrical interface signal 1 544 kbit/s
E12	Electrical interface signal 2 048 kbit/s
E22	Electrical interface signal 8 448 kbit/s
E31	Electrical interface signal 34 368 kbit/s

E32	Electrical interface signal 44 736 kbit/s
E4	Electrical interface signal 139 264 kbit/s
EBC	Errored Block Count
EDC	Error Detection Code
EDCV	Error Detection Code Violation
EFS	Equipment Functional Specification
EMF	Equipment Management Function
EQ	EQuipment
Ex	CCITT Recommendation G.703 [3] type Electrical signal, bit rate order x
ExSL	Expected Signal Label
ExTI	Expected Trace Identifier
F_B	Far-end Block
FAS	Frame Alignment Signal
FASE	Frame Alignment Signal Error
FO	Frame Offset information
FOP	Failure Of Protocol
FS	Frame Start signal
HDB3	High Density Bipolar of order 3
HDLC	High-level Data Link Control procedure
HO	Higher Order
HOVC	Higher Order Virtual Container
HP	Higher order Path
ID	IDentifier
IF	In Frame state
INC	INCrement
IOS	Intra-Office Section
IS	Intermediate System
ISDN	Integrated Services Digital Network
ISO	International Standardization Organization
LC	Link Connection
LO	Lower Order
LOF	Loss Of Frame
LOM	Loss Of Multiframe
LOP	Loss Of Pointer
LOS	Loss Of Signal
LOVC	Lower Order Virtual Container
LPx	Lower order Path for VC-x (x = 11, 12, 2, 3)
LT	Line Termination
M&CF	Management & Communication Function
MC	Matrix Connection
MFP	MultiFrame Present
MI	Management Information
MON	MONitored
MP	Management Point
N.C.	Not Connected
N_B	Near-end Block
NC	Network Connection
NCI	No CRC-4 Multiframe Indication
NDF	New Data Flag
NE	Network Element
NMON	Not MONitored
NNI	Network Node Interface
NU	National Use (bits, bytes)
OAM	Operation, Administration and Management
OFS	Out of Frame Second
OOF	Out Of Frame state
OS	Operations System
OS	Optical Section
OSC	OSCillator
OSI(x)	Open Systems Interconnection, layer x

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OW	Order Wire
P	Protection
P0_31c	1 984 kbit/s layer
P0s	64 kbit/s layer (transparent)
P11x	1 544 kbit/s layer (transparent)
P12s	2 048 kbit/s PDH path layer with synchronous 125 µs frame structure as specified in ETS 300 167 [2]
P12x	2 048 kbit/s layer (transparent)
P22e	8 448 kbit/s PDH path layer with 4 plesiochronous 2 048 kbit/s
P22x	8 448 kbit/s layer (transparent)
P31e	34 368 kbit/s PDH path layer with 4 plesiochronous 8 448 kbit/s
P31s	34 368 kbit/s PDH path layer with synchronous 125 µs frame structure as specified in ETS 300 337 [9]
P31x	34 368 kbit/s layer (transparent)
P32x	44 736 kbit/s layer (transparent)
P4e	139 264 kbit/s PDH path layer with 4 plesiochronous 34 368 kbit/s
P4s	139 264 kbit/s PDH path layer with synchronous 125 µs frame structure as specified in ETS 300 337 [9]
P4x	139 264 kbit/s layer (transparent)
PDH	Plesiochronous Digital Hierarchy
PEC	PDH Equipment Clock
PJE	Pointer Justification Event
PLM	PayLoad Mismatch
PM	Performance Monitoring
Pn	Plesiochronous signal, Level n
POH	Path OverHead
PRC	Primary Reference Clock
PS	Protection Switching
PSC	Protection Switch Count
PTR	PoinTeR
PU	PDH Unit
QOS	Quality Of Service
RDI	Remote Defect Indicator
REI	Remote Error Indicator
RI	Remote Information
RLT	Regenerated Line Termination
RNCI	Remote No CRC-4 Multiframe Indication
RP	Remote Point
RS	Regenerator Section
RS1	STM-1 Regenerator Section
RS16	STM-16 Regenerator Section
RS4	STM-4 Regenerator Section
RSOH	Regenerator Section OverHead
RxSL	Received Signal Label
RxTI	Received Trace identifier
SASE	Stand-Alone Synchronization Equipment
SD	synchronization distribution layer, Signal Degrade
SEC	SDH Equipment Clock
SES	Severely Errored Second
SESR	Severely Errored seconds Ratio
SF	Signal Fail
Sk	Sink
SMF	Sub-Multi-Frame
SNC	Sub-Network Connection
SNC/I	Inherently monitored Sub-Network Connection protection
SNC/N	Non-intrusively monitored Sub-Network Connection protection
So	Source
SOH	Section OverHead
SPRING	Shared Protection RING
SSD	Server Signal Degrade

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SSF	Server Signal Fail
SSM	Synchronization Status Message
SSU	Synchronization Supply Unit
TCP	Termination Connection Point
TD	Transmit Degrade
TF	Transmit Fail
TFAS	trail Trace identifier Frame Alignment Signal
TG	Timing Generator
TI	Timing Information
TIM	Trace Identifier Mismatch
TM	Transmission_Medium
TP	Timing Point
TPmode	Termination Point mode
TR	Threshold Report
TS	Time Slot
TSD	Trail Signal Degrade
TSF	Trail Signal Fail
TSL	Trail Signal Label
TT	Trail Termination function
TTI	Trail Trace Identifier
TTP	Trail Termination Point
TTs	Trail Termination supervisory function
TU	Tributary Unit
TUG	Tributary Unit Group
TUG-m	Tributary Unit Group, level m
TU-m	Tributary Unit, level m
TxSL	Transmitted Signal Label
TxTI	Transmitted Trace Identifier
UAS	UnAvailable Second
UNEQ	Unequipped
UNI	User Network Interface
USR	USER channels
UVC	Unequipped VC
VC	Virtual Container
VC-n	Virtual Container, level n
VMR	Violation Monitoring and Removal
VP	Virtual Path
W	Working

3.3 Symbols and Diagrammatic Conventions

The symbols and diagrammatic conventions are described in the EN 300 417-1-1 [8].