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Prenos in multipleksiranje (TM) ï Generiļ ne zahteve za prenosno funkcionalnost opreme ï 3-1. del: Funkcije plasti regeneratorskega in multipleksnega odseka za sinhroni prenosni modul-N (STM-N)

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

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Contents

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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 3-1 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 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 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; Implementaion Conformance Statement (ICS) proforma specification".

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 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 6-1: "Synchronization layer functions".

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

Part 7-1: "Auxiliary layer functions".

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

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

- Parts 2-1, 2-2 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 and 8-2 together will all parts x-3 (Abstract Test Suites) have been stopped.

This version of the present document has been published because the previous version had incorrect dates in the transposition table.

National transposition dates	
Date of latest announcement of this EN (doa):	31 August 1999
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	29 February 2000
Date of withdrawal of any conflicting National Standard (dow):	29 February 2000

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 transport functionality of equipment. The library comprises the functional building blocks needed to completely specify the generic functional structure of the European Transmission Hierarchies. Equipment which is compliant with the present document needs to be describable as an interconnection of a subset of these functional blocks contained within the present document. The interconnections of these blocks need to obey the combination rules given. The generic functionality is described in EN 300 417-1-1 [3].

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] ETS 300 147: "Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH); Multiplexing structure".

[2] 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".

[3] EN 300 417-1-1: "Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment; Part 1-1: Generic processes and performance".

[4] 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".

[5] EN 300 417–6–1: "Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment; Part 6-1: Synchronization distribution layer functions".

[6] ETS 300 746: "Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH); Network protection schemes; Automatic Protection Switch (APS) protocols and operation".

[7] ITU-T Recommendation G.783: "Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks".

3 Definitions, abbreviations and symbols

3.1 Definitions

The functional definitions are described in EN 300 417-1-1 [3].

3.2 Abbreviations

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

A	Adaptation function
AcTI	Accepted Trace Identifier
ADM	Add-Drop Multiplexer
AI	Adapted Information
AIS	Alarm Indication Signal
AP	Access Point
APId	Access Point Identifier
APS	Automatic Protection Switch
AU	Administrative Unit
AUG	Administrative Unit Group
AU-n	Administrative Unit, level n
BER	Bit Error Ratio
BIP	Bit Interleaved Parity
BIP-N	Bit Interleaved Parity, width N
C	Connection function
CI	Characteristic Information
CK	ClocK
CM	Connection Matrix
CP	Connection Point
CS	Clock Source
D	Data
DCC	Data Communications Channel
DEC	DECrement
DEG	DEGraded
DEGTHR	DEGraded THReshold
EBC	Errored Block Count
ECC	Embedded Communications Channel
ECC(x)	Embedded Communications Channel, layer x
EDC	Error Detection Code
EDCV	Error Detection Code Violation
EMF	Equipment Management Function
EQ	EQuipment
ES	Electrical Section
ES	Errored Second
ExTI	Expected Trace Identifier
F_B	Far-end Block
FAS	Frame Alignment Signal
FOP	Failure Of Protocol
FS	Frame Start signal
HO	Higher Order
HOVC	Higher Order Virtual Container
HP	Higher order Path
ID	IDentifier
IF	In Frame state
INC	INCrement
INV	INValid
LC	Link Connection
LO	Lower Order

LOA	Loss Of Alignment; generic for LOF, LOM, LOP
LOF	Loss Of Frame
LOP	Loss Of Pointer
LOS	Loss Of Signal
LOVC	Lower Order Virtual Container
MC	Matrix Connection
MCF	Message Communications Function
MDT	Mean Down Time
mei	maintenance event information
MI	Management Information
MO	Managed Object
MON	MONitored
MP	Management Point
MS	Multiplex Section
MS1	STM-1 Multiplex Section
MS16	STM-16 Multiplex Section
MS4	STM-4 Multiplex Section
MSB	Most Significant Bit
MSOH	Multiplex Section OverHead
MSP	Multiplex Section Protection
MSPG	Multiplex Section Protection Group
NC	Not Connected
N_B	Near-end Block
NC	Network Connection
NDF	New Data Flag
NE	Network Element
NMON	Not MONitored
NNI	Network Node Interface
NU	National Use (bits, bytes)
NUx	National Use, bit rate order x
OAM	Operation, Administration and Maintenance
OFS	Out of Frame Second
OOF	Out Of Frame state
OS	Optical Section
OSI(x)	Open Systems Interconnection, layer x
OW	Order Wire
P	Protection
P_A	Protection Adaptation
P_C	Protection Connection
P_TT	Protection Trail Termination
PDH	Plesiochronous Digital Hierarchy
PJE	Pointer Justification Event
PM	Performance Monitoring
Pn	Plesiochronous signal, level n
POH	Path OverHead
PRC	Primary Reference Clock
PS	Protection Switching
PSC	Protection Switch Count
PTR	PoinTeR
QOS	Quality Of Service
RDI	Remote Defect Indication
REI	Remote Error Indication
RI	Remote Information
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
RxTI	Received Trace Identifier

S4	VC-4 path layer
SASE	Stand-Alone Synchronization Equipment
SD	Synchronization Distribution layer, Signal Degrade
SDH	Synchronous Digital Hierarchy
SEC	SDH Equipment Clock
SF	Signal Fail
Sk	Sink
SNC	Sub-Network Connection
SNC/I	Inherently monitored Sub-Network Connection protection
SNC/N	Non-intrusively monitored Sub-Network Connection protection
SNC/S	Sublayer monitored Sub-Network Connection protection
So	Source
SOH	Section OverHead
SPRING	Shared Protection RING
SR	Selected Reference
SSD	Server Signal Degrade
SSF	Server Signal Fail
SSM	Synchronization Status Message
SSU	Synchronization Supply Unit
STM	Synchronous Transport Module
STM-N	Synchronous Transport Module, level N
TCP	Termination Connection Point
TI	Timing Information
TIM	Trace Identifier Mismatch
TM	Transmission_Medium
TMN	Telecommunications Management Network
TP	Timing Point
TPmode	Termination Point mode
TS	Time Slot
TSD	Trail Signal Degrade
TSF	Trail Signal Fail
TT	Trail Termination function
TTI	Trail Trace Identifier
TTs	Trail Termination supervisory function
TxTI	Transmitted Trace Identifier
UNEQ	UNEQuipped
UNI	User Network Interface
USR	USeR channels
V0	64 kbit/s contradirectional data layer
VC	Virtual Container
VC-n	Virtual Container, level-n
W	Working

3.3 Symbols and Diagrammatic Conventions

The symbols and diagrammatic conventions are described in EN 300 417-1-1 [3].

3.4 Introduction

The atomic functions defining the regenerator and multiplex section layers are described below (clause 4 onwards).

4 STM-1 Regenerator Section Layer Functions

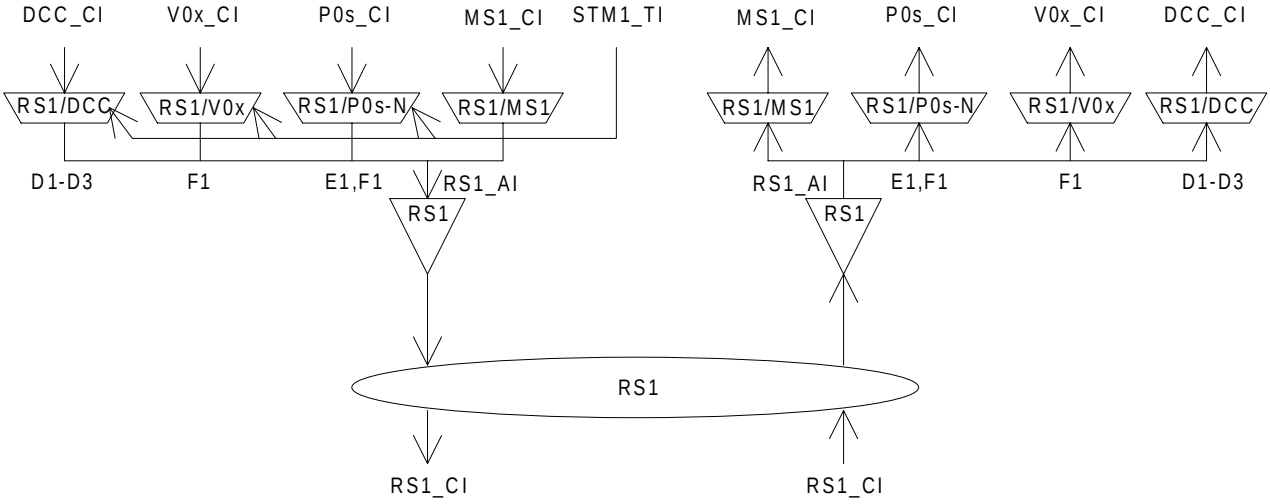

Figure 1: STM-1 Regenerator Section atomic functions

RS1 Layer CP

The CI at this point is an octet structured, 125 µs framed data stream with co-directional timing. It is the entire STM-1 signal as defined in ETS 300 147 [1]. Figure 2 depicts only bytes handled in the RS1 layer.

NOTE 1: The unmarked bytes [2, 6], [3, 6], [3, 8], [3, 9] in rows 2,3 (figure 2) are reserved for future international standardization. Currently, they are undefined.

NOTE 2: The unmarked bytes [2, 2], [2, 3], [2, 5], [3, 2], [3, 3], [3, 5] in rows 2,3 (figure 2) are reserved for media specific usage (e.g. radio sections). In optical and electrical section applications they are undefined.

NOTE 3: The bytes for National Use (NU) in rows 1,2 (figure 2) are reserved for operator specific usage. Their processing is not within the province of the present document. If NU bytes [1, 8] and [1, 9] are unused, care should be taken in selecting the binary content of the bytes which are excluded from the scrambling process of the STM-N signal to ensure that long sequences of "1"s or "0"s do not occur.

	1	2	3	4	5	6	7	8	9	10	....	270
1	A1	A1	A1	A2	A2	A2	J0	NU	NU			
2	B1			E1			F1	NU	NU			
3	D1			D2			D3					
4												
5												
6											MS1_CI	
7												
8												
9												

Figure 2: RS1_CI_D signal

RS1 Layer AP

The AI at this point is octet structured and 125 µs framed with co-directional timing and represents the combination of adapted information from the MS1 layer (2 403 bytes per frame), the management communication DCC layer (3 bytes per frame if supported), the OW layer (1 byte per frame if supported) and the user channel F1 (1 byte per frame if supported). The location of these four components in the frame is defined in ETS 300 147 [1] and depicted in figure 3.

NOTE 4: Bytes E1, F1 and D1-D3 will be undefined when the adaptation functions sourcing these bytes are not present in the network element.