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Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment; Part 3-2: Synchronous Transport Module-N (STM-N) regenerator and multiplex section layer functions Implementaion Conformance Statement (ICS) proforma specification

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Foreword

This final draft European Telecommunication Standard (ETS) has been produced by the Transmission and Multiplexing (TM) Technical Committee of the European Telecommunications Standards Institute (ETSI), and is now submitted for the Voting phase of the ETSI standards approval procedure.

This ETS provides the Implementation Conformance Statement (ICS) proforma specification to be used in connection with conformance/approval testing of Synchronous Digital Hierarchy (SDH) equipment. It is one of a family of ETSs covering various aspects of SDH equipment standards.

The ICS proforma specification will ultimately consist of 8 sub-parts of ETS 300 417, numbered 1-2 to 8-2, each of which will correspond to sub-parts 1-1 to 8-1 of ETS 300 417, respectively. The ICS sub-parts are:

Part 1-2: ETS 300 417-1-2: "General information about Implementation Conformance Statement (ICS) proforma specification";

Part 2-2: ETS 300 417-2-2: "SDH and PDH Physical section layer functions Implementation Conformance Statement (ICS) proforma specification";

Part 3-2: ETS 300 417-3-2: "STM-N regenerator and multiplex section layer functions Implementation Conformance Statement (ICS) proforma specification";

Part 4-2: ETS 300 417-4-2: "SDH path layer functions Implementation Conformance Statement (ICS) proforma specification";

Part 5-2: ETS 300 417-5-2: "PDH path layer functions Implementation Conformance Statement (ICS) proforma specification";

Part 6-2: ETS 300 417-6-2: "Synchronization layer functions Implementation Conformance Statement (ICS) proforma specification";

Part 7-2: ETS 300 417-7-2: "Auxiliary layer functions Implementation Conformance Statement (ICS) proforma specification";

Part 8-2: ETS 300 417-8-2: "Major compound functions, Implementation Conformance Statement (ICS) proforma specification".

Proposed transposition dates	
Date of latest announcement of this ETS (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this ETS (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	6 months after doa

Introduction

To evaluate conformance of a particular implementation, it is necessary to have a statement of which capabilities and options have been implemented for a telecommunication specification. Such a statement is called an Implementation Conformance Statement (ICS).

A client of a test laboratory who requests a conformance/approval test shall provide to the test laboratory a completed ICS proforma for each layer to be tested and a detailed system description of the implementation.

The ICS proforma is not another complete description of the related specification, but rather a compact form of its static conformance requirements, to be used by the test laboratory to identify which test shall be performed on a given implementation. Not every feature of a profile specification is contained in the related ICS proforma. For particular cases requiring specific information the ICS can refer to the appropriate clause of the related specification by means of references, notes and or comments.

The ICS proforma captures the implementation flexibility allowed by the related specification and details which option are left to the implementor, which are conditionally dependent on other option taken by the implementor.

1 Scope

This European Telecommunication Standard (ETS) provides the Implementation Conformance Statement (ICS) proforma specification for the Synchronous Transport Module-1 (STM-1), STM-4 and STM-16 regenerator section and multiplex section layer functions defined in ETS 300 417-3-1 [2] in compliance with the relevant requirements, and in accordance with the relevant guidance given in ISO/IEC 9646-7 [7] and ETS 300 406 [3].

2 Normative references

This ETS incorporates by dated and 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 apply to this ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

[1] ETS 300 417-1-1 (1996): "Transmission and Multiplexing (TM); Generic functional requirements for SDH equipment; Generic processes and performance".

[2] ETS 300 417-3-1 (1997): "Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment; STM-N regenerator and multiplex section layer functions".

[3] ETS 300 406 (1995): "Methods for testing and Specification (MTS); Protocol and profile conformance testing specifications; Standardization methodology".

[4] ETS 300 232: "Transmission and Multiplexing (TM); Optical interfaces for equipments and systems relating to the Synchronous Digital Hierarchy [ITU-T Recommendation G.957 (1993) modified]".

[5] ITU-T Recommendation G.957 (1993): "Optical interfaces for equipments and systems relating to the synchronous digital hierarchy".

[6] ISO/IEC 9646-1 (1994): "Information technology - Open systems interconnection - Conformance testing methodology and framework - Part 1: General concepts".

[7] ISO/IEC 9646-7 (1995): "Information technology - Open systems interconnection - Conformance testing methodology and framework - Part 7: Implementation Conformance Statements".

[8] ETS 300 147 (1993): "Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH); Multiplexing structure".

[9] CCITT Recommendation G.704 (1991): "Synchronous frame structures used at primary and secondary hierarchical levels".

[10] CCITT Recommendation G.751 (1988): "Digital multiplex equipments operating at third order bit rate of 34 368 kbit/s and fourth order bit rate of 139 264 kbit/s and using positive justification".

[11] ITU-T Recommendation G.823 (1993): "The control of jitter and wander within digital networks which are based on the 2 048 kbit/s hierarchy".

[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.826 (1993): "Error performance parameters and objectives for international, constant bit rate digital paths at or above the primary rate".

[14] ITU-T Recommendation G.707 (1996): "Network node interface for the Synchronous Digital Hierarchy".

[15] ETS 300 746 (1997): "Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH); Network protection schemes; Automatic Protection Switch (APS) protocols and operation".

[16] TS 101 009: "Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH); Network Protection schemes; Types and characteristics".

[17] ETS 300 417-2-2 (1997): "Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment; Part 2-2: Synchronous Digital Hierarchy (SDH) and Plesiochronous Digital Hierarchy (PDH) physical section layer functions Implementation Conformance Statement (ICS) proforma specification".

3 Definitions and abbreviations

3.1 Definitions

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

- terms defined in ETS 300 417-3-1 [2];
- terms defined in ISO/IEC 9646-1 [6] and in ISO/IEC 9646-7 [7].

In particular, the following terms defined in ISO/IEC 9646-1 [6] apply:

Implementation Conformance Statement (ICS): A statement made by the supplier of an implementation or system claimed to conform to a given specification, stating which capabilities have been implemented. The ICS can take several forms: protocol ICS, profile ICS, profile specific ICS, information object ICS, etc.

ICS proforma: A document, in the form of a questionnaire, which when completed for an implementation or system becomes an ICS.

3.2 Abbreviations

For the purposes of this ETS, 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 Rate
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	EDC Violation
EMF	Equipment Management Function (EMF)
EQ	EQuipment
ERSN	External Request Signal Number
ERT	External Request Type
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

GRSN	Global Request Signal Number
GRT	Global Request Type
HO	Higher Order
HOVC	Higher Order Virtual Container
HP	Higher order Path
ICS	Implementation Conformance Statement
ID	IDentifier
IF	In Frame state
INC	INCrement
IUT	Implementation Under Test
LBSN	Local Bridge Signal Number
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
LRSN	Local Request Signal Number
LRT	Local Request Type
LSSN	Local Selector Signal Number
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
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 Management
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
RARCH	Remote ARCHitecture type
RBSN	Remote Bridge Signal Number
RDI	Remote Defect Indicator
REI	Remote Error Indicator
RI	Remote Information
RP	Remote Point
RRSN	Remote Request Signal Number
RRT	Remote Request Type
RS	Regenerator Section
RS1	STM-1 Regenerator Section
RS4	STM-4 Regenerator Section
RS16	STM-16 Regenerator Section
RSOH	Regenerator Section OverHead
RxTI	Received Trace Identifier
S4	VC-4 path layer
SASE	Stand-Alone Synchronization Equipment
SCS	System Conformance Statement
SD	Synchronization Distribution layer, Signal Degrade
SDH	Synchronous Digital Hierarchy
SEC	SDH Equipment Clock
SF	Signal Fail
Sk	Sink
So	Source
SOH	Section OverHead
SPRING	Shared Protection Ring
SR	Selected Reference
SRSN	Signal Request Signal Number
SRT	Signal Request Type
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
SUT	System Under Test
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
VC	Virtual Container
VC-n	Virtual Container, level n
W	Working
WTR	Wait-To-Restore

4 Conformance to this ICS proforma specification

If it claims to conform to this ETS, the actual ICS proforma to be filled in by a supplier shall be technically equivalent to the text of the ICS proforma given in the annexes of this ETS, and shall preserve the numbering/naming and ordering of the proforma items.

An ICS which conforms to this ETS shall be a conforming ICS proforma completed in accordance with the instructions for completion given in clause A.1.

For each layer instance, it is needed to fill a separate ICS Proforma depending on the layer instance.

Annex A (normative): ICS proforma for ETS 300 417-3-1

A.1 Guidance for completing the ICS proforma

A.1.1 Purposes and structure

The purpose of this ICS proforma is to provide a mechanism whereby a supplier of an implementation of the requirements defined in ETS 300 417-3-1 [2] may provide information about the implementation in a standardized manner.

The ICS proforma is subdivided into subclauses for the following categories of information:

- instructions for completing the ICS proforma;
- identification of the implementation;
- identification of the ETS;
- global statement of conformance.

A.1.2 Abbreviations and conventions

The ICS proforma contained in this annex is comprised of information in tabular form in accordance with the guidelines presented in ISO/IEC 9646-7 [7].

Item column

The item column contains a number which identifies the item in the table.

Item description column

The item description column describes in free text each respective item (e.g. parameters, timers, etc.). It implicitly means "is <item description> supported by the implementation?".

Status column

The following notations, defined in ISO/IEC 9646-7 [7], are used for the status column:

m	mandatory - the capability is required to be supported.
o	optional - the capability may be supported or not.
n/a	not applicable - in the given context, it is impossible to use the capability.
x	prohibited (excluded) - there is a requirement not to use this capability in the given context.
o.i	qualified optional - for mutually exclusive or selectable options from a set. "i" is an integer which identifies an unique group of related optional items and the logic of their selection which is defined immediately following the table.
ci	conditional - the requirement on the capability ("m", "o", "x" or "n/a") depends on the support of other optional or conditional items. "i" is an integer identifying an unique conditional status expression which is defined immediately following the table. For nested conditional expressions, the syntax "IF ... THEN (IF ... THEN ... ELSE...) ELSE ..." shall be used to avoid ambiguities.

Reference column

The reference column gives reference to ETS 300 417-3-1 [2], except where explicitly stated otherwise.

Support column

The support column shall be filled in by the supplier of the implementation. The following common notations, defined in ISO/IEC 9646-7 [7], are used for the support column:

Y or y	supported by the implementation.
N or n	not supported by the implementation.
N/A, n/a or -	no answer required (allowed only if the status is n/a, directly or after evaluation of a conditional status).

If this ICS proforma is completed in order to describe a multiple-profile support in a system, it is necessary to be able to answer that a capability is supported for one profile and not supported for another. In that case, the supplier shall enter the unique reference to a conditional expression, preceded by "?" (e.g. ?3). This expression shall be given in the cell provided at the bottom of the table. It uses predicates defined in the SCS, each of which refers to a single profile and which takes the value TRUE if and only if that profile is to be used.

EXAMPLE: ?3: IF prof1 THEN Y ELSE N

It is also possible to provide a comment to an answer in the space provided at the bottom of the table.

Values allowed column

The values allowed column contains the values or the ranges of values allowed.

Values supported column

The values supported column shall be filled in by the supplier of the implementation. In this column, the values or the ranges of values supported by the implementation shall be indicated.

Mnemonic column

The mnemonic column contains mnemonic identifiers for each item.

References to items

For each possible item answer (answer in the support column) within the ICS proforma exists a unique reference, used, for example, in the conditional expressions. It is defined as the table identifier, followed by a solidus character "/", followed by the item number in the table. If there is more than one support column in a table, the columns shall be discriminated by letters (a, b, etc.), respectively.

EXAMPLE 1: C.5/4 is the reference to the answer of item 4 in table 5 of annex C.

EXAMPLE 2: C.6/3b is the reference to the second answer (i.e. in the second support column) of item 3b in table 6 of annex C.

Prerequisite line
A prerequisite line takes the form: Prerequisite: <predicate>.

A prerequisite line after a clause or table title indicates that the whole clause or the whole table is not required to be completed if the predicate is FALSE.

A.1.3 Instructions for completing the ICS proforma

The supplier of the implementation shall complete the ICS proforma in each of the spaces provided. However, the tables containing in "user role" subclause shall only be completed for user implementations, and the tables containing in "network role" subclause shall only be completed for network implementations. If necessary, the supplier may provide additional comments separately.

More detailed instructions are given at the beginning of the different subclauses of the ICS proforma.

Annex B (normative): ICS proforma for STM-1 regenerator section layer

B.1 Identification of the implementation

In this ETS, an Implementation Under Test (IUT), and of course the identification of an IUT refers to an STM-1 Regenerator Section (RS1) layer instance implemented inside the System Under Test (SUT).

Identification of the IUT and the SUT in which it resides should be filled in so as to provide as much detail as possible regarding version numbers and configuration options.

The product supplier information and client information should both be filled in if they are different.

A person who can answer queries regarding information supplied in the ICS should be named as the contact person.

B.1.1 Date of the statement

.....

B.1.2 Implementation Under Test (IUT) identification

IUT name:

.....

.....

IUT version

Hardware version:

.....

.....

Software version:

.....

.....

Firmware version:

.....

.....

B.1.3 System Under Test (SUT) identification

SUT name:

.....

.....

Hardware configuration:

.....

.....

SUT Software version:

.....

.....

SUT Firmware version:

.....

Operating system:

.....

.....

B.1.4 Product supplier

Name:

.....

Address:

.....

.....

.....

Telephone number:

.....

Facsimile number:

.....

E-mail address:

.....

Additional information:

.....

.....

B.1.5 Client

Name:

.....

Address:

.....

.....

.....

Telephone number:

.....

Facsimile number:

.....

E-mail address:

.....

Additional information:

.....

.....

.....

B.1.6 ICS contact person

Name:

.....

Telephone number:

.....

Facsimile number:

.....

E-mail address:

.....

Additional information:

.....

.....

B.2 Identification of the ETS

This ICS proforma applies to the following standard:

ETS 300 417-3-1 [2]: "Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment: STM-N regenerator and multiplex section layer functions".

B.3 Global statement of conformance of STM-1 Regenerator Section (RS1) layer

Are all mandatory capabilities implemented (Yes/No) .....

NOTE: Answering "No" to this question indicates non-conformance to the ETS specification. Non-supported mandatory capabilities are to be identified in the ICS, with an explanation of why the implementation is non-conforming, on pages attached to the ICS proforma.

Answering "Yes" to this question indicates only that all the capabilities with the explicit status "m" are supported. It is not necessary to fill in the support column of the associated item.

B.4 RS1 Layer function

B.4.1 RS1 layer description

Table B.1: RS1 layer functions

Item	RS1 layer	Reference	Status	Support
1	Regenerator section connection function (RS1_C)	4, figure 1	o	
2	Regenerator section trail termination source function (RS1_TT_So)	4, figure 1	o.101	
3	Regenerator section trail termination sink function (RS1_TT_Sk)	4, figure 1	o.101	
4	Regenerator Section to MS1 Layer Adaptation Source function (RS1/MS1_A_So)	4, figure 1	c101	
5	Regenerator Section to MS1 Layer Adaptation Sink function (RS1/MS1_A_Sk)	4, figure 1	c102	
6	Regenerator Section to DCC Layer Adaptation Source function (RS1/DCC_A_So)	4, figure 1	c103	
7	Regenerator Section to DCC Layer Adaptation Sink function (RS1/DCC_A_Sk)	4, figure 1	c104	
8	Regenerator Section to P0sP0s Layer Adaptation Source function (RS1/P0s_A_So-N)	4, figure 1	c103	
9	Regenerator Section to P0s Layer Adaptation Sink function (RS1/P0s_A_Sk-N)	4, figure 1	c104	
10	Regenerator Section to V0x Layer Adaptation Source function (RS1/V0x_A_So)	4, figure 1	c103	
11	Regenerator Section to V0x Layer Adaptation Sink function (RS1/V0x_A_Sk)	4, figure 1	c104	
12	This RS1 layer is part of an SDH Regenerator equipment.	ETS 300 417-2-2 [17] table B.1/1	o	

o.101: It is mandatory to support at least one of these items -- at least one TT function present
c101: IF B.1/2 THEN m ELSE x -- a TT_So function should exist for A_So function
c102: IF B.1/3 THEN m ELSE x -- a TT_Sk function should exist for A_Sk function
c103: IF B.1/2 THEN o ELSE x -- a TT_So function should exist for A_So function
c104: IF B.1/3 THEN o ELSE x -- a TT_Sk function should exist for A_Sk function

Comment: for a bi-directional layer both TT_So and TT_Sk functions are present, for a unidirectional layer just one of them can be present.
Item B.1/12 is the same as the one given in the reference column.

Table B.2: Supervision processes

Item	Supervision process	Reference	Status	Support
1	Performance monitoring process	ETS 300-417-1-1 [1] subclauses 8.2-8.4	c201	
2	Defect correlation process	ETS 300-417-1-1 [1] subclauses 8.2-8.3	c201	

c201: IF B.1/3 THEN m ELSE n/a -- RS1_TT_Sk present

B.4.2 RS1 layer transmission tables

Table B.3: Data stream structure

Item	Data stream structure	Reference	Status	Support
1	The CI at the RS1 connection point is octet structured and 125 µs framed with co-directional timing.	4	m	
2	The RS1_CI is a fully formatted STM-1 data stream.	4	m	
3	Regenerator Section OverHead (RS-OH) bytes are placed in rows 1 to 3 of columns 1 to 9 of the STM-1 frame.	4, figure 2	m	

B.4.2.1 RS1 connection function: RS1_C

Table B.4: Connection functionalities

Prerequisite: B.1/1 -- RS1_C present

Item	Connection functionalities	Reference	Status	Support
1	For further study	4.1	n/a	

B.4.2.2 STM-1 regenerator section layer trail termination functions: RS1_TT_So and RS1_TT_Sk

B.4.2.2.1 Frame alignment signal

Table B.5: Frame Alignment Signal (FAS) byte location

Item	Frame Alignment Signal (FAS) byte location	Reference	Status	Support
1	The FAS is located in A1(1,1), A1(1,2), A1(1,3), A2(1,4), A2(1,5), A2(1,6) of the STM-1 frame.	4.2.1, G.707 [14] subclause 9.2.2.1	m	

Table B.6: FAS byte structure

Item	Frame Alignment Signal (FAS) byte structure	Reference	Status	Support
1	A1 byte is coded '1111 0110' and A2 byte is coded'0010 1000'.	G.707 [14] subclause 9.2.2.1	m	

B.4.2.2.2 FAS generation

Table B.7: FAS insertion

Prerequisite: B.1/2 -- RS1_TT_So present

Item	Frame Alignment Signal (FAS) insertion	Reference	Status	Support
1	The RS1_TT_So inserts the STM-1 FAS A1A1A1A2A2A2 into the RSOH.	4.2.1, G.707 [14] subclause 9.2.2.1	m	

B.4.2.2.3 Signal scrambling/descrambling

Table B.8: Scrambling/descrambling: principles

Item	Scrambling/descrambling: principles	Reference	Status	Support
1	The operation of the scrambler/ descrambler is functionally identical to that of a frame synchronous scrambler/ descrambler of sequence length 127 operating at the line rate.	4.2.1, 4.2.2	m	
2	The generating polynomial is $1 + X^6 + X^7$	4.2.1, 4.2.2	m	

Table B.9: Scrambling process

Prerequisite: B.1/2 -- RS1_TT_So present

Item	Scrambling process	Reference	Status	Support
1	The scrambler is reset to '1111 1111' on the Most Significant Bit (MSB) of the byte (1,10) following the last byte of the STM-1 SOH in the first row.	4.2.1	m	
2	This bit and all subsequent bits to be scrambled are modulo 2 added to the output of the X^7position of the scrambler.	4.2.1	m	
3	The scrambler runs continuously throughout the remaining STM-1 frame	4.2.1	m	

Table B. 10: Descrambling process

Prerequisite: B.1/3 -- RS1_TT_Sk function present

Item	Descrambling process	Reference	Status	Support
1	The RS1_TT_Sk descrambles the incoming STM-1 signal except the first row of the RSOH.	4.2.2	m	

B.4.2.2.4 In service error monitoring process

Table B.11: In service error monitoring: principles

Item	In service error monitoring: principles	Reference	Status	Support
1	An Error Detection Code (EDC) is part of the characteristic information for in service error monitoring	ETS 300-417-1-1 [1] subclause 7.3	m	
2	In service error monitoring parameter definition is block-based.	G.707 [14] subclause 9.2.2.4 note	m	
3	The block length is 2 430 bytes, corresponding to the STM-1 frame structure.		m	
4	The error monitoring is performed using Bit Interleaved Parity 8 (BIP-8).	4.2.1, G.707 [14] subclause 9.2.2.4	m	
5	The BIP-8 is calculated using even parity in such a manner that the bit in position x provides even parity over the x-bits of all the 8-bits sequences within the specified block.	G.707 [14] subclause 9.2.2.4 note	m	

Comments: The BIP-n is interpreted as checking 'n' separate interleaved parity check blocks. If any of the 'n' parity check fails (EDC Violation (EDCV)), the block is assumed to be in error.

Table B.12: EDC location

Item	Error Detection Code (EDC) location	Reference	Status	Support
1	Regenerator Section EDC is located in byte B1(2,1) of the STM-1 frame.	4.2.1	m	

Table B.13: EDC processing: source direction

Prerequisite: B.1/2 -- RS1_TT_So present

Item	Error Detection Code (EDC) processing: source direction	Reference	Status	Support
1	The BIP-8 is calculated over all bits of the previous STM-1 frame after scrambling.	4.2.1	m	
2	BIP-8 code is inserted in B1 byte of the current STM-1 frame before scrambling.	4.2.1	m	

Table B.14: EDC processing: sink direction

Prerequisite: B.1/3 -- RS1_TT_Sk function present

Item	Error Detection Code (EDC) processing: sink direction	Reference	Status	Support
1	The incoming error monitoring byte B1 is recovered from the STM-1 signal after descrambling.	4.2.2	m	
2	The BIP-8 is calculated over all bits of the previous STM-1 frame before descrambling.	4.2.2	m	
3	Recovered B1 byte is compared with the calculated BIP-8.	4.2.2	m	
4	A difference between the computed and recovered B1 value is taken as evidence of one or more errors (nN_B) in the computation block.	4.2.2	m	

B.4.2.2.5 Trail Trace Identifier (TTI)

Table B.15: Trail Trace Identifier (TTI): principles

Item	Trail Trace Identifier (TTI): principles	Reference	Status	Support
1	A Trail Trace Identifier (TTI) is inserted by the termination source containing the local Access Point Identifier (APId) and TTI header (TxTI).	4.2.1, ETS 300-417-1-1 [1] subclause 7.1	c1501	
2	The content of the accepted TTI (AcTI) is compared by the trail termination sink function with the provisioned "expected TTI" (ExTI), identifying the expected remote AP.	4.2.2, ETS 300-417-1-1 [1] subclauses 7.1and 8.2.1.3	c1502	

c1501: IF B.1/2 THEN m ELSE n/a -- RS1_TT_So present
c1502: IF B.1/3 THEN m ELSE n/a -- RS1_TT_Sk present

Table B.16: Trail Trace Identifier (TTI) byte location

Item	Trail Trace Identifier (TTI) byte location	Reference	Status	Support
1	The Regenerator Section Trail trace Identifier (TTI) is located in byte J0(1,7) of the STM-1 frame.	4.2.1	m	

Table B.17: Trail Trace Identifier (TTI) byte structure

Item	Trail Trace Identifier (TTI) byte structure	Reference	Status	Support
1	The RS TTI is a 16 byte string containing the 15 byte APId and a 1 byte header. The MSB of the header is a "1", the remaining 9 bits contain the CRC-7 value of the RS TTI. The MSB of the 15 APId bytes is "0".	ETS 300-417-1-1 [1] subclause 7.1	m	
2	The CRC-7 word is the remainder after multiplication by x^7 and then division (modulo 2) by the generator polynomial $x^7 + x^3 + 1$, of the polynomial representation of the RS TTI with the CRC bits set to binary zeroes.	ETS 300-417-1-1 [1] subclause 7.1	m	
3	The 16 byte RS TxTI, is transferred via the Management Point to and from the trail termination function.	ETS 300-417-1-1 [1] subclause 8.2.1.3	c1701	
4	The 16 byte RS ExTI and 16 byte RS AcTI are transferred via the Management Point to and from the trail termination function.	ETS 300-417-1-1 [1] subclause 8.2.1.3	c1702	

c1701: IF B.1/2 THEN m ELSE n/a -- RS1_TT_So present
c1702: IF B.1/3 THEN m ELSE n/a -- RS1_TT_Sk present

Table B.18: Trail Trace Identification: source direction

Prerequisite: B.1/2 -- RS1_TT_So present

Item	Trail Trace identification: source direction	Reference	Status	Support
1	The 16 byte RS TTI is transmitted continuously.	ETS 300-417-1-1 [1] subclause 7.1	m	

Table B.19: Trail Trace identification: sink direction

Prerequisite: B.1/3 -- RS1_TT_Sk present

Item	Trail Trace Identification: sink direction	Reference	Status	Support
1	The RS1_TT_Sk supports mode 1	ETS 300-417-1-1 [1] subclause 7.1	m	
2	The RS1_TT_Sk supports mode 2	ETS 300-417-1-1 [1] subclause 7.1	m	
3	The TTI mode is provisionable by the EMF.	4.2.2	m	
4	The RS1_TT_Sk recovers the 16 byte multiframe carried in byte J0 and assumes it as Received Trail Trace Identifier (RxTI). The RxTI is made available as AcTI for network management purposes.	4.2.2	m	

B.4.2.3 RS1 layer to MS1 Layer adaptation functions: RS1/MS1_A_So and RS1/MS1_A_Sk

B.4.2.3.1 RS1 layer to STM-1 Multiplex Section (MS1) layer multiplexing and demultiplexing processes

Table B.20: Multiplexing

Prerequisite: B.1/4 -- RS1/MS1_A_So present

Item	Multiplexing	Reference	Status	Support
1	The RS1/MS1_A_So function multiplexes the MS1_CI data (2 403 bytes/frame) into the STM-1 frame.	4.3.1	m	

Table B.21: Demultiplexing

Prerequisite: B.1/5 -- RS1/MS1_A_Sk present

Item	Demultiplexing	Reference	Status	Support
1	The RS1/MS1_A_Sk recovers the MS1_CI data from the STM-1 frame.	4.3.2	m	

B.4.2.4 RS1 layer to DCC Layer adaptation functions: RS1/DCC_A_So and RS1/DCC_A_Sk

B.4.2.4.1 RS1 layer to DCC layer multiplexing and demultiplexing processes

Table B.22: Multiplexing

Prerequisite: B.1/6 -- RS1/DCC_A_So present

Item	Multiplexing	Reference	Status	Support
1	The DCC_CI data (192 kbit/s) are multiplexed in D1, D2 and D3 bytes of the STM-1 frame.	4.3.3	m	

Comments: DCC transmission can be "disabled" when the matrix connection in the connected DCC_C function is removed.

Table B.23: Demultiplexing

Prerequisite: B.1/7 -- RS1/DCC_A_Sk present

Item	Demultiplexing	Reference	Status	Support
1	The DCC_CI data (192 kbit/s) are demultiplexed from bytes D1 to D3.	4.3.4	m	

B.4.2.5 RS1 layer to P0s layer adaptation functions: RS1/P0s_A_So-N and RS1/P0s_A_Sk-N

B.4.2.5.1 RS1 layer to P0s layer multiplexing and demultiplexing processes

Table B.24: Multiplexing

Prerequisite: B.1/8 -- RS1/P0s_A_So-N present

Item	Multiplexing	Reference	Status	Support
1	The RS1/P0s_A_So-E1 multiplexes a 64 kbit/s orderwire information stream into the RSOH byte E1.	4.3.5	o.2401	
2	The RS1/P0s_A_So-F1 multiplexes a 64 kbit/s user channel information stream into the RSOH byte F1.	4.3.5	o.2401	

o.2401: It is mandatory to support at least one of these items -- at least one RS1/P0s_A_So-N function present

Table B.25: Demultiplexing

Prerequisite: B.1/9 -- RS1/P0s_A_Sk-N present

Item	Demultiplexing	Reference	Status	Support
1	The RS1/P0s_A_Sk-E1 demultiplexes the P0s data from byte E1 of the RS Overhead.	4.3.6	o.2501	
2	The RS1/P0s_A_Sk-F1 demultiplexes the P0s data from byte F1 of the RS Overhead.	4.3.6	o.2501	

o.2501: It is mandatory to support at least one of these items -- at least one RS1/P0s_A_Sk-N function present

B.4.2.5.2 RS1 layer to P0s layer frequency justification and bitrate adaptation processes

Table B.26: Frequency justification and bitrate adaptation: principles

Prerequisite: B.1/8 -- RS1/P0s_A_So-N present

Item	Frequency justification and bitrate adaptation: principles	Reference	Status	Support
1	The RS1/P0s_A_So-N function provides frequency justification and bitrate adaptation for a 64 kbit/s information stream. It takes P0s_CI as an unstructured bit-stream with a rate of 64 kbit/s ± 100 ppm and inserts it into the RSOH.	4.3.5	m	
2	Frequency justification is performed by octet slip buffering.	4.3.5	m	

Table B.27: Frequency justification and bitrate adaptation: source direction

Prerequisite: B.1/8 -- RS1/P0s_A_So-N present

Item	Frequency justification and bitrate adaptation: source direction	Reference	Status	Support
1	The RS1/P0s_A_So- function provides for an elastic store (slip buffer) process. The are written into the store under control of the associated input clock. The data are read out of the store under control of the STM-1 clock, frame position and justification decision.	4.3.5	m	
2	Each justification decision results in a corresponding negative/positive justification action. Upon a positive justification (slip) action, the reading of one 64 kbit/s octet (9 bits) is cancelled once. Upon a negative justification (slip) action, the same 64 kbit/s octet (9 bits) is read out a second time.	4.3.5	m	
3	The elastic store (slip buffer) accommodates at least 18 µs of wander without introducing errors.	4.3.5	m	

B.4.2.6 RS1 layer to V0x layer adaptation functions: RS1/V0x_A_So and RS1/V0x_A_Sk

B.4.2.6.1 RS1 layer to V0x layer multiplexing and demultiplexing processes

Table B.28: Multiplexing

Prerequisite: B.1/10 -- RS1/V0x_A_So present

Item	Multiplexing	Reference	Status	Support
1	The RS1/V0x_A_So multiplexes the V0x_CI data (64 kbit/s) into the byte location F1	4.3.7	m	

Table B.29: Demultiplexing

Prerequisite: B.1/11 -- RS1/V0x_A_Sk present

Item	Demultiplexing	Reference	Status	Support
1	The RS1/V0x_A_Sk demultiplexes the user channel data from RS Overhead (byte F1)	4.3.8	m	

B.4.3 Defect, fault and performance monitoring

B.4.3.1 Trail termination point mode management

Table B.30: Trail termination point mode process

Prerequisite: B.1/3 -- RS1_TT_Sk function present

Item	Trail termination point status process	Reference	Status	Support
1	The Trail Termination Point Mode supports "not monitored" (NMON) status	ETS 300 417-1-1 [1] subclause 8.5	m	
2	The Trail Termination Point Mode supports "monitored" (MON) status	ETS 300 417-1-1 [1] subclause 8.5	m	
3	The Trail Termination Point Mode status is provisionable by the EMF.	4.2.2	m	

B.4.3.2 Defect detection and clearance criteria

Table B.31: Trace Identifier Mismatch defect (dTIM)

Prerequisite: B.1/3 -- RS1_TT_Sk function present

Item	Trace Identifier Mismatch defect (dTIM)	Reference	Status	Support
1	The RS1 dTIM defect is detected within a maximum period of 100 ms in the absence of bit errors.	ETS 300 417-1-1 [1] subclause 8.2.1.3	m	
2	The RS1 dTIM defect is cleared within a maximum period of 100 ms in the absence of bit errors.	ETS 300 417-1-1 [1] subclause 8.2.1.3	m	
3	The RS1 dTIM is suppressed during the reception of aSSF from the server layer.	ETS 300 417-1-1 [1] subclause 8.2.1.3	m	
4	The RS1 dTIM detection can be disabled (TIMdis).	ETS 300 417-1-1 [1] subclause 8.2.1.3	m	

B.4.3.3 Consequent action activation and clearance criteria

Table B.32: Alarm Indication Signal action (aAIS)

Prerequisite: B.1/3 OR B.1/4 OR B.1/9 OR B.1/11 -- RS1_TT_Sk and/or RS1/MS1_A_So and/or RS1/P0s_A_Sk and/or RS1/V0X_A_Sk present

Item	Alarm Indication Signal action (aAIS)	Reference	Status	Support
1	The RS1_TT_Sk outputs an all "1s" signal within 250 µs upon RS1 dTIM detection.	4.2.2	c3201	
2	The RS1_TT_Sk outputs an all "1"s signal within 250 µs upon CI_SSF reception.	4.2.2	c3201	
3	The RS1_TT_Sk outputs normal data within 250 µs when there is (are) no more defect(s) active.	4.2.2	c3201	
4	The RS1/MS1_A_So outputs an all "1"s signal within 250 µs upon CI_SSF reception.	4.2.2	c3202	
5	The frequency of the all "1s" signal is within the range of 155 520 kHz ± 20 ppm.	4.3.1	c3202	
6	The RS1/MS1_A_So outputs normal data within 250 µs when there is (are) no more defect(s) active.	4.3.1	c3202	
7	The RS1/P0s_A_Sk-N outputs an all "1s" signal within 1 ms upon AI_TSF reception.	4.3.6	c3203	
8	The frequency of the all "1s" signal is within the range of 64 kbit/s ± 20 ppm.	4.3.6	c3203	
9	The RS1/P0s_A_Sk-N outputs normal data within 1 ms when there is (are) no more defect(s) active.	4.3.6	c3203	
10	The RS1/V0x_A_Sk outputs an all "1s" signal within 1 ms upon AI_TSF reception.	4.3.8	c3204	
11	The frequency of the all "1s" signal is within the frequency limits for this signal.	4.3.8	c3204	
12	The RS1/V0x_A_Sk outputs normal data within 1 ms when there is (are) no more defect(s) active.	4.3.8	c3204	

c3201:IF B.1/3 THEN m ELSE n/a -- RS1_TT_Sk present
c3202:IF (B.1/4) THEN m ELSE n/a -- RS1/MS1_A_So present
c3203:IF B.1/9 THEN m ELSE n/a -- RS1/P0s_A_Sk-N present
c3204:IF B.1/11 THEN m ELSE n/a -- RS1/V0x_A_Sk present

Table B.33: Server Signal Fail action (aSSF)

Prerequisite: B.1/3 -- at least one adaptation function present

Item	Server Signal Fail action (aSSF)	Reference	Status	Support
1	The RS1/MS1_A_Sk sets CI_SSF to TRUE on AI_TSF reception.	4.3.2	c3301	
2	The RS1/MS1_A_Sk sets CI_SSF to FALSE as soon as AI_TSF is no longer received.	4.3.2	c3301	
3	The RS1/DCC_A_Sk sets CI_SSF to TRUE on AI_TSF reception.	4.3.4	c3302	
4	The RS1/ DCC _A_Sk sets CI_SSF to FALSE as soon as AI_TSF is no longer received.	4.3.4	c3302	
5	The RS1/P0s_A_Sk sets CI_SSF to TRUE on AI_TSF reception.	4.3.6	c3303	
6	The RS1/ P0s _A_Sk sets CI_SSF to FALSE as soon as AI_TSF is no longer received.	4.3.6	c3303	
7	The RS1/V0x_A_Sk sets CI_SSF to TRUE on AI_TSF reception.	4.3.8	c3304	
8	The RS1/ V0x _A_Sk sets CI_SSF to FALSE as soon as AI_TSF is no longer received.	4.3.8	c3304	

c3301:IF B.1/5 THEN m ELSE n/a -- RS1/MS1_A_Sk present
c3302:IF B.1/7 THEN m ELSE n/a -- RS1/DCC_A_Sk present
c3303:IF B.1/9 THEN m ELSE n/a -- RS1/P0s_A_Sk present
c3304:IF B.1/11 THEN m ELSE n/a -- RS1/V0x_A_Sk present

Table B.34: Trail Signal Fail action (aTSF)

Prerequisite: B.1/3 -- RS1_TT_Sk function present

Item	Trail Signal Fail action (aTSF)	Reference	Status	Support
1	The RS1_TT_Sk sets AI_TSF to TRUE on RS1 dTIM detection.	4.3.2	m	
2	The RS1_TT_Sk sets AI_TSF to TRUE on CI_SSF reception.	4.3.2	m	
3	The RS1_TT_Sk sets AI_TSF to FALSE when there is (are) no more defect(s) active.	4.3.2	m	

B.4.3.4 Defect correlation

Table B.35: Defect correlation

Prerequisite: B.2/2 -- Defect correlation process supported

Item	Defect correlation	Reference	Status	Support
1	Under RS1 dTIM detection the RS1_TT_Sk generates a RS1 cTIM report if the port is in the monitoring state (MON).	4.2.2	c3501	
2	All the generated fault cause (cXXX) are reported to the EMF.	ETS 300 417-1-1 [1] subclause 8.1, figure 36	m	

c3501: IF B.1/3 THEN m ELSE n/a -- RS1_TT_Sk present

Annex C (normative): ICS proforma for STM-1 multiplex section layer

C.1 Identification of the implementation

In this ETS, an Implementation Under Test (IUT), and of course the identification of an IUT refers to an STM-1 Multiplex Section (MS1) implemented inside the System Under Test (SUT).

Identification of the IUT and the SUT in which it resides should be filled in so as to provide as much detail as possible regarding version numbers and configuration options.

The product supplier information and client information should both be filled in if they are different.

A person who can answer queries regarding information supplied in the ICS should be named as the contact person.

C.1.1 Date of the statement

.....

C.1.2 Implementation Under Test (IUT) identification

IUT name:

.....

.....

IUT version

Hardware version:

.....

Software version:

.....

Firmware version:

.....

C.1.3 System Under Test (SUT) identification

SUT name:

.....

.....

Hardware configuration:

.....

SUT Software version:

.....

SUT Firmware version:

.....

Operating system:

.....

C.1.4 Product supplier

Name:

.....

Address:

.....

.....

.....

Telephone number:

.....

Facsimile number:

.....

E-mail address:

.....

Additional information:

.....

.....

.....

C.1.5 Client

Name:

.....

Address:

.....

.....

.....

Telephone number:

.....

Facsimile number:

.....

E-mail address:

.....

Additional information:

.....

.....

.....

C.1.6 ICS contact person

Name:

.....

Telephone number:

.....

Facsimile number:

.....

E-mail address:

.....

Additional information:

.....

.....

C.2 Identification of the ETS

This ICS proforma applies to the following standard:

ETS 300 417-3-1 [2]: "Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment: STM-N regenerator and multiplex section layer functions".

C.3 Global statement of conformance of MS1 layer

Are all mandatory capabilities implemented (Yes/No)

NOTE: Answering "No" to this question indicates non-conformance to the ETS specification. Non-supported mandatory capabilities are to be identified in the ICS, with an explanation of why the implementation is non-conforming, on pages attached to the ICS proforma.

Answering "Yes" to this question indicates only that all the capabilities with the explicit status "m" are supported. It is not necessary to fill in the support column of the associated item.

C.4 MS1 section layer function

C.4.1 MS1 layer description

Table C.1: MS1 layer functions

Item	MS1 layer functions	Reference	Status	Support
1	Multiplex Section Connection function (MS1_C)	5, figure 16	o	
2	Multiplex Section Trail Termination Source function (MS1_TT_So)	5, figure 16	o.101	
3	Multiplex Section Trail Termination Sink function (MS1_TT_Sk)	5, figure 16	o.101	
4	Multiplex Section to S4 Layer Adaptation Source function (MS1/S4_A_So)	5, figure 16	c101	
5	Multiplex Section to S4 Layer Adaptation Sink function (MS1/S4_A_Sk)	5, figure 16	c102	
6	Multiplex Section to SD Layer Adaptation Source function (MS1/SD_A_So)	5, figure 16	c103	
7	Multiplex Section to SD Layer Adaptation Sink function (MS1/SD_A_Sk)	5, figure 16	c104	
8	Multiplex Section to DCC Layer Adaptation Source function (MS1/DCC_A_So)	5, figure 16	c105	
9	Multiplex Section to DCC Layer Adaptation Sink function (MS1/DCC_A_Sk)	5, figure 16	c104	
10	Multiplex Section to P0s Layer Adaptation Source function (MS1/P0s_A_So)	5, figure 16	c105	
11	Multiplex Section to P0s Layer Adaptation Sink function (MS1/P0s_A_Sk)	5, figure 16	c104	
12	MS1 1+1 Linear Trail protection	5, figure 16, table A.1	o	
13	MS1 1:n Linear Trail protection	5, figure 16, table A.1	c106	

o.101: It is mandatory to support at least one of these items -- at least one TT function present
c101: IF C.1/2 THEN m ELSE x -- a TT_So function should exist for A_So function
c102: IF C.1/3 THEN m ELSE x -- a TT_Sk function should exist for A_Sk function
c103: IF C. 1/2 THEN m ELSE x -- a TT_So function should exist for MS1/SD_A_So
c104: IF C.1/3 THEN o ELSE x -- a TT_Sk function should exist for A_Sk
c105: IF C.1/2 THEN o ELSE x -- a TT_So function should exist for A_So
c106: IF (C.1/2 AND C.1/3) THEN o ELSE x -- bi-directional layer needed

Table C.2: STM-1 Multiplex Section Linear Trail Protection schemes

Prerequisite: C.1/12 OR C.1/13 -- STM-1 Linear Trail Protection scheme supported

Item	STM-1 Multiplex Section Linear Trail Protection functions	Reference	Status	Support
1	MS1 1+1 Linear Trail Protection with unidirectional switching and revertive operation	5.5.1.1	c201	
2	MS1 1+1 Linear Trail Protection with unidirectional switching and non-revertive operation	5.5.1.1	c201	
3	MS1 1+1 Linear Trail Protection with bi-directional switching and revertive operation	5.5.1.1	c202	
4	MS1 1+1 Linear Trail Protection with bi-directional switching and non-revertive operation	5.5.1.1	c202	
5	MS1 1:n Linear Trail Protection with bi-directional switching and revertive operation	5.5.1.2	c203	

o.201: It is mandatory to support at least one of these items -- at least one 1+1 protection scheme
c201: IF C.1/12 THEN o.201 ELSE x -- 1+1 MS Linear Trail Protection supported
c202: IF C.1/12 AND (C.1/2 AND C.1/3)
THEN o.201 ELSE x -- 1+1 MS Linear Trail Protection and bi-directional layer supported
c203: IF C.1/13 THEN m ELSE x -- 1:n MS Linear Trail Protection supported

Table C.3: MS1 linear trail protection functions

Prerequisite: C.1/12 OR C.1/13 -- STM-1 linear trail protection scheme supported

Item	MS1 linear trail protection functions	Reference	Status	Support
1	Multiplex Section Linear Trail Protection Connection function	5, figure 19	m	
2	Multiplex Section Protection Trail Termination Source function (MS1P_TT_So)	5, figure 19	c301	
3	Multiplex Section Protection Trail Termination Sink function (MS1P_TT_Sk)	5, figure 19	c302	
4	Multiplex Section to Multiplex Section Protection Layer Adaptation Source function (MS1/MS1P_A_So)	5, figure 19	c301	
5	Multiplex Section to Multiplex Section Protection Layer Adaptation Sink function (MS1/MS1P_A_Sk)	5, figure 19	c302	

c301: IF C.1/2 THEN m ELSE x -- a TT_So function should exist for protection Source functions
c302: IF C.1/3 THEN m ELSE x -- a TT_Sk function should exist for protection Sink functions

Table C.4: Supervision processes

Item	Supervision process	Reference	Status	Support
1	Near-end performance monitoring process	ETS 300 417-1-1 [1] subclauses 8.2 to 8.4	c401	
2	Far-end performance monitoring process	ETS 300 417-1-1 [1] subclauses 8.2 to 8.4	c402	
3	Pointer performance monitoring process	ETS 300 417-1-1 [1] subclauses 8.2 to 8.4	c403	
4	Protection performance monitoring process	ETS 300 417-1-1 [1] subclauses 8.2 to 8.4	c404	
5	Defect correlation process	ETS 300 417-1-1 [1] subclauses 8.2 to 8.3	c405	

c401: IF C.1/3 THEN m ELSE n/a -- MS1_TT_Sk present
c402: IF (C.1/2 AND C.1/3) THEN m ELSE n/a -- both TT_So and TT_Sk present
c403: IF C.1/4 THEN m ELSE n/a -- MS1/S4_A_So present
c404: IF (C.1/12 OR C.1/13 OR C.1/14)
THEN m ELSE n/a -- STM-1 linear trail protection supported
c405: IF (C.1/3 OR C.1/5) THEN m ELSE n/a -- MS1_TT_Sk and/or MS1/S4_A_Sk present

C.4.2 MS1 layer transmission tables

Table C.5: Data stream structure

Item	Data stream structure	Reference	Status	Support
1	The CI at the MS1 connection point is octet structured and 125 μs framed with co-directional timing.	5	m	
2	The MS1_CI is an STM-1 data stream without the Regenerator Section Overhead.	5	m	
3	Multiplex Section OverHead (MS-OH) bytes are placed in rows 5 to 9 of columns 1 to 9 of the STM-1 frame.	5, figure 17	m	

Table C.6: Payload composition

Item	Payload composition	Reference	Status	Support
1	The payload is composed of one VC-4 of 150 336 kbit/s.	5	m	

C.4.2.1 MS1 connection function: MS1_C

Table C.7: Connection functionalities

Prerequisite: C.1/1 -- MS1_C present

Item	Connection functionalities	Reference	Status	Support
1	For further study	5.1	n/a	

C.4.2.2 MS1 layer trail termination functions: MS1_TT_So and MS1_TT_Sk

C.4.2.2.1 In service error monitoring process

Table C.8: In service error monitoring: principles

Item	In service error monitoring: principles	Reference	Status	Support
1	An EDC is part of the characteristic information for in service monitoring purposes.	ETS 300 417-1-1 [1] subclause 7.3	m	
2	In service error monitoring parameter definition is block-based.	G.707 [14] subclause 9.2.2.4 note	m	
3	The block length is 2 403 bytes (the STM-1 frame structure without the Regenerator Section Overhead).	G.707 [14] subclause 9.2.2.4	m	
4	The error monitoring is performed using Bit Interleaved Parity 24 (BIP-24).	5.2.1, G.707 [14] subclause 9.2.2.4 note	m	
5	The BIP-24 is calculated using even parity in such a manner that the bit in position x provides even parity over the x-bits of all the 24-bits sequences within the specified block.	G.707 [14] subclause 9.2.2.4 note	m	

Comments: The BIP-n is interpreted as checking 'n' separate interleaved parity check blocks. If any of the 'n' parity check fails (EDC Violation (EDCV)), the block is assumed to be in error.

Table C.9: EDC location

Item	Error Detection Code (EDC) location	Reference	Status	Support
1	Multiplex Section EDC is located in bytes B2(5,1), B2(5,2), B2(5,3) of the STM-1 frame.	5, figure 17	m	

Table C.10: EDC processing: source direction

Prerequisite: C.1/2 -- MS1_TT_So present

Item	Error Detection Code (EDC) processing: source direction	Reference	Status	Support
1	The BIP-24 is calculated over all bits, except those in the RSOH bytes, of the previous STM-1 frame.	5.2.1	m	
2	BIP-24 code is inserted in the 3 B2 bytes of the current STM-1 frame	5.2.1	m	

Table C.11: EDC processing: sink direction

Prerequisite: C.1/3 -- MS1_TT_Sk function present

Item	Error Detection Code (EDC) processing: sink direction	Reference	Status	Support
1	The incoming error monitoring bytes B2 are recovered from the MSOH signal.	5.2.2	m	
2	The BIP-24 is calculated over all bits, except of those in the RSOH bytes, of the previous STM-1 frame.	5.2.2	m	
3	Recovered B2 bytes are compared with the calculated BIP-24.	5.2.2	m	
4	A difference between the computed and recovered B2 values is taken as evidence of one or more errors (nN_B) in the computation block.	5.2.2	m	

C.4.2.2.2 Server layer status monitoring process

C.4.2.2.2.1 MS1 Alarm Indication Signal (MS1 AIS)

Table C.12: Alarm Indication Signal processing: sink direction

Prerequisite: C.1/3 -- MS1_TT_Sk present

Item	Alarm Indication Signal processing: sink direction	Reference	Status	Support
1	MS1_TT_Sk extracts and monitors bits 6 to 8 of K2 byte in order to detect the '111' bit pattern as evidence of MS AIS condition.	5.2.2	m	

C.4.2.2.3 Remote indicators monitoring process

C.4.2.2.3.1 MS1 Remote Defect Indication (MS1 RDI)

Table C.13: Remote Defect Indication (RDI) location

Prerequisite: C.1/2 AND C.1/3 -- bi-directional layer supported

Item	Remote Defect Indication (RDI) location	Reference	Status	Support
1	The MS RDI is located in bits 6,7 and 8 of byte K2(5,7) of the STM-1 frame.	5.2.1, 5.2.2	m	

Table C.14: Remote Defect Indication (RDI) processing: source direction

Prerequisite: C.1/2 AND C.1/3 -- bi-directional layer supported

Item	Remote Defect Indication (RDI) processing: source direction	Reference	Status	Support
1	MS1 RDI is set upon activation of MS1_RI_RDI determined by the associated MS1_TT_Sk.	5.2.1	m	
2	MS1 RDI is cleared upon deactivation of MS1_RI_RDI determined by the associated MS1_TT_Sk.	5.2.1	m	
3	MS1 RDI signal is coded as a '110' bit pattern.	5.2.1	m	
4	The '000' bit pattern is inserted if no MS1_RI_RDI signal is active.	5.2.1	m	

Table C.15: Remote Defect Indication (RDI) processing: sink direction

Prerequisite: C.1/3 -- MS1_TT_Sk present

Item	Remote Defect Indication (RDI) processing: sink direction	Reference	Status	Support
1	MS1_TT_Sk extracts and monitors bits 6 to 8 of K2 byte in order to detect the '110' bit pattern as evidence of MS RDI condition.	5.2.2	m	

C.4.2.2.3.2 MS1 Remote Error Indication (REI) (MS1 REI)

Table C.16: Remote Error Indication (REI): principles

Prerequisite: C.1/2 AND C.1/3 -- bi-directional layer supported

Item	Remote Error Indication (REI): principles	Reference	Status	Support
1	The REI signal contains the exact number of Errored Block (EB) detected in the trail signal at the far-end trail termination	G.707 [14] subclause 9.2.2.12	m	
2	The block length is 801 bits. The EDC is BIP-1.	G.707 [14] subclause 9.2.2.12	m	

Table C.17: Remote Error Indication (REI) location

Prerequisite: C.1/2 AND C.1/3 -- -- bi-directional layer supported

Item	Remote Error Indication (REI) location	Reference	Status	Support
1	The MS REI is located in bits 1 to 8 of M1(9,6) byte of the STM-1 frame.	G.707 [14] subclause 9.2.2.12	m	

Table C.18: Remote Error Indication (REI) processing: source direction

Prerequisite: C.1/2 AND C.1/3 -- -- bi-directional layer supported

Item	Remote Error Indication (REI) processing: source direction	Reference	Status	Support
1	The MS1_TT_So sets REI to the equivalent binary value of the number of EDCV detected by the monitoring process	G.707 [14] subclause 9.2.2.12	m	

Table C.19: Remote Error Indication (REI) processing: sink direction

Prerequisite: C.1/3 -- MS1_TT_Sk present

Item	Remote Error Indication (REI) processing: sink direction	Reference	Status	Support
1	The MS1_TT_Sk extracts the MS1 REI from the incoming STM-1 signal .	5.2.2	m	
2	The MS1_TT_Sk interprets the MS1 REI as given in G.707 [14] subclause 9.2.2.12	G.707 [14] subclause 9.2.2.12	m	

C.4.2.3 MS1 layer to S4 layer adaptation functions: MS1/S4_A_So and MS1/S4_A_Sk

Table C.20: Adaptation process

Prerequisite: C.1/4 OR C.1/5 -- MS1/S4_A_So and/or MS1/S4_A_Sk present

Item	Adaptation process	Reference	Status	Support
1	The MS1/S4_A_So function provides frequency justification and bitrate adaptation for a VC-4 signal, represented by a nominally (261×9×64) = 150 336 kbit/s information stream and the related frame phase with a frequency accuracy within ±4,6 ppm, to be multiplexed into an STM-1 signal.	5.3.1	c2001	
2	The MS1/S4_A_Sk recovers the VC-4 data with frame phase information from the STM-1 stream.	5.3.2	c2002	

c2001: IF C.1/4 THEN m ELSE n/a -- MS1/S4_A_So present
c2002: IF C.1/5 THEN m ELSE n/a -- MS1/S4_A_Sk present

C.4.2.3.1 MS1 layer to S4 Layer frequency justification and bitrate adaptation processes

Table C.21: Frequency justification and bitrate adaptation: principles

Prerequisite: C.1/4 -- MS1/S4_A_So present

Item	Frequency justification and bitrate adaptation: principles	Reference	Status	Support
1	Frequency justification is performed by pointer adjustments.	5.3.1	m	

Table C.22: Frequency justification and bitrate adaptation: source direction

Prerequisite: C.1/4 -- MS1/S4_A_So present

Item	Frequency justification and bitrate adaptation: source direction	Reference	Status	Support
1	The MS1/S4_A_So function provides for an elastic store (buffer) process. The data and frame start signals are written into the store under control of the associated input clock. The data and frame start signals are read out of the store under control of the VC-4 clock, frame position and justification decision.	5.3.1	m	
2	Each justification decision results in a corresponding negative/positive justification action. Upon a positive justification action, the reading of 24 data bits are cancelled once and no data written at the three positions H3+1. Upon a negative justification action, an extra 24 data bits are read out once into the three positions H3.	5.3.1	m	
3	Consecutive pointer operations shall be separated by at least three frames (i.e. every fourth frame) in which the pointer value remains constant	5.3.1	m	
4	The buffer hysteresis is at least 12 bytes.	5.3.1	m	
5	The size of the buffer for the elastic store process is for further study	5.3.1	n/a	

C.4.2.3.2 MS1 layer to S4 layer alignment process

Table C.23: Alignment process principles

Prerequisite: C.1/4 OR C.1/5 -- MS1/S4_A_So and/or MS1/S4_A_Sk present

Item	Alignment process principles	Reference	Status	Support
1	The alignment process is carried out by the processing of the AU-4 pointer which is aligned in the STM-1 payload in fixed position relative to the STM-1 frame.	G.707 [14] subclause 8.1	m	
2	The location of the first byte of the VC-4 with respect to the AU-4 pointer is given by the related AU-4 pointer value in three bytes increment.	G.707 [14] subclause 8.1.2	m	

Comments: The pointer value gives a measure of the phase offset between the VC-4 stream and the STM-1 frame.

Table C.24: AU-4 pointer and alignment byte location

Prerequisite: C.1/4 OR C.1/5 -- MS1/S4_A_So and/or MS1/S4_A_Sk present

Item	AU-4 pointer and alignment byte location	Reference	Status	Support
1	The 9 bytes at the beginning of row 4 in the STM-1 frame are allocated to the alignment process.	5.3.1, G.707 [14] subclauses 8.1-8.1.1	m	
2	The AU-4 pointer is located into H1(4,1) and H2(4,4) bytes of the STM-1 frame.	5.3.1, G.707 [14] subclauses 8.1-8.1.1	m	

Table C.25: AU-4 pointer and alignment byte structure

Prerequisite: C.1/4 OR C.1/5 -- MS1/S4_A_So and/or MS1/S4_A_Sk present

Item	AU-4 pointer and alignment byte structure	Reference	Status	Support
1	The content of H1(4,1) and H2(4,4) bytes is viewed as one pointer word.	G.707 [14] subclause 8.1.2	m	
2	Bits 1 through 4 of the pointer word carry the New Data Flag (NDF).	G.707 [14] subclause 8.1.2	m	
3	Bits 5 and 6 of the pointer word, named ss bits, carry the AU-n type code. They are set to '10'.	5.3.1, G.707 [14] subclause 8.1.2	m	
4	Bits 7 through 16 (last ten bits) of the pointer word carry the pointer value.	G.707 [14] subclause 8.1.2	m	
5	The AU-4 pointer value is a binary number with a range of 0 to 782.	G.707 [14] subclause 8.1.2	m	
6	Bytes (4,2) and (4,3) contain the fixed stuff code Y = 1001 ss11. Bits ss are undefined.	5.3.1, G.707 [14] subclause 8.1.2	m	
7	Bytes (4,5) and (4,6) contain the fixed stuff code '1' = 1111 1111.	5.3.1, G.707 [14] subclause 8.1.2	m	
8	H3(4,7), H3(4,8), H3(4,9) bytes are the negative justification opportunity bytes.	G.707 [14] subclause 8.1.2	m	
9	Bits 7,9,11,13,15 of the pointer word (I bits) are the pointer incrementation indication bits.	G.707 [14] subclause 8.1.2	m	
10	Bits 8,10,12,14,16 of the pointer word (D bits) are the pointer decrementation indication bits.	G.707 [14] subclause 8.1.2	m	

NOTE: Items C.25/3 and C.25/6 are contradictory but just reflect the base specification in ITU-T Recommendation G.707 [14] and ETS 300 417-3-1 [2].

C.4.2.3.2.1 AU-4 pointer generation

Table C.26: Pointer generation principles

Prerequisite: C.1/4 -- MS1/S4_A_So present

Item	Pointer generation principles	Reference	Status	Support
1	The pointer is generated according to the pointer generation algorithm.	5.3.1, ETS 300 417-1-1 [1] annex A	m	
2	The pointer generation algorithm can be modelled by a finite state machine as shown in ETS 300 417-1-1 [1] figure A.1. . Four states can be identified: - NORM_state - NDF_state - INC_state - DEC_state	ETS 300 417-1-1 [1] annex A	m	
3	The transitions from the NORM state to the INC, DEC and NDF states are initiated by Elastic Store process events.	ETS 300 417-1-1 [1] annex A	m	
4	The transitions from INC, DEC and NDF states to the NORM state occur autonomously under the generation of special pointer patterns.	ETS 300 417-1-1 [1] annex A	m	
5	Definition of excessive pointer adjustments is for further study.	ETS 300 417-1-1 [1] annex A	n/a	

Table C.27: Pointer generation events

Prerequisite: C.1/4 -- MS1/S4_A_So present

Item	Pointer generation events	Reference	Status	Support
1	**thr_exc**: elastic store filling exceeds an upper threshold	ETS 300 417-1-1 [1] annex A	m	
2	**thr_und**: elastic store filling falls below a lower threshold	ETS 300 417-1-1 [1] annex A	m	
3	**FO_normal**: normal frame offset	ETS 300 417-1-1 [1] annex A	m	
4	**FO_discont**: frame offset discontinuity	ETS 300 417-1-1 [1] annex A	m	
5	A frame offset discontinuity occurs if an incoming NDF_enable or 3*new_point is received by the pointer interpreter controlling the process of writing into the elastic store.	ETS 300 417-1-1 [1] annex A	m	
6	A frame offset discontinuity occurs if the Elastic Store overflow/underflow condition is detected.	ETS 300 417-1-1 [1] annex A	m	
7	The active offset is defined as the phase between the outgoing STM-1 and the VC-4.	ETS 300 417-1-1 [1] annex A	m	
8	The active offset is undefined during a signal fail condition.	ETS 300 417-1-1 [1] annex A	m	

Table C.28: Pointer generation actions

Prerequisite: C.1/4 -- MS1/S4_A_So present

Item	Pointer generation actions	Reference	Status	Support
1	The **norm_point action** generates a transmitted pointer word with: - NDF disabled (NDF bytes set to 0110), - pointer value set to active offset.	ETS 300 417-1-1 [1] annex A	m	
2	The **inc_ind action** generates a transmitted pointer word with: - NDF disabled (NDF bytes set to 0110), - pointer value set to the active offset and I-bits inverted. After this action 3 stuffing bytes are transmitted in the 3 bytes after the third H3 byte of the AU-4 and the active offset is incremented by one unit. If the previous pointer value is set to its maximum value, the subsequent pointer is set to zero.	ETS 300 417-1-1 [1] annex A, G.707 [14] subclause 8.1.5	m	
3	The **dec_ind action** generates a transmitted pointer word with: - NDF disabled (NDF bytes set to 0110), - pointer value set to the active offset and D-bits inverted. After this action 3 data bytes are transmitted in the 3 H3 bytes of the AU-4 and the active offset is decremented by one. If the previous pointer value is zero, the subsequent pointer is set to its maximum value.	ETS 300 417-1-1 [1] annex A, G.707 [14] subclause 8.1.5	m	
4	The **NDF_enable action** generates a pointer word with: - NDF enabled (NDF bytes set to 1001), - pointer value set to the new offset. After this action the active offset is updated to the new offset value.	ETS 300 417-1-1 [1] annex A	m	

Comments: I bits and D bits are, respectively, bits 7,9,11,13,15 and 8,10,12,14,16 of the pointer word.

Table C.29: Pointer generation: operation in NORM state

Prerequisite: C.1/4 -- MS1/S4_A_So present

Item	Pointer generation: operation in NORM state	Reference	Status	Support
1	Reception: FO_normal Transition to state: NORM Action: norm_point	ETS 300 417-1-1 [1] annex A	m	
2	Reception: thr_exc Transition to state: DEC Action: dec_ind	ETS 300 417-1-1 [1] annex A	m	
3	Reception: thr_und Transition to state: INC Action: inc_ind	ETS 300 417-1-1 [1] annex A	m	
4	Reception: FO_discont Transition to state: NDF Action: NDF_enable	ETS 300 417-1-1 [1] annex A	m	

Table C.30: Pointer generation: operation in INC state

Prerequisite: C.1/4 -- MS1/S4_A_So present

Item	Pointer generation: operation in INC state	Reference	Status	Support
1	Reception: FO_normal Transition to state: INC Action: norm_point	ETS 300 417-1-1 [1] annex A	m	
2	Reception: 3*FO_normal Transition to state: NORM Action: norm_point	ETS 300 417-1-1 [1] annex A	m	
3	Reception: FO_discont Transition to state: NDF Action: NDF_enable	ETS 300 417-1-1 [1] annex A	m	

Table C.31: Pointer generation: operation in DEC state

Prerequisite: C.1/4 -- MS1/S4_A_So present

Item	Pointer generation: operation in DEC state	Reference	Status	Support
1	Reception: FO_normal Transition to state: DEC Action: norm_point	ETS 300 417-1-1 [1] annex A	m	
2	Reception: 3*FO_normal Transition to state: NORM Action: norm_point	ETS 300 417-1-1 [1] annex A	m	
3	Reception: FO_discont Transition to state: NDF Action: NDF_enable	ETS 300 417-1-1 [1] annex A	m	

Table C.32: Pointer generation: operation in NDF state

Prerequisite: C.1/4 -- MS1/S4_A_So present

Item	Pointer generation: operation in NDF state	Reference	Status	Support
1	Reception: FO_normal Transition to state: NDF Action: norm_point	ETS 300 417-1-1 [1] annex A	m	
2	Reception: FO_discont Transition to state: NDF Action: NDF_enable	ETS 300 417-1-1 [1] annex A	m	
3	Reception: 3*FO_normal Transition to state: NORM Action: norm_point	ETS 300 417-1-1 [1] annex A	m	

Table C.33: Pointer generation: operation in NDF state

Prerequisite: C.1/4 -- MS1/S4_A_So present

Item	Pointer generation: operation in NDF state	Reference	Status	Support
1	Reception: FO_normal Transition to state: NDF Action: norm_point	ETS 300 417-1-1 [1] annex A	m	
2	Reception: FO_discont Transition to state: NDF Action: NDF_enable	ETS 300 417-1-1 [1] annex A	m	
3	Reception: 3*FO_normal Transition to state: NORM Action: norm_point	ETS 300 417-1-1 [1] annex A	m	

C.4.2.3.2.2 AU-4 pointer interpretation

Table C.34: Pointer interpretation principles

Prerequisite: C.1/5 -- MS1/S4_A_Sk present

Item	Pointer interpretation principles	Reference	Status	Support
1	The pointer is interpreted according to the pointer interpretation algorithm.	5.3.2, 5.3.4, ETS 300 417-1-1 [1] annex B	m	
2	The pointer interpretation algorithm can be globally described by a state diagram as shown in ETS 300 417-1-1 [1] figure C.1. Six states are defined: - NORMal_state (NORM) - AIS_state (AIS) - LOP_state (LOP) - INCrement_state (INC) - DECrement_state (DEC) - NDF_state (NDF)	ETS 300 417-1-1 [1] annex B	m	
3	The transitions between the states will be initiated either by single or consecutive events.	ETS 300 417-1-1 [1] annex B	m	
4	The kind and number of consecutive indications activating a transition is chosen such that the behaviour is stable and insensitive to signal degradations.	ETS 300 417-1-1 [1] annex B	m	

Table C.35: Pointer interpretation events

Prerequisite: C.1/5 -- MS1/S4_A_Sk present

Item	Pointer interpretation events	Reference	Status	Support
1	•**NDF Enabled** occurs when any of the following bit patterns is received: "1001", "0001", "1101", "1011", "1000"	ETS 300 417-1-1 [1] annex B	m	
2	**NDF Disabled** occurs when any of the following bit patterns is received: "0110", "1110", "0010", "0100", "0111"	ETS 300 417-1-1 [1] annex B	m	
3	The **norm_point event** corresponds to a received pointer word with: NDF disabled AND ss-bits set to 10 (indicating AU-4) AND received pointer offset value equal to active offset value	ETS 300 417-1-1 [1] annex B	m	
4	The **NDF_enable event** corresponds to a received pointer word with: NDF enabled AND ss-bits set to 10 (indicating AU-4) AND received pointer offset value in range	ETS 300 417-1-1 [1] annex B	m	
5	The **AIS_ind event** corresponds to a received pointer word set to 11111111 11111111 (FF FF Hex)	ETS 300 417-1-1 [1] annex B	m	
6	The **inc_ind event** corresponds to a received pointer word with: NDF disabled AND ss-bits set to 10 (indicating AU-4) AND majority of I-bits inverted AND no majority of D-bits inverted	ETS 300 417-1-1 [1] annex B	m	
7	The **inv_point event** corresponds to any other received pointer word: NOT norm_point AND NOT NDF_enable AND NOT AIS_ind AND NOT ((inc_ind OR dec_ind) AND NORM_state)	ETS 300 417-1-1 [1] annex B	m	
8	The **new_point event** corresponds to a received pointer word with: NDF disabled AND ss-bits set to 10 (indicating AU-4) AND received pointer offset value in range but not equal to active offset value	ETS 300 417-1-1 [1] annex B	m	
9	The remaining six **NDF codes** ("0000", "0011", "0101", "1010", "1100", "1111") result in an **inv_pointer** indication.	ETS 300 417-1-1 [1] annex B	m	
10	The **8*NDF_enable event** corresponds to 8 consecutive NDF_enable events.	ETS 300 417-1-1 [1] annex B	m	
11	The **3*AIS_ind** corresponds to three consecutive AIS_ind events.	ETS 300 417-1-1 [1] annex B	m	
12	The **8*inv_point event** corresponds to 8 consecutive inv_point events.	ETS 300 417-1-1 [1] annex B	m	
13	The **3*any_point** corresponds to the following combination of events: 3*NOT NDF_enable AND NOT 3*AIS_ind AND NOT 3*new_point	ETS 300 417-1-1 [1] annex B	m	
14	The **3*new_point** corresponds to three consecutive equal new_point events.	ETS 300 417-1-1 [1] annex B	m	

Table C.36: Operation in NORM state

Prerequisite: C.1/5 -- MS1/S4_A_Sk present

Item	Operation in NORM state	Reference	Status	Support
1	Reception: inc_ind Transition to state: INC Action: increment active offset	ETS 300 417-1-1 [1] annex B	m	
2	Reception: dec_ind Transition to state: DEC Action: decrement active offset	ETS 00 417-1-1 [1] annex B	m	
3	Reception: NDF_enable Transition to state: NDF Action: accept new offset	ETS 300 417-1-1 [1] annex B	m	
4	Reception: 3*new_point Transition to state: NORM Action: accept new offset	ETS 300 417-1-1 [1] annex B	m	
5	Reception: 8*inv_point Transition to state: LOP Action: offset undefined	ETS 300 417-1-1 [1] annex B	m	
6	Reception: 3*AIS_ind Transition to state: AIS Action: offset undefined	ETS 300 417-1-1 [1] annex B	m	

Table C.37: Operation in INC state

Prerequisite: C.1/5 -- MS1/S4_A_Sk present

Item	Operation in INC state	Reference	Status	Support
1	Reception: 3*new_point Transition to state: NORM Action: accept new offset	ETS 300 417-1-1 [1] annex B	m	
2	Reception: 3*AIS_ind Transition to state: AIS Action: offset undefined	ETS 300 417-1-1 [1] annex B	m	
3	Reception: 3*any_point Transition to state: NORM Action: none	ETS 300 417-1-1 [1] annex B	m	
4	Reception: NDF_enable Transition to state: NDF Action: accept new offset	ETS 300 417-1-1 [1] annex B	m	

Table C.38: Operation in DEC state

Prerequisite: C.1/5 -- MS1/S4_A_Sk present

Item	Operation in DEC state	Reference	Status	Support
1	Reception: 3*new_point Transition to state: NORM Action: accept new offset	ETS 300 417-1-1 [1] annex B	m	
2	Reception: 3*AIS_ind Transition to state: AIS Action: offset undefined	ETS 300 417-1-1 [1] annex B	m	
3	Reception: 3*any_point Transition to state: NORM Action: none	ETS 300 417-1-1 [1] annex B	m	
4	Reception: NDF_enable Transition to state: NDF Action: accept new offset	ETS 300 417-1-1 [1] annex B	m	

Table C.39: Operation in NDF state

Prerequisite: C.1/5 -- MS1/S4_A_Sk present

Item	Operation in NDF state	Reference	Status	Support
1	Reception: 3*new_point Transition to state: NORM Action: accept new offset	ETS 300 417-1-1 [1] annex B	m	
2	Reception: 3*AIS_ind Transition to state: AIS Action: offset undefined	ETS 300 417-1-1 [1] annex B	m	
3	Reception: 3*any_point Transition to state: NORM Action: none	ETS 300 417-1-1 [1] annex B	m	
4	Reception: FO_discont Transition to state: NDF Action: accept new offset	ETS 300 417-1-1 [1] annex B	m	
5	Reception: 8*NDF_enable Transition to state: LOP Action: offset undefined	ETS 300 417-1-1 [1] annex B	m	

Table C.40: Operation in LOP state

Prerequisite: C.1/5 -- MS1/S4_A_Sk present

Item	Operation in LOP state	Reference	Status	Support
1	Reception: 3*new_point Transition to state: NORM Action: accept new offset	ETS 300 417-1-1 [1] annex B	m	
2	Reception: 3*AIS_ind Transition to state: AIS Action: offset undefined	ETS 300 417-1-1 [1] annex B	m	

Table C.41: Operation in AIS state

Prerequisite: C.1/5 -- MS1/S4_A_Sk present

Item	Operation in AIS state	Reference	Status	Support
1	Reception: 3*new_point Transition to state: NORM Action: accept new offset	ETS 300 417-1-1 [1] annex B	m	
2	Reception: 3*AIS_ind Transition to state: AIS Action: offset undefined	ETS 300 417-1-1 [1] annex B	m	
3	Reception: 8*inv_point Transition to state: LOP Action: offset undefined	ETS 300 417-1-1 [1] annex B	m	
4	Reception: NDF_enable Transition to state: NDF Action: accept new offset	ETS 300 417-1-1 [1] annex B	m	

Table C.42: Pointer interpretation: complements

Prerequisite: C.1/5 -- MS1/S4_A _Sk present

Item	Pointer interpretation: complements	Reference	Status	Support
1	Non-consecutive invalid indications do not activate the transition to the LOP_state.	ETS 300 417-1-1 [1] annex B	m	
2	The pointer processor maintains its current phase on detection of an invalid pointer and searches in parallel for a new phase.	9.3.2, 9.3.4	m	
3	The reception of 3*new_point takes precedence over any other events.	ETS 300 417-1-1 [1] annex B	m	
4	The second and third offset value received in 3*new_point needs to be identical with the first.	ETS 300 417-1-1 [1] annex B	m	
5	The "consecutive new_point" counter is reset to zero on a change of state, except for transitions occurring among INC, DEC, NDF states and the NORM state.	ETS 300 417-1-1 [1] annex B	m	
6	The "consecutive inv_point counter" can be incremented in all states. The "consecutive inv_point" counter is not reset on a change of state.	ETS 300 417-1-1 [1] annex B	m	
7	The "consecutive AIS_ind" counter is not reset on a change of state.	ETS 300 417-1-1 [1] annex B	m	
8	The "consecutive NDF_enable" counter is reset to zero on a change of AIS to NDF state; otherwise the counter is not reset.	ETS 300 417-1-1 [1] annex B	m	

C.4.2.3.3 MS1 layer to S4 layer multiplexing and demultiplexing processes

Table C.43: Multiplexing

Prerequisite: C.1/4 -- MS1/S4_A_So present

Item	Multiplexing	Reference	Status	Support
1	Bytes allocated to the AU-4 pointer are multiplexed into MS1_AI.	5.3.1	m	
2	The VC-4 is multiplexed into MS1_AI according to the pointer generation algorithm.	5.3.1	m	

Table C.44: Demultiplexing

Prerequisite: C.1/5 -- MS1/S4_A_Sk present

Item	Demultiplexing	Reference	Status	Support
1	The AU-4 pointer is recovered from MS1_AI.	5.3.2	m	
2	The VC-4 is recovered from MS1_AI according to the pointer interpretation algorithm.	5.3.2	m	

C.4.2.4 MS1 layer to DCC layer adaptation functions: MS1/DCC_A_So and MS1/DCC_A_Sk

C.4.2.4.1 MS1 layer to DCC layer multiplexing and demultiplexing processes

Table C.45: Multiplexing

Prerequisite: C.1/8 -- MS1/DCC_A_So present

Item	Multiplexing	Reference	Status	Support
1	The DCC_CI data (576 kbit/s) are multiplexed into D4(6,1), D5(6,4), D6(6,7), D7(7,1), D8(7,4), D9(7,7), D10(8,1), D11(8,4), D12(8,7) bytes of the STM-1 frame.	5.3.3	m	

Table C.46: Demultiplexing

Prerequisite: C.1/9 -- MS1/DCC_A_Sk present

Item	Demultiplexing	Reference	Status	Support
1	The DCC_CI data (576 kbit/s) are demultiplexed from byte locations D4 to D12.	5.3.4	m	

C.4.2.5 MS1 layer to P0s layer adaptation functions: MS1/P0s_A_So and MS1/P0s_A_Sk

C.4.2.5.1 MS1 layer to P0s layer frequency justification and bitrate adaptation processes

Table C.47: Frequency justification and bitrate adaptation: principles

Prerequisite: C.1/10 -- MS1/P0s_A_So present

Item	Frequency justification and bitrate adaptation: principles	Reference	Status	Support
1	The MS1/ P0s _A_So function provides frequency justification and bitrate adaptation for a 64 kbit/s orderwire information stream. It takes P0s_CI as an unstructured bit-stream with a rate of 64 kbit/s ± 100 ppm and inserts it into the MSOH.	5.3.5	m	

Table C.48: Frequency justification and bitrate adaptation

Prerequisite: C.1/10 -- MS1/P0s_A_So present

Item	Frequency justification and bitrate adaptation	Reference	Status	Support
1	The MS1/P0s_A_So function provides for an elastic store (slip buffer) process. The data and frame start signals are written into the store under control of the associated input clock. The data and frame start signals are read out of the store under control of the STM-1 clock, frame position and justification decision.	5.3.6	m	
2	Each justification decision results in a corresponding negative/positive justification action. Upon a positive justification (slip) action, the reading of one 64 kbit/s octet (9 bits) is cancelled once. Upon a negative justification (slip) action, the same 64 kbit/s octet (9 bits) is read out a second time.	5.3.6	m	
3	The elastic store (slip buffer) size accommodates at least 18 µs of wander without introducing errors is at least 2 octets.	5.3.6	m	

C.4.2.5.2 MS1 layer to P0s layer multiplexing and demultiplexing processes

Table C.49: Multiplexing

Prerequisite: C.1/10 -- MS1/P0s_A_So present

Item	Multiplexing	Reference	Status	Support
1	The P0s_CI data (64 kbit/s) are multiplexed into E2(9,7) byte of the STM-1 frame.	5.3.5	m	

Table C.50: Demultiplexing

Prerequisite: C.1/11 -- MS1/P0s_A_Sk present

Item	Demultiplexing	Reference	Status	Support
1	The P0s_ CI data (64 kbit/s) are demultiplexed from byte location E2.	5.3.6	m	

C.4.3 MS1 linear trail protection transmission tables

Table C.51: Protection operation

Prerequisite: C.1/12 OR C.1/13 -- STM-1 linear trail protection supported

Item	Protection operation	Reference	Status	Support
1	The APS channel is a 13 bits channel carried into bits K1[1-8] and K2[1-5].	5.5.1.1, 5.5.1.2, A.1	c5101	
2	The signal switching procedure is started under Signal Fail (SF) or Signal Degrade (SD) conditions.	5.5.1.1, 5.5.1.2, A.1	m	
3	In revertive operation the available external commands are LO, FSw-#1, MSw-#1, CLR, EXER-#1.	5.5.1.1, 5.5.1.2, A.1	c5102	
4	In non-revertive operation the available external commands are LO or FSw, FSw-#i, MSw, MSw-#i, CLR, EXER-#i.	5.5.1.1, 5.5.1.2, A.1	c5103	
5	In revertive operation the available external commands are LO, FSw-#i, MSw-#i, CLR, EXER-#i.	5.5.1.1, 5.5.1.2, A.1	c5104	
6	Extra Traffic is supported	5.5.1.2, A.1	c5105	
7	The Wait-To-Restore (WTR) time is provisionable	5.5.1.1, 5.5.1.2	c5106	

c5101: IF (C.2/3 OR C.2/4 OR C.2/5)THEN m ELSE o -- bi-directional switching supported
c5102: IF (C.2/1 OR C.2/3) THEN m ELSE n/a -- 1+1 revertive operation supported
c5103: IF (C.2/2 OR C.2/4) THEN m ELSE n/a -- 1+1 non-revertive operation supported
c5104: IF C.1/13 THEN m ELSE n/a -- 1:n protection architecture supported
c5105: IF C.1/13 THEN o ELSE n/a -- 1:n protection architecture supported
c5106: IF (C.2/1 OR C.2/3 OR C.2/5)THEN m ELSE n/a -- revertive operation supported

Comments: The Linear Protection Switching Operation is generically described in annex A of ETS 300 417-3-1 [2].

Table C.52: Protection architecture characteristic parameters

Prerequisite: C.1/12 OR C.1/13 -- STM-1 linear trail protection supported

Item	Protection architecture characteristic parameters	Reference	Status	Support	Values	
					Allowed	Supported
1	Working trails: n value.	5.5.1.2, A.1	c5201		$1 \leq n \leq 14$	
2	Wait-To-Restore (WTR) time: X value	5.5.1.1, 5.5.1.2, A.1	c5202		$0 \leq X \leq 12$ minutes	
3	Switching time: Y value	5.5.1.1, 5.5.1.2, A.1	m		$0 \leq Y \leq$ 50 ms	

c5201: IF C.1/16 THEN m ELSE n/a -- 1:n protection architecture supported
c5202: IF (C.2/1 OR C.2/3 OR C.2/5)
THEN m ELSE n/a -- revertive operation supported

Table C.53: Automatic Protection Switch (APS) channel bits structure

Prerequisite: C.51/1 -- APS channel supported

Item	APS channel bits structure	Reference	Status	Support
1	The request type is transported in K1[1-4] bits of the APS channel.	A.7.2, figure A.3	m	
2	The request signal number is transported in K1[4-8] bits of the APS channel.	A.7.2, figure A.3	m	
3	The local bridged signal number is transported in K2[1-4] bits of the APS channel.	A.7.2, figure A.3	m	
4	The architecture type is transported in K1[5] bit of the APS channel.	A.7.2, figure A.3	m	

Table C.54: APS signal fields

Prerequisite: C.51/1 -- APS channel supported

Item	APS signal fields	Reference	Status	Support
1	The content of the request type field conforms to table A.3 (subclause A.7.1) of annex A in ETS 300 417-3-1 [2].	A.7.1, table A.3	m	
2	The content of the request signal number field conforms to table A.4 (subclause A.7.1) of annex A in ETS 300 417-3-1 [2].	A.7.1, table A.4	m	
3	The content of the local bridged signal number field conforms to table A.5 (subclause A.7.1) of annex A in ETS 300 417-3-1 [2].	A.7.1, table A.5	m	
4	The content of the architecture type field conforms to table A.6 (subclause A.7.1) of annex A in ETS 300 417-3-1 [2].	A.7.1, table A.6	m	

C.4.3.1 MS1 linear trail protection connection functions: MS1P1+1_C and MS1P1:n_C

Table C.55: Connectivity functionalities: generalities

Prerequisite: C.3/1-- MS Protection Connection function present

Item	Connectivity functionalities: generalities	Reference	Status	Support
1	The MS1P1+1_C connection function performs the STM-1 linear multiplex section protection process for 1+1 protection architectures.	5.5.1.1	c5501	
2	The MS1P1+1_C connection function performs the bridge and selector functionality.	5.5.1.1	c5501	
3	The MS1P1:n_C connection function performs the STM-1 linear multiplex section protection process for 1:n protection architectures.	5.5.1.2	c5502	
4	The MS1P1:n_C connection function performs the bridge and selector functionality.	5.5.1.2	c5502	
5	Provided no protection switching action is activated/required it is possible to change between switching types without disturbing the CI passing the connection.	5.5.1.1, 5.5.1.2	c5503	
6	Provided no protection switching action is activated/required it is possible to change between operation types without disturbing the CI passing the connection.	5.5.1.1, 5.5.1.2	c5504	
7	Provided no protection switching action is activated/required it is possible to change the WTR time without disturbing the CI passing the connection.	5.5.1.1, 5.5.1.2	c5505	
8	The priority associated to SD for both protection and working sections is fixed high.	5.5.1.1	c5501	
9	The priority associated to SF for both protection and working sections is fixed high.	5.5.1.1	c5501	
10	The switching type (uni- or bi-directional) is provisionable from the EMF	5.5.1.1	c5501	
11	The priority associated to SD (high or low) for each working section is provisionable from the EMF. The priority associated to SD for the protection section is fixed high.	5.5.1.2	c5502	
12	The priority associated to SF (high or low) for each working section is provisionable from the EMF. The priority associated to SF for the protection section is fixed high.	5.5.1.2	c5502	
13	The switching type (uni- or bi-directional) is provisionable from the EMF	5.5.1.2	c5503	
14	The operation type (revertive or non revertive) is provisionable from the EMF	5.5.1.1	c5504	
15	The use of extra traffic (true or false) is provisionable from the EMF	5.5.1.2	c5506	

c5501: IF C.1/12 THEN m ELSE n/a -- 1+1 protection architecture supported
c5502: IF C.1/13 THEN m ELSE n/a -- 1:n protection architecture supported
c5503: IF (C.2/1 OR C.2/2) AND (C.2/3 OR C.2/4) THEN m ELSE n/a -- both unidirectional and bi-directional switching supported
c5504: IF (C.2/1 OR C.2/3) AND (C.2/2 OR C.2/4) THEN m ELSE n/a -- both revertive and non- revertive operation supported
c5505: IF C.51/7 THEN m ELSE n/a -- WTR time programmable
c5506: IF C.51/6 THEN m ELSE n/a -- 1:n architecture with extra traffic supported

Table C.56: Connectivity functionalities: source direction

Prerequisite: C.3/1-- MS Protection Connection function present

Item	Connectivity functionalities: source direction	Reference	Status	Support
1	The working outputs are connected to the associated normal inputs for 1+1 protection.	5.5.1.1	c5601	
2	The protection output is connected to the normal #1 input.	5.5.1.1	c5601	
3	The working outputs are connected to the associated normal inputs for 1:n protection.	5.5.1.2	c5602	
4	The protection output is unsourced (no input connected), connected to the extra traffic input, or connected to any normal input.	5.5.1.2	c5602	

c5601: IF C.1/12 THEN m ELSE n/a -- 1+1 protection architecture supported
c5602: IF C.1/13 THEN m ELSE n/a -- 1:n protection architecture supported IF

Table C.57: Connectivity functionalities: sink direction

Prerequisite: C.3/1-- MS Protection Connection function present

Item	Connectivity functionalities: sink direction	Reference	Status	Support
1	The signal output at the normal #1 reference point can be the signal received via either the associated working #1 section or the protection section for 1+1 protection.	5.5.1.1	c5701	
2	The signal output at the normal #i reference point can be the signal received via either the associated working #i section or the protection section for 1:n protection.	5.5.1.2	c5702	

c5701: IF C.1/12 THEN m ELSE n/a -- 1+1 protection architecture supported
c5702: IF C.1/13 THEN o ELSE n/a -- 1:n protection architecture supported IF

C.4.3.2 MS1 linear protection trail termination functions: MS1P_TT_So and MS1P_TT_Sk

Table C.58: Trail termination process

Prerequisite: C.3/2 OR C.3/3 -- MS1P_TT_So and/or MS1P_TT_Sk function present

Item	Trail termination process	Reference	Status	Support
1	The MS1_AI at the output of the MS1P_TT_So is identical to the MS1P_CI at its input.	5.5.2.1	c5801	
2	The MS1P_TT_Sk function reports the state of the protected MS1 trail.	5.5.2.2	c5802	
3	In case all connections are unavailable the MS1P_TT_Sk reports the signal fail condition of the protected trail.	5.5.2.2	c5802	

c5801: IF C.3/2 THEN m ELSE n/a -- MS1P_TT_So function supported
c5802: IF C.3/3 THEN m ELSE n/a -- MS1P_TT_Sk function supported

C.4.3.3 MS1 linear trail protection adaptation functions: MS1/MS1P_A_So and MS1/MS1P_A_Sk

C.4.3.3.1 MS1 layer to MS1 protection layer multiplexing and demultiplexing processes

Table C.59: Multiplexing

Prerequisite: C. 3/4 -- MS1/MS1P_A_So present

Item	Multiplexing	Reference	Status	Support
1	The MS1/MS1P_A_So multiplexes the MS1 APS signal and MS1 data signal into the MS1_AI of the Protection Section.	5.5.3.1	m	

Table C.60: Demultiplexing

Prerequisite: C.3/5 -- MS1/MS1P_A_Sk present

Item	Demultiplexing	Reference	Status	Support
1	The MS1/MS1P_A_Sk extracts the MS1P_CI_D signal from the MS1_AI_D signal.	5.5.3.2	m	
2	The MS1/MS1P_A_Sk extracts the MS1 APS signal from the MS1_AI.	5.5.3.2	m	

Table C.61: APS channel processing: sink direction

Prerequisite: C.2/3 OR C.2/4 OR C.2/5 -- -- bi-directional switching supported

Item	APS channel processing: sink direction	Reference	Status	Support
1	A new value for the APS message is accepted when the value of the 13 APS bits is identical for three consecutive frames. This value is output via MS1P_CI_APS.	5.5.3.2	m	
2	The APS signal processing is performed only on the Protection Section.	5.5.3.2	m	

C.4.3.4 MS1 linear trail protection processes

C.4.3.4.1 Automatic Protection Switching (APS) externally initiated commands

Table C.62: Issuing of External Switching Commands

Prerequisite: C.1/12 OR C.1/13 -- at least one STM-1 linear trail protection scheme supported

Item	Issuing of External Switching Commands	Reference	Status	Support
1	The external commands are received from the EMF.	ETS 300 746 [15] subclause 5.1.2.1	m	

Table C.63: Transmission of external switching requests

Prerequisite: C.62/1 -- External Switching Command issuing is supported

Item	Transmission of external switching requests	Reference	Status	Support
1	The external requests are issued via the APS bytes.	ETS 300 746 [15] subclause 5.1.2.1	c6301	
2	The external requests are issued via the EMF.	ETS 300 746 [15] subclause 5.1.2.1	c6301	

c6301: IF (C.2/3 OR C.2/4 OR C.2/5)
THEN o.6301 ELSE o -- bi-directional switching supported
o.6301: It is mandatory to support exactly one of these items -- Transmission of external bridge request is supported by one of the allowed ways.

Table C.64: External switching commands

Prerequisite: C.62/1 -- External switching command issuing is supported

Item	External switching commands	Reference	Status	Support
1	The external command Clear (CLR) conforms to the definition given in the whole point 1) clause A.2 of annex A in ETS 300 417-3-1 [2].	A.2	m	
2	The external command Lockout of Protection (LO) conforms to the definition given in the whole point 2) clause A.2 of annex A in ETS 300 417-3-1 [2].	A.2	m	
3	The external command Forced Switch #i (FSw-#i) conforms to the definition given in the whole point 3) of clause A.2 of annex A in ETS 300 417-3-1 [2].	A.2	m	
4	The external command Manual Switch #i (MSw-#i) conforms to the definition given in the whole point 4) clause A.2 of annex A in ETS 300 417-3-1 [2].	A.2	m	
5	The external command Exercise #i (EXER #i) conforms to the definition given in the whole point 5) clause A.2 of annex A in ETS 300 417-3-1 [2].	A.2	m	
6	The descending order of priority for external switching commands is: CLR, LO, FSw-#i, MSw-#i, EXER #i.	A.2	m	

C.4.3.4.2 Automatic Protection Switching (APS) automatically initiated commands

Table C.65: Automatic Generation of Requests

Prerequisite: C.1/12 OR C.1/13 -- STM-1 Linear Trail Protection scheme supported

Item	Automatic Generation of Requests	Reference	Status	Support
1	The NE initiates the following automatic requests: Signal Failure (SF), Signal Degrade (SD).	ETS 300 746 [15] subclause 5.1.2.2	m	
2	The NE initiates the following automatic requests: Reverse Request (RR).	ETS 300 746 [15] subclause 5.1.2.2	c6501	
3	The NE initiates the following automatic requests: Wait To Restore (WTR).	ETS 300 746 [15] subclause 5.1.2.2	c6502	

c6501: IF (C.2/3 OR C.2/4 OR C.2/5) THEN m ELSE x -- dual-ended switching supported
c6502: IF (C.2/1 OR C.2/3 OR C.2/5) THEN m ELSE x -- revertive switching supported

Table C.66: Transmission of automatically generated requests

Prerequisite: C.1/12 OR C.1/13 -- STM-1 linear trail protection scheme supported

Item	Transmission of automatically generated requests	Reference	Status	Support
1	The automatically generated requests are issued via the APS bytes.	ETS 300 746 [15] subclause 5.1.2.2	c6601	

c6601: IF (C.2/3 OR C.2/4 OR C.2/5)
THEN m ELSE o -- bi-directional switching supported

Table C.67: Automatically generated requests

Prerequisite: C.1/12 OR C.1/13 -- STM-1 linear trail protection scheme supported

Item	Automatically generated requests	Reference	Status	Support
1	In the Wait-To-Restore (WTR) state the operation is such that in the revertive mode of operation, the normal signal will be restored when the working trail has recovered from the fault.	A.4	c6701	
2	An SF or SD condition will override the WTR.	A.4	c6701	
3	After the WTR period is completed, a No Request state will be entered.	A.4	c6701	
4	In the Reverse Request state the operation is such that for the case of bi-directional switching, a reverse request is returned for exerciser and for all other requests of higher priority.	A.4	c6702	
5	In unidirectional switching, Reverse Request is never indicated.	A.4	c6703	
6	In the Do not Revert state the operation is such that in the non-revertive mode of operation, assuming the normal signal is on protection when the working trail is repaired or a switch command is released, the tail end maintains the selection and issues Do not Revert for normal signal 1.	A.4	c6704	
7	For the case of bi-directional switching, the head end also maintains the selection and continues indicating reverse request.	A.4	c6705	
8	The Do not Revert is removed when pre-empted by a defect condition or an external request.	A.4	c6704	
9	In the No Request state none of the trail signal conditions is active, none of the external commands is active, and none of the states described above is active.	A.4	m	

c6701: IF (C.2/1 OR C.2/3 OR C.2/5) THEN m ELSE n/a --revertive operation supported
c6702: IF (C.2/3 OR C.2/4 OR C.2/5) THEN m ELSE n/a --bi-directional switching supported
c6703: IF (C.2/1 OR C.2/2) THEN m ELSE n/a --unidirectional operation supported
c6704: IF (C.2/2 OR C.2/4) THEN m ELSE n/a --non-revertive operation supported
c6705: IF C.2/4 THEN m ELSE n/a --non-revertive and bi-directional switching supported

C.4.3.4.3 Automatic Protection Switching (APS) generalities

Table C.68: Allocation of extra traffic

Item	Allocation of extra traffic	Reference	Status	Support
1	Extra traffic is allocated to the protection trail when this one is not transporting a normal signal and the protection trail is not "locked out".	A.5	c6801	

c6801: IF C.51/6 THEN m ELSE n/a -- Extra traffic supported

Table C.69: Priority of request types

Prerequisite: C.1/12 -- STM-1 linear trail protection supported

Item	Priority of request types	Reference	Status	Support
1	The priority of request types conforms to the priority order given in table A.2 (clause A.6) of annex A in ETS 300 417-3-1 [2].	A.6, table A.2	m	

C.4.3.4.4 Automatic Protection Switching (APS) switch performance

Table C.70: Switch completion time

Prerequisite: C.1/12 OR C.1/13 -- STM-1 Linear Trail Protection scheme supported

Item	Switch completion time	Reference	Status	Support
1	The switch completion time is less than 50 ms.	A.8	m	

C.4.3.4.5 Automatic Protection Switching (APS) subprocesses

Table C.71: Signal request process

Prerequisite: C.1/12 OR C.1/13 -- STM-1 linear trail protection scheme supported

Item	Signal request processes	Reference	Status	Support
1	The SRSN is "0" (zero) for the protection trail and "i" ($1 \leq i \leq n$) for working trail #i.	A.9	m	
2	The SRT is generated based on the inputs SF, SD, SFpriority, SDpriority, as specified in the clause "Signal request (type & signal number) processes" in clause A.9 of annex A in ETS 300 417-3-1 [2].	A.9	m	

Comments: The signal request process transfers the input SF and SD signals from a trail into a Signal Request Type (SRT) and Signal Request Signal Number (SRSN).

Table C.72: External request process

Prerequisite: C.1/12 OR C.1/13 -- STM-1 linear trail protection scheme supported

Item	External request processes	Reference	Status	Support
1	The ERSN is "0" (zero) if no normal signal is indicated, "i" ($1 \leq i \leq nmax$) for normal signal #i, and "nmax+1" for the extra traffic signal.	A.9	m	
2	The ERT/ERN is generated as specified in the clause "External request (type & signal number) processes" in clause A.9 of annex A in ETS 300 417-3-1 [2].	A.9	m	

Comments: The external request process transfers the external commands (EXTCMD) into an External Request Type (ERT) and External Request Signal Number (ERSN).

Table C.73: Local request priority process

Prerequisite: C.1/12 OR C.1/13 -- STM-1 linear trail protection scheme supported

Item	Local request priority processes	Reference	Status	Support
1	The status of the protection and working input signals (SRT/SRSN #0 to SRT/SRSN #n), the external command (ERT/ERSN), and protection parameters OPERtype and EXTRAtraffic is evaluated by a three step priority logic as specified in the clause "Local request (type & signal number) priority processes" in clause A.9 of annex A in ETS 300 417-3-1 [2].	A.9	m	

Comments: The local request priority process determines the highest priority local request.

Table C.74: Global request priority process

Prerequisite: C.1/12 OR C.1/13 -- STM-1 linear trail protection scheme supported

Item	Global request priority processes	Reference	Status	Support
1	The local request (LRT,LRSN) and the remote request (RRT,RRSN) are compared to decide which has priority, according to the descending order of priorities in table A.2 of annex A in ETS 300 417-3-1 [2].	A.9	c7401	
2	A received reverse request is not considered in the comparison.	A.9	c7401	
3	The Global Request Type (GRT) and Global Request Signal Number (GRSN) is determined as specified in the clause "Global request (type & signal number) priority processes" in clause A.9 of annex A in ETS 300 417-3-1 [2].	A.9	m	

c7401: IF (C.2/3 OR C.2/4 OR C.2/5)
THEN m ELSE n/a -- bi-directional switching supported

Comments: The global request priority process determines the Global Request Type (GRT) and Global Request Signal Number (GRSN).

Table C.75: Bridge control process

Prerequisite: C.1/12 OR C.1/13 -- STM-1 linear trail protection scheme supported

Item	Bridge control process	Reference	Status	Support
1	The bridge control process is performed as specified in the clause "Bridge control process" in clause A.9 of annex A in ETS 300 417-3-1 [2].	A.9	m	

Comments: The bridge control process controls which of the normal/extra traffic signals is bridged to the protection trail.

Table C.76: Control of the selector

Prerequisite: C.1/12 OR C.1/13 -- STM-1 linear trail protection scheme supported

Item	Control of the selector	Reference	Status	Support
1	The control of the selector is performed as specified in the clause "Control of the selector" in clause A.9 of annex A in ETS 300 417-3-1 [2].	A.9	m	

Comments: The control of the selector controls which of the normal/extra traffic signals is connected to/extracted from the protection trail.

C.4.3.4.6 Automatic Protection Switching (APS) signal generation

Table C.77: APS generation process

Prerequisite: C.1/12 OR C.1/13 -- STM-1 linear trail protection scheme supported

Item	APS generation process	Reference	Status	Support
1	The Global Request Type (GRT) is translated into the transmitted Request Type (TxRT) in accordance to table A.8 (clause A.9) of annex A in ETS 300 417-3-1 [2].	A.9	c7701	
2	The transmitted Request Signal Number (TxRSN) equals the Global Request Signal Number (GRSN).	A.9	c7701	
3	The transmitted Local Bridged Signal Number (TxLBSN) is set to '0' if the Remote Request Signal Number (RRSN) equals '0' else it is set to the Local Bridged Signal Number (LBSN) value.	A.9	c7701	
4	The transmitted (TxARCH) is set to "1" (one) if the Architecture type (ARCHtype) is 1:n else it is set to "0" (zero).	A.9	c7701	

c7701: IF (C.2/3 OR C.2/4 OR C.2/5)
THEN m ELSE o -- bi-directional switching supported

Comments: The APS generation process translates the signals Global Request Type (GRT), Global Request Channel Number (GRSN), Local Bridged Signal Number (LBSN) and local Architecture type (ARCHtype) into a transmitted APS signal

C.4.3.4.7 Automatic Protection Switching (APS) signal interpretation

Table C.78: APS interpretation process

Prerequisite: C.1/12 OR C.1/13 -- STM-1 linear trail protection scheme supported

Item	APS interpretation process	Reference	Status	Support
1	The accepted Request Type (AcRT) is translated into the Remote Request Type (RRT) in accordance to table A.7 (clause A.9) of annex A in ETS 300 417-3-1 [2].	A.9	c7801	
2	The Remote Request Signal Number (RRSN) equals the accepted Request Signal Number (AcRSN).	A.9	c7801	
3	The Remote Bridged Signal Number (RBSN) equals the accepted Local Bridged Signal Number (AcLBSN).	A.9	c7801	
4	The Remote Architecture type (RARCH) equals the accepted Architecture type (AcARCH).	A.9	c7801	

c7801: IF (C.2/3 OR C.2/4 OR C.2/5)
THEN m ELSE o -- bi-directional switching supported

Comments: The APS interpretation process translates the accepted APS signal into the signals Remote Request Type (RRT), Remote Request Signal Number (RRSN), Remote Bridged Signal Number (RBSN) and Remote Architecture type (RARCH).

Table C.79: Use of the accepted APS message

Prerequisite: C.1/14 OR C.1/15 -- STM-16 Linear Trail Protection supported

Item	Use of the accepted APS message	Reference	Status	Support
1	The accepted Request Type, Remote Request Signal Number, Remote Bridged Signal Number and Remote Architecture type are used for protection switching operation.	A.9	c7901	

c7901: IF (C.2/3 OR C.2/4 OR C.2/5)
THEN m ELSE x -- bi-directional switching supported

C.4.3.4.8 Automatic Protection Switching (APS) status report

Table C.80: APS reporting process

Prerequisite: C.1/12 OR C.1/13 -- STM-1 linear trail protection scheme supported

Item	APS reporting process	Reference	Status	Support
1	The active external request are reported to the Equipment Management Function (EMF).	A.9	m	
2	The active local request are reported to the Equipment Management Function (EMF).	A.9	m	
3	The active remote request are reported to the Equipment Management Function (EMF).	A.9	c8001	
4	The reason of denial of an external command are reported to the Equipment Management Function (EMF).	A.9	m	
5	The condition (SF,SD) of the working and protection trails are reported to the Equipment Management Function (EMF).	A.9	m	

c8001: IF (C.2/3 OR C.2/4 OR C.2/5)
THEN m ELSE o -- bi-directional switching supported

C.4.4 MS1 layer defect, fault and performance monitoring tables

C.4.4.1 Port status management

Table C.81: Trail termination point mode process

Prerequisite: C.1/3 -- MS1_TT_Sk function present

Item	Trail Termination point mode process	Reference	Status	Support
1	The Trail Termination Point Mode supports "not monitored" (NMON) status	ETS 300 417-1-1 [1] subclause 8.5	m	
2	The Trail Termination Point Mode supports "monitored" (MON) status	ETS 300 417-1-1 [1] subclause 8.5	m	
3	The Trail Termination Point Mode status is provisionable by the EMF.	5.2.2	m	

C.4.4.2 Defect detection and clearance criteria

Table C.82: MS1 Alarm Indication Signal defect (MS1 dAIS)

Prerequisite: C.1/3 -- MS1_TT_Sk function present

Item	MS1 Alarm Indication Signal defect (MS1 dAIS)	Reference	Status	Support
1	The MS1 dAIS is detected if at least *x* consecutive frames contain the '111' pattern in bits 6, 7 and 8 of the K2 byte.	5.2.2	m	
2	The MS1 dAIS is cleared if in at least *x* consecutive frames any pattern other than '111' is detected in bits 6, 7 and 8 of the K2 byte.	5.2.2	m	

Table C.83: MS1 dAIS parameters value

Prerequisite: C.1/3 -- MS1_TT_Sk function present

Item	MS1 dAIS parameters value	Reference	Status	Support	Values	
					Allowed	Supported
1	MS1 dAIS threshold: *x* parameter	5.2.2	m		$3 \leq x \leq 5$	

Table C.84: Remote Defect Indication (RDI) defect (dRDI)

Prerequisite: C.1/3 -- MS1_TT_Sk function present

Item	Remote Defect Indication (RDI) defect (dRDI)	Reference	Status	Support
1	The MS1 RDI defect is detected if *5* consecutive frames contain the '110' pattern in bits 6, 7 and 8 of the K2 byte.	ETS 300 417-1-1 [1] subclause 8.2.1.5	m	
2	The MS1 RDI defect is cleared if in *5* consecutive frames any pattern other than '110' is detected in bits 6, 7 and 8 of the K2 byte.	ETS 300 417-1-1 [1] subclause 8.2.1.5	m	
3	The MS1 RDI defect is cleared during reception of an RS1 aSSF.	ETS 300 417-1-1 [1] subclause 8.2.1.5	m	

Table C.85: Trail performance monitoring

Prerequisite: C.1/3 -- MS1_TT_Sk function present

Item	Trail performance monitoring	Reference	Status	Support
1	An MS1 near-end block is errored if one or more EDC Violations (EDCV) - BIP-24 parity - are detected.	5.2.2	m	
2	The EDCV process assumes "zero" EDCVs in the incoming all "1s" (AIS) signal during reception of Server Signal Fail (aSSF) from the server layer.	5.2.2	m	

Table C.86: Degraded defect (dDEG)

Prerequisite: C.1/3 -- MS1_TT_Sk function present

Item	Degraded defect (dDEG)	Reference	Status	Support
1	Once every second, MS1 pNEBC is compared with DEGTHR.	5.2.2	m	
2	If MS1 pNEBC>=DEGTHR the corresponding second is declared BAD, otherwise it is declared GOOD.	5.2.2	m	
3	The MS1 dDEG is detected if M consecutive BAD seconds have occurred.	5.2.2	m	
4	The MS1 dDEG is cleared if M consecutive GOOD seconds have occurred.	5.2.2		
5	The MS1 dDEG is cleared during reception of an RS1 aSSF.	5.2.2		
6	The DEGTHR parameter is provisionable by the EMF.	5.2.2	m	
7	The DEGM parameter is provisionable by the EMF.	5.2.2	m	

Table C.87: DEG defect parameters value

Prerequisite: C.1/3 -- MS1_TT_Sk function present

Item	DEG defect parameters	Reference	Status	Support	Values	
					Allowed	Supported
1	MS1 dDEG DEGTHR parameter	5.2.2	c8701		0< DEGTHR ≤ 8 000	
2	MS1 dDEG M parameter	5.2.2	c8702		2 ≤ M ≤ 10	

c8701: IF C.86/6 THEN m ELSE n/a -- DEGTHR programmable
c8702: IF C.86/7 THEN m ELSE n/a -- DEGM programmable

Table C.88: AU-4 Alarm Indication Signal defect (AU4 dAIS)

Prerequisite: C.1/5 -- MS1/S4_A_Sk function present

Item	AU-4 Alarm Indication Signal defect (AU4 dAIS)	Reference	Status	Support
1	The AU4 dAIS is detected if the pointer interpreter enters the AIS_state.	5.3.2	m	
2	The AU4 dAIS is cleared if the pointer interpreter exits the AIS_state.	5.3.2	m	

Table C.89: Loss of Pointer defect (dLOP)

Prerequisite: C.1/5 -- MS1/S4_A_Sk function present

Item	Loss of Pointer defect (dLOP)	Reference	Status	Support
1	The High Order Path dLOP is detected if the pointer interpreter enters the LOP_state.	5.3.2	m	
2	The High Order Path dLOP is cleared if the pointer interpreter exits the LOP_state.	5.3.2	m	

C.4.4.3 Consequent action activation and clearance criteria

Table C.90: Alarm Indication Signal action (aAIS)

Item	Alarm Indication Signal action (aAIS)	Reference	Status	Support
1	The MS1_TT_Sk outputs an all "1s" signal within 250 µs upon MS1 dAIS detection.	5.2.2	c9001	
2	The MS1_TT_Sk outputs normal data within 250 µs when there is (are) no more defect(s) active.	5.2.2	c9001	
3	The MS1/S4_A_So outputs an all "1s" signal within 250 µs upon CI_SSF reception.	5.3.1	c9002	
4	The MS1/S4_A_So outputs normal data within 250 µs when there is (are) no more defect(s) active.	5.3.1	c9002	
5	The MS1/S4_A_Sk outputs an all "1s" signal within 250 µs upon AU4 dAIS detection.	5.3.2	c9003	
6	The MS1/S4_A_Sk outputs an all "1s" signal within 250 µs upon HO dLOP detection.	5.3.2	c9003	
7	The MS1/S4_A_Sk outputs normal data within 250 µs when there is (are) no more defect(s) active.	5.3.2	c9003	
8	The MS1/P0s_A_Sk outputs an all "1s" signal within 1 ms upon AI_TSF reception.	5.3.6	c9004	
9	The MS1/P0s_A_Sk outputs normal data within 1 ms when there is (are) no more defect(s) active.	5.3.6	c9004	

c9001: IF C.1/3 THEN m ELSE n/a -- MS1_TT_Sk present
c9002: IF C.1/4 THEN m ELSE n/a -- MS1/S4_A_So present
c9003: IF C.1/5 THEN m ELSE n/a -- MS1/S4_A_Sk present
c9004: IF C.1/11 THEN m ELSE n/a -- MS1/P0s_A_Sk present

Table C.91: Remote Defect Indication (RDI) defect action (aRDI)

Prerequisite: C.1/2 AND C.1/3 -- MS1_TT_So and MS1_TT_Sk function present

Item	Remote Defect Indication (RDI) defect action (aRDI)	Reference	Status	Support
1	The MS1_TT_Sk outputs an RDI request generation (RI_RDI) on MS1 dAIS detection.	5.2.2	m	
2	The MS1_TT_Sk clears the RDI request when there is (are) no more defect(s) active.	5.2.2	m	
3	The MS1_TT_So inserts the RDI code within 250 µs upon RI_RDI reception.	5.2.1	m	
4	The MS1_TT_So outputs normal data within 250 µs upon RI_RDI clearing.	5.2.1	m	

Table C.92: Remote Error Indication (REI) action (aREI)

Prerequisite: C.1/2 AND C.1/3 -- MS1_TT_So and MS1_TT_Sk function present

Item	Remote Error Indication (REI) action (aREI)	Reference	Status	Support
1	The MS1_TT_So inserts the REI value in the REI bits of the next frame.	5.2.1	m	

Table C.93: Server Signal Fail action (aSSF)

Prerequisite: C.1/5 OR C.1/9 -- MS1/S4_A_Sk and /or MS1/DCC_A_Sk function present

Item	Server Signal Fail action (aSSF)	Reference	Status	Support
1	The MS1/S4_A_Sk sets CI_SSF to TRUE on AU4 dAIS detection.	5.3.2	c9301	
2	The MS1/S4_A_Sk sets CI_SSF to TRUE on HO dLOP detection.	5.3.2	c9301	
3	The MS1/S4_A_Sk sets CI_SSF to FALSE when there is (are) no more defect(s) active.	5.3.2	c9301	
4	The MS1/DCC_A_Sk sets CI_SSF to TRUE on AI_TSF reception.	5.3.4	c9302	
5	The MS1/ DCC _A_Sk sets CI_SSF to FALSE when there is (are) no more defect(s) active.	5.3.4	c9302	
6	The MS1/P0s_A_Sk sets CI_SSF to TRUE on AI_TSF reception.	5.3.6	c9303	
7	The MS1/P0s _A_Sk sets CI_SSF to FALSE when there is (are) no more defect(s) active.	5.3.6	c9303	

c9301: IF C.1/5 THEN m ELSE n/a -- MS1/S4_A_Sk present
c9302: IF C.1/9 THEN m ELSE n/a -- MS1/DCC_A_Sk present
c9303: IF C.1/11 THEN m ELSE n/a -- MS1/P0s_A_Sk present

Table C.94: Trail Signal Fail action (aTSF)

Prerequisite: C.1/3 -- MS1_TT_Sk function present

Item	Trail Signal Fail action (aTSF)	Reference	Status	Support
1	The MS1_TT_Sk sets AI_TSF to TRUE on MS1 dAIS detection.	5.2.2	m	
2	The MS1_TT_Sk sets AI_TSF to FALSE when there is (are) no more defect(s) active.	5.2.2	m	

Table C.95: Trail Signal Degrade action (aTSD)

Prerequisite: C.1/3 -- MS1_TT_Sk function present

Item	Trail Signal Degrade action (aTSD)	Reference	Status	Support
1	If the dDEG is detected in the trail termination sink the aTSD is performed.	ETS 300 417-1-1 [1] subclause 8.2.2.6	m	
2	It ceases aTSD insertion after the dDEG defect is cleared.	ETS 300 417-1-1 [1] subclause 8.2.2.6	m	
3	The aTSD is equivalent to send the Signal Degrade (SD) signal as defined in the Automatic Protection Switching (APS).	ETS 300 417-1-1 [1] subclause 8.2.2.6	m	

C.4.4.4 Defect correlation

Table C.96: Defect correlation

Prerequisite: C.4/5 -- Defect correlation process supported

Item	Defect correlation	Reference	Status	Support
1	Under MS1 dAIS detection the MS1_TT_Sk generates a MS1 cAIS report if the port is in the monitoring state (MON) and no CI_SSF is received from the server layer.	5.2.2	c9601	
2	The MS1 cAIS is reported only if selected MS1 AIS_reported is set to TRUE by the NEM. By default MS1 AIS_reported is set to FALSE.	5.2.2	c9601	
3	Under MS1 dAIS detection the MS1_TT_Sk generates a MS1 cSSF report if the port is in the monitoring state (MON).	5.2.2	c9601	
4	The MS1 cSSF is reported only if selected MS1 SSF_reported is set to TRUE by the NEM. By default MS1 SSF_reported is set to FALSE.	5.2.2	c9601	
5	Under MS1 dRDI detection the MS1_TT_Sk generates a MS1 cRDI report if the port is in the monitoring state (MON).	5.2.2	c9601	
6	The MS1 cRDI is reported only if MS1 RDI_reported is set to TRUE by the NEM. By default MS1 RDI_reported is set to FALSE.	5.2.2	c9601	
7	Under MS1 dDEG detection the MS1_TT_Sk generates a MS1 cDEG report if the port is in the monitoring state (MON).	5.2.2	c9601	
8	Under AU4 dAIS detection the MS1/S4_A_Sk generates a AU4 cAIS report if the port is in the monitoring state (MON) and no AI_TSF is received from the MS1_TT_Sk.	5.3.2	c9602	
9	The AU4 cAIS is reported only if AU4 AIS _reported is set to TRUE by the NEM. By default AU4 cAIS_reported is set to FALSE.	5.3.2	c9602	
10	Under HO dLOP detection the MS1/S4_A_Sk generates a HO cLOP report.	5.3.2	c9602	
11	All the generated fault cause (cXXX) are reported to the EMF.	ETS 300 417-1-1 [1] subclause 8.1, figure 36	m	

c9601: IF C.1/3 THEN m ELSE n/a -- MS1_TT_Sk present
c9602: IF C.1/5 THEN m ELSE n/a -- MS1/S4_A_Sk present

C.4.4.5 Performance monitoring

C.4.4.5.1 Near end performance monitoring

Table C.97: pN_DS performance parameter

Prerequisite: C.4/1 -- Near-end performance monitoring process supported

Item	pN_DS performance parameter	Reference	Status	Support
1	The MS1_TT_Sk indicates a MS1 pN_DS every second with at least one occurrence of MS1 aTSF or an equipment defect (dEQ) and reports it to the EMF.	5.2.2	m	

Table C.98: pN_EBC performance parameter

Prerequisite: C.4/1 -- Near-end performance monitoring process supported

Item	pN_EBC performance parameter	Reference	Status	Support
1	Every second the MS1_TT_Sk counts the number of MS1 Near-end Errored Block (MS1 N_Bs) within that second as the MS1 pN_EBC (MS1 Near-end Error Block Count) and reports it to the EMF.	5.2.2	m	

Comments: A "Near-end Block" (N_B) is errored if one or more BIP-24 violations are detected.

C.4.4.5.2 Far end performance monitoring

Table C.99: pF_DS performance parameter

Prerequisite: C.4/2 -- Far-end performance monitoring process supported

Item	pF_DS performance parameter	Reference	Status	Support
1	The MS1_TT_Sk indicates a MS1 pF_DS every second with at least one occurrence of MS1 dRDI and reports it to the EMF.	5.2.2	m	

Table C.100: pF_EBC performance parameter

Prerequisite: C.4/2 -- Far-end performance monitoring process supported

Item	pF_EBC performance parameter	Reference	Status	Support
1	Every second the MS1_TT_Sk counts the number of MS1 Far-end Errored Block (MS1 F_Bs) within that second as the MS1 pF_EBC (MS1 Far-end Error Block Count) and reports it to the EMF.	5.2.2	m	

Comments: A "Far-end Block" (F_B) is errored if the REI count indicates one or more errors.

C.4.4.5.3 Pointer performance monitoring

Table C.101: PJE performance parameter

Prerequisite: C.4/3 -- Pointer performance monitoring process supported

Item	PJE performance parameter	Reference	Status	Support
1	Every second the number of generated HO pointer increments is counted as the HO pPJE+ and reported to the EMF.	5.3.1	m	
2	Every second the number of generated HO pointer decrements within that second is counted as the HO pPJE- and reported to the EMF.	5.3.1	m	

C.4.5 MS1 protection layer defect, fault and performance monitoring tables

C.4.5.1 Defect detection and clearance criteria

Table C.102: Protection Architecture Mismatch defect (dPAM)

Prerequisite: C.2/3 OR C.2/4 OR C.2/5 -- bi-directional switching supported

Item	Protection Architecture Mismatch defect (dPAM)	Reference	Status	Support
1	The MS1P dPAM is detected if the received APS Architecture (RARCH) value differs from the local architecture type (ARCHtype) for a period of 50 ms.	A.9	m	
2	The MS1P dPAM is cleared when the there is again a match between the received APS Architecture (RARCH) value and the local architecture type (ARCHtype).	A.9	m	

Comments: This defect concerns the APS interpretation process.

Table C.103: Invalid Command defect (dINV)

Prerequisite: C.2/3 OR C.2/4 OR C.2/5 -- bi-directional switching supported

Item	Invalid Command defect (dINV)	Reference	Status	Support
1	The MS1P dINV is detected if the request type bits (RT) in the APS signal indicate an invalid request code, or the RSN or LBSC indicate a non-existing trail signal number for Y ms.	A.9	m	
2	The MS1P dINV is cleared when the RT indicates a valid code and the RSN or LBSN indicate an existing signal number.	A.9	m	

Comments: This defect concerns the APS interpretation process.

Table C.104: INV defect parameters value

Prerequisite: C.2/3 OR C.2/4 OR C.2/5 -- bi-directional switching supported

Item	INV defect parameters value	Reference	Status	Support	Values	
					Allowed	Supported
1	MS1P dINV parameter (Y)	A.9	m		TBD	

Table C.105: Acknowledge Timeout defect (dTMOUT)

Prerequisite: C.2/3 OR C.2/4 OR C.2/5 -- bi-directional switching supported

Item	Acknowledge Timeout defect (dTMOUT)	Reference	Status	Support
1	The MS1P dTMOUT is detected if a head end response on a tail end request does not comply to the protocol within a period of 50 ms.	A.9	m	
2	The MS1P dTMOUT is cleared when the head-end response complies again.	A.9	m	
3	The MS1P dTMOUT is cleared if the protection trail is in SF condition.	A.9	m	

Comments: This defect concerns the global request priority process.

Table C.106: Selector Control Mismatch defect (dSCM)

Prerequisite: C.2/3 OR C.2/4 OR C.2/5 -- bi-directional switching supported

Item	Selector Control Mismatch defect (dSCM)	Reference	Status	Support
1	The MS1P dSCM is detected if a mismatch between RRSN and GRSN persists for Y ms.	A.9	m	
2	The MS1P dSCM is cleared when RRSN is identical to GRSN.	A.9	m	
3	The MS1P dSCM is cleared if the protection trail is in SF condition.	A.9	m	

Comments: This defect concerns the selector control.

Table C.107: SCM defect parameters value

Prerequisite: C.2/3 OR C.2/4 OR C.2/5 -- bi-directional switching supported

Item	INV defect parameters value	Reference	Status	Support	Values	
					Allowed	Supported
1	MS1P dSCM parameter (Y)	A.9	m		TBD	

C.4.5.2 Consequent action activation and clearance criteria

Table C.108: Null signal insertion

Prerequisite: C.1/13 -- 1:n MS Linear Trail Protection supported

Item	Null signal insertion	Reference	Status	Support
1	If neither the extra traffic nor a normal signal input is to be connected to the protection section output, the null signal is connected to the protection output.	5.5.1.2	m	
2	If the extra traffic output (if applicable) is disconnected from the protection input it is set to all-ONEs signal (AIS).	5.5.1.2	10801	

c10801: IF 51/6 THEN m ELSE n/a -- Extra traffic channel supported

Table C.109: Server Signal Fail action (aSSF)

Prerequisite: C.1/13 -- 1:n MS Linear Trail Protection supported

Item	Server Signal Fail action (aSSF)	Reference	Status	Support
1	The MS1P1:n_C sets the CI_SSF to TRUE on the extra traffic connection point if the extra traffic output (if applicable) is disconnected from the protection input.	5.5.1.2	c10901	
2	The MS1/MS1P_A_Sk sets CI_SSF to TRUE on AI_TSF reception.	5.5.3.2	c10902	
3	The MS1/MS1P_A_Sk sets CI_SSF to FALSE when there is (are) no more defect(s) active.	5.5.3.2	c10902	

c10901: IF (C.1/13 AND C.51/6) THEN m ELSE n/a -- 1:n MS Linear Trail Protection and extra traffic channel present

c10902: IF C.3/5 THEN m ELSE n/a -- MS1/MS1P_A_Sk present

Table C.110: Trail Signal Fail action (aTSF)

Prerequisite: C.3/4 -- MS1P_TT_Sk present

Item	Trail Signal Fail action (aTSF)	Reference	Status	Support
1	The MS1P_TT_Sk sets AI_TSF to TRUE on CI_SSF reception.	5.5.2.2	m	
2	The MS1P_TT_Sk sets AI_TSF to FALSE when there is (are) no more defect(s) active.	5.5.2.2	m	

Table C.111: Server Signal Degrade action (aSSD)

Prerequisite: C.3/6 -- MS1/MS1P_A_Sk present

Item	Server Signal Degrade action (aSSD)	Reference	Status	Support
1	The MS1/MS1P_A_Sk sets CI_SSD to TRUE on AI_TSD reception.	5.5.3.2	m	
2	The MS1/MS1P_A_Sk sets CI_SSD to FALSE when there is (are) no more defect(s) active.	5.5.3.2	m	

Table C.112: Selector release

Prerequisite: C.2/3 OR C.2/4 OR C.2/5 -- bi-directional switching supported

Item	Selector release	Reference	Status	Support
1	The selector is released if one or more of the four defects dPAM, dSCM, dTMOUT, dINV is active.	A.9	m	

Comments: This consequent action concerns the selector control.

C.4.5.3 Defect correlation

Table C.113: Defect correlation

Prerequisite: C.4/4 AND (C.1/12 OR C.1/13) -- Defect correlation process supported and STM-1 linear trail protection supported -- Defect correlation process supported

Item	Defect correlation	Reference	Status	Support
1	Under MS1P dSCM detection a MS1P cFOP (Failure Of Protocol) report is generated.	A.9	c11301	
2	Under MS1P dPAM detection a MS1P cFOP (Failure Of Protocol) report is generated.	A.9	c11301	
3	Under MS1P dTMOUT detection a MS1P cFOP (Failure Of Protocol) report is generated.	A.9	c11301	
4	Under MS1P dINV detection a MS1P cFOP (Failure Of Protocol) report is generated.	A.9	c11301	
5	Under MS1P CI_SSF reception a MS1P cSSF report is generated.	5.5.2.2	c11302	
6	The MS1P cSSF is reported only if selected MS1P SSF_reported is set to TRUE by the NEM. By default MS1P SSF_reported is set to FALSE.	5.5.2.2	c11302	
7	All the generated fault cause (cXXX) are reported to the EMF.	ETS 300 417-1-1 [1] subclause 8.1, figure 36	m	

c11301: IF (C.2/3 OR C.2/4 OR C.2/5) THEN m ELSE n/a -- bi-directional switching supported
c11302: IF C.3/3 THEN m ELSE n/a -- MS1P_TT_Sk present

C.4.5.4 Performance monitoring

Table C.114: pPSC performance parameter

Prerequisite: C.4/3 AND (C.1/12 OR C.1/13) -- Protection performance monitoring process supported and STM-1 linear trail protection supported -- Defect correlation process supported

Item	pPSC performance parameter	Reference	Status	Support
1	Every second the MS1P1+1_C indicates as MS1P pPSC (Protection Switching Count) the number of Protection Switching actions within that second and reports it to the EMF.	A.9	c11401	
2	Every second the MS1P1:n_C indicates as MS1P pPSC (Protection Switching Count) the number of Protection Switching actions within that second and reports it to the EMF.	A.9	c11402	

c11401: IF C.1/12 THEN m ELSE n/a -- 1+1 MS Linear Trail Protection supported
c11402: IF C.1/13 THEN m ELSE n/a -- 1:n MS Linear Trail Protection supported

Table C.115: pPSD performance parameter

Prerequisite: C.4/3 AND (C.2/1 OR C.2/3 OR C.2/5) -- Protection performance monitoring process supported and revertive protection supported

Item	pPSD performance parameter	Reference	Status	Support
1	Every second that the normal signal #i is not selected from the Working trail #i is reported as a pPSD/i (i≥1) to the EMF.	A.9	m	
2	Every second that the normal signal is selected from the Protection trail is reported as a pPSD/0 to the EMF.	A.9	m	

Annex D (normative): ICS proforma for STM-4 regenerator section layer

D.1 Identification of the implementation

In this ETS, an Implementation Under Test (IUT), and of course the identification of an IUT refers to an RS-4 regenerator section (RS4) instance implemented inside the System Under Test (SUT).

Identification of the IUT and the SUT in which it resides should be filled in so as to provide as much detail as possible regarding version numbers and configuration options.

The product supplier information and client information should both be filled in if they are different.

A person who can answer queries regarding information supplied in the ICS should be named as the contact person.

D.1.1 Date of the statement

.....

D.1.2 Implementation Under Test (IUT) identification

IUT name:

.....

.....

IUT version

Hardware version:

.....

Software version:

.....

Firmware version:

.....

D.1.3 System Under Test (SUT) identification

SUT name:

.....

.....

Hardware configuration:

.....

SUT Software version:

.....

SUT Firmware version:

.....

Operating system:

.....

D.1.4 Product supplier

Name:

.....

Address:

.....

.....

.....

Telephone number:

.....

Facsimile number:

.....

E-mail address:

.....

Additional information:

.....

.....

.....

D.1.5 Client

Name:

.....

Address:

.....

.....

.....

Telephone number:

.....

Facsimile number:

.....

E-mail address:

.....

Additional information:

.....

.....

.....

D.1.6 ICS contact person

Name:

.....

Telephone number:

.....

Facsimile number:

.....

E-mail address:

.....

Additional information:

.....

.....

D.2 Identification of the ETS

This ICS proforma applies to the following standard:

ETS 300 417-3-1 [2]: "Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment: STM-N regenerator and multiplex section layer functions".

D.3 Global statement of conformance of RS-4 regenerator section (RS4)

Are all mandatory capabilities implemented (Yes/No)

NOTE: Answering "No" to this question indicates non-conformance to the ETS specification. Non-supported mandatory capabilities are to be identified in the ICS, with an explanation of why the implementation is non-conforming, on pages attached to the ICS proforma.

Answering "Yes" to this question indicates only that all the capabilities with the explicit status "m" are supported. It is not necessary to fill in the support column of the associated item.

D.4 RS4 section layer function

D.4.1 STM-4 regenerator section layer description

Table D.1: RS4layer functions

Item	STM-4 regenerator section layer	Reference	Status	Support
1	Regenerator section connection function (RS4_C)	6, figure 36	o	
2	Regenerator section trail termination source function (RS4_TT_So)	6, figure 36	o.101	
3	Regenerator section trail termination sink function (RS4_TT_Sk)	6, figure 36	o.101	
4	Regenerator section to MS4 layer adaptation source function (RS4/MS4_A_So)	6, figure 36	c101	
5	Regenerator section to MS4 layer adaptation sink function (RS4/MS4_A_Sk)	6, figure 36	c102	
6	Regenerator section to DCC layer adaptation source function (RS4/DCC_A_So)	6, figure 36	c103	
7	Regenerator section to DCC Layer adaptation sink function (RS4/DCC_A_Sk)	6, figure 36	c104	
8	Regenerator section to P0s Layer adaptation source function (RS4/P0s_A_So-N)	6, figure 36	c103	
9	Regenerator section to P0s layer adaptation sink function (RS4/P0s_A_Sk-N)	6, figure 36	c104	
10	Regenerator section to V0x layer adaptation source function (RS4/V0x_A_So)	6, figure 36	c103	
11	Regenerator section to V0x layer adaptation sink function (RS4/V0x_A_Sk)	6, figure 36	c104	
12	This RS4 layer is part of an SDH regenerator equipment.	ETS 300 417-2-2 [17] table C.1/1	o	

c101: IF D.1/2 THEN m ELSE x -- a TT_So function should exist for A_So function
c102: IF D.1/3 THEN m ELSE x -- a TT_Sk function should exist for A_Sk function
c103: IF D.1/2 THEN o ELSE x -- a TT_So function should exist for A_So function
c104: IF D.1/3 THEN o ELSE x -- a TT_Sk function should exist for A_Sk function
o.101: It is mandatory to support at least one of these items -- at least one TT function present

Comment: for a bi-directional layer both TT_So and TT_Sk functions are present, for a unidirectional layer just one of them can be present.
Item D.1/12 is the same as the one given in the reference column.

Table D.2: Supervision processes

Item	Supervision process	Reference	Status	Support
1	Performance monitoring process	ETS 300-417-1-1 [1] subclauses 8.2 to 8.4	c201	
2	Defect correlation process	ETS 300-417-1-1 [1] subclauses 8.2 to 8.3	c201	

c201: IF D.1/3 THEN m ELSE n/a -- RS4_TT_Sk present

D.4.2 RS-4 regenerator section Layer Transmission Tables

Table D.3: Data stream structure

Item	Data stream structure	Reference	Status	Support
1	The CI at the RS4 connection point is octet structured and 125 µs framed with co-directional timing.	6	m	
2	The RS4_CI is a fully formatted STM-4 data stream.	6	m	
3	Regenerator Section OverHead (RS-OH) bytes are placed in rows 1 to 3 of columns 1 to 36 of the STM-4 frame.	6, figure 37	m	

D.4.2.1 RS-4 regenerator section connection function: RS4_C

Table D.4: Connection functionalities

Prerequisite: D.1/1 -- RS4_C present

Item	Connection functionalities	Reference	Status	Support
1	For further study	6.1	n/a	

D.4.2.2 RS-4 regenerator section layer trail termination functions: RS4_TT_So and RS4_TT_Sk

D.4.2.2.1 FAS

Table D.5: FAS byte location

Item	Frame Alignment Signal (FAS) byte location	Reference	Status	Support
1	The FAS is located in A1 from (1,1) to (1,12) and A2 from (1,13) to (1,24) of the STM-4 frame.	6.2.1, G.707 [14] subclause 9.2.2.1	m	

Table D.6: FAS byte structure

Item	Frame Alignment Signal (FAS) byte structure	Reference	Status	Support
1	A1 byte is coded '1111 0110' and A2 byte is coded'0010 1000',	G.707 [14] subclause 9.2.2.1	m	

D.4.2.2.2 FAS generation

Table D.7: FAS insertion

Prerequisite: D.1/2 -- RS4_TT_So present

Item	Frame Alignment Signal (FAS) insertion	Reference	Status	Support
1	The RS4_TT_So inserts the STM-4 FAS A1...A1A2...A2 into the RSOH.	6.2.1, G.707 [14] subclause 9.2.2.1	m	

D.4.2.2.3 Signal scrambling/descrambling

Table D.8: Scrambling/descrambling: principles

Item	Scrambling/descrambling: principles	Reference	Status	Support
1	The operation of the scrambler/ descrambler is functionally identical to that of a frame synchronous scrambler/ descrambler of sequence length 127 operating at the line rate.	6.2.1, 6.2.2	m	
2	The generating polynomial is $1 + X^6 + X^7$	6.2.2	m	

Table D.9: Scrambling process

Prerequisite: D.1/2 -- RS4_TT_So present

Item	Scrambling process	Reference	Status	Support
1	The scrambler is reset to '1111 1111' on the MSB of the byte (1,37) following the last byte of the STM-4 SOH in the first row.	6.2.1	m	
2	This bit and all subsequent bits to be scrambled are modulo 2 added to the output of the X^7 position of the scrambler.	6.2.1	m	
3	The scrambler runs continuously throughout the remaining STM-4 frame	6.2.1	m	

Table D. 10: Descrambling process

Prerequisite: D.1/3 -- RS4_TT_Sk function present

Item	Descrambling process	Reference	Status	Support
1	The RS4_TT_Sk descrambles the incoming STM-4 signal except the first row of the RSOH.	6.2.2	m	

D.4.2.2.4 In service error monitoring process

Table D.11: In service error monitoring: principles

Item	In service error monitoring: principles	Reference	Status	Support
1	An EDC is part of the characteristic information for in service error monitoring	ETS 300-417-1-1 [1] subclause 7.3	m	
2	In service error monitoring parameter definition is block-based.	G.707 [14] subclause 9.2.2.4 note	m	
3	The block length is 9 720 bytes, corresponding to the STM-4 frame structure		m	
4	The error monitoring is performed using Bit Interleaved Parity 8 (BIP-8).	6.2.1, G.707 [14] subclause 9.2.2.4	m	
5	The BIP-8 is calculated using even parity in such a manner that the bit in position x provides even parity over the x-bits of all the 8-bits sequences within the specified block.	G.707 [14] subclause 9.2.2.4 note	m	

Comments: The BIP-n is interpreted as checking 'n' separate interleaved parity check blocks. If any of the 'n' parity check fails (EDC Violation), the block is assumed to be in error.

Table D.12: EDC location

Item	Error Detection Code (EDC) location	Reference	Status	Support
1	Regenerator section EDC is located in byte B1(2,1) of the STM-4 frame.	6.2.1	m	

Table D.13: EDC processing: source direction

Prerequisite: D.1/2 -- RS4_TT_So present

Item	Error Detection Code (EDC) processing: source direction	Reference	Status	Support
1	The BIP-8 is calculated over all bits of the previous STM-4 frame after scrambling.	6.2.1	m	
2	BIP-8 code is inserted in B1 byte of the current STM-4 frame before scrambling.	6.2.1	m	

Table D.14: EDC processing: sink direction

Prerequisite: D.1/3 -- RS4_TT_Sk function present

Item	Error Detection Code (EDC) processing: sink direction	Reference	Status	Support
1	The incoming error monitoring byte B1 is recovered from the STM-4 signal after descrambling.	6.2.2	m	
2	The BIP-8 is calculated over all bits of the previous STM-4 frame before descrambling.	6.2.2	m	
3	Recovered B1 byte is compared with the calculated BIP-8.	6.2.2	m	
4	A difference between the computed and recovered B1 value is taken as evidence of one or more errors (nN_B) in the computation block.	6.2.2	m	

D.4.2.2.5 Trail Trace Identifier (TTI)

Table D.15: Trail Trace Identifier (TTI): principles

Prerequisite: D.1/2 OR D.1/3 -- RS4_TT_So and/or RS4_TT_Sk present

Item	Trail Trace Identifier (TTI): principles	Reference	Status	Support
1	A Trail Trace Identifier (TTI) is inserted by the termination source containing the local Access Point Identifier (APId) and TTI header (TxTI).	6.2.1, ETS 300-417-1-1 [1] subclause 7.1	c1501	
2	The content of the accepted TTI (AcTI) is compared by the trail termination sink function with the provisioned "expected TTI" (ExTI), identifying the expected remote AP.	6.2.2, ETS 300-417-1-1 [1] subclauses 7.1 and 8.2.1.3	c1502	

c1501: IF D.1/2 THEN m ELSE n/a -- RS4_TT_So present
c1502: IF D.1/3 THEN m ELSE n/a -- RS4_TT_Sk present

Table D.16: Trail Trace Identifier (TTI) byte location

Item	Trail Trace Identifier (TTI) byte location	Reference	Status	Support
1	The Regenerato section trail trace Identifier (TTI) is located in byte J0(1,25) of the STM-4 frame.	6.2.1	m	

Table D.17: Trail Trace Identifier (TTI) byte structure

Item	Trail Trace Identifier (TTI) byte structure	Reference	Status	Support
1	The RS TTI is a 16 byte string containing the 15 byte APId and a 1 byte header. The MSB of the header is a "1", the remaining 9 bits contain the CRC-7 value of the RS TTI. The MSB of the 15 APId bytes is "0".	ETS 300-417-1-1 [1] subclause 7.1	m	
2	The CRC-7 word is the remainder after multiplication by x^7 and then division (modulo 2) by the generator polynomial $x^7 + x^3 + 1$, of the polynomial representation of the RS TTI with the CRC bits set to binary zeroes.	ETS 300-417-1-1 [1] subclause 7.1	m	
3	The 16 byte RS TxTI is transferred via the Management Point to and from the trail termination function.	ETS 300-417-1-1 [1] subclause 8.2.1.3	c1701	
4	The 16 byte RS ExTI and 16 byte RS AcTI are transferred via the Management Point to and from the trail termination function.	ETS 300-417-1-1 [1] subclause 8.2.1.3	c1702	

c1701: IF D.1/2 THEN m ELSE n/a -- RS4_TT_So present
c1702: IF D.1/3 THEN m ELSE n/a -- RS4_TT_Sk present

Table D.18: Trail Trace identification: source direction

Prerequisite: D.1/2 -- RS4_TT_So present

Item	Trail Trace identification: source direction	Reference	Status	Support
1	The16 byte RS TTI is transmitted continuously.	ETS 300-417-1-1 [1] subclause 7.1	m	

Table D.19: Trail Trace identification: sink direction

Prerequisite: D.1/3 -- RS4_TT_Sk present

Item	Trail Trace identification: sink direction	Reference	Status	Support
1	The RS4_TT_Sk supports mode 1	ETS 300-417-1-1 [1] subclause 7.1	m	
2	The RS4_TT_Sk supports mode 2	ETS 300-417-1-1 [1] subclause 7.1	m	
3	The TTI mode is provisionable by the EMF.	6.2.2	m	
4	The RS4_TT_Sk recovers the 16 byte multiframe carried in byte J0 and assumes it as Received Trail Trace Identifier (RxTI). The RxTI is made available as AcTI for network management purposes	6.2.2	m	

D.4.2.3 STM-4 regenerator section layer to MS4 layer adaptation functions: RS4/MS4_A_So and RS4/MS4_A_Sk

D.4.2.3.1 RS4 layer to MS4 layer multiplexing and demultiplexing processes

Table D.20: Multiplexing

Prerequisite: D.1/4 -- RS4/MS4_A_So present

Item	Multiplexing	Reference	Status	Support
1	The RS4/MS4_A_So function multiplexes the MS4_CI data (9 612 bytes/frame) into the STM-4 frame.	6.3.1	m	

Table D.21: Demultiplexing

Prerequisite: D.1/5 -- RS4/MS4_A_Sk present

Item	Demultiplexing	Reference	Status	Support
1	The RS4/MS4_A_Sk recovers the MS4_CI data from the STM-4 frame.	6.3.2	m	

D.4.2.4 STM-4 regenerator section layer to DCC layer adaptation functions: RS4/DCC_A_So and RS4/DCC_A_Sk

D.4.2.4.1 RS4 layer to DCC layer multiplexing and demultiplexing processes

Table D.22: Multiplexing

Prerequisite: D.1/6 -- RS4/DCC_A_So present

Item	Multiplexing	Reference	Status	Support
1	The DCC_CI data (192 kbit/s) are multiplexed in D1, D2 and D3 bytes of the STM-4 frame.	6.3.3	m	

Comments: DCC transmission can be "disabled" when the matrix connection in the connected DCC_C function is removed.

Table D.23: Demultiplexing

Prerequisite: D.1/7 -- RS4/DCC_A_Sk present

Item	Demultiplexing	Reference	Status	Support
1	The DCC_CI data (192 kbit/s) are demultiplexed from bytes D1 to D3.	6.3.4	m	

D.4.2.5 STM-4 regenerator section layer to P0s layer adaptation functions: RS4/P0s_A_So-N and RS4/P0s_A_Sk-N

D.4.2.5.1 RS4 layer to P0s layer multiplexing and demultiplexing processes

Table D.24: Multiplexing

Prerequisite: D.1/8 -- RS4/P0s_A_So-N present

Item	Multiplexing	Reference	Status	Support
1	The RS4/P0s_A_So-E1 multiplexes a 64 kbit/s orderwire information stream into the RSOH byte E1.	6.3.5	o.2401	
2	The RS4/P0s_A_So-F1 multiplexes a 64 kbit/s user channel information stream into the RSOH byte F1.	6.3.5	o.2401	

o.2401: It is mandatory to support at least one of these items -- at least one RS4/P0s_A_So-N function present

Table D.25: Demultiplexing

Prerequisite: D.1/9 -- RS4/P0s_A_Sk-N present

Item	Demultiplexing	Reference	Status	Support
1	The RS4/P0s_A_Sk-E1 demultiplexes the P0s data from byte E1 of the RS Overhead.	6.3.6	o.2501	
2	The RS4/P0s_A_Sk-F1 demultiplexes the P0s data from byte F1 of the RS Overhead.	6.3.6	o.2501	

o.2501: It is mandatory to support at least one of these items -- at least one RS4/P0s_A_Sk-N function present

D.4.2.5.2 RS4 layer to P0s layer frequency justification and bitrate adaptation processes

Table D.26: Frequency justification and bitrate adaptation: principles

Prerequisite: D.1/8 -- RS4/P0s_A_So-N present

Item	Frequency justification and bitrate adaptation: principles	Reference	Status	Support
1	The RS4/P0s_A_So-N function provides frequency justification and bitrate adaptation for a 64 kbit/s information stream. It takes P0s_CI as an unstructured bit-stream with a rate of 64 kbit/s ± 100 ppm and inserts it into the RSOH.	6.3.5	m	
	Frequency justification is performed by octet slip buffering.	6.3.5	m	

Table D.27: Frequency justification and bitrate adaptation: source direction

Prerequisite: D.1/8 -- RS4/P0s_A_So-N present

Item	Frequency justification and bitrate adaptation: source direction	Reference	Status	Support
1	The RS4/P0s_A_So-N function provides for an elastic store (slip buffer) process. The are written into the store under control of the associated input clock. The data are read out of the store under control of the STM-4 clock, frame position and justification decision.	6.3.5	m	
2	Each justification decision results in a corresponding negative/positive justification action. Upon a positive justification (slip) action, the reading of one 64 kbit/s octet (9 bits) is cancelled once. Upon a negative justification (slip) action, the same 64 kbit/s octet (9 bits) is read out a second time.	6.3.5	m	
3	The elastic store (slip buffer) size accommodates at least 18 µs of wander without introducing errors.is at least 2 octets.	6.3.5	m	

D.4.2.6 STM-4 regenerator section layer to V0x layer adaptation functions: RS4/V0x_A_So and RS4/V0x_A_Sk

D.4.2.6.1 RS4 layer to V0x layer multiplexing and demultiplexing processes

Table D.28: Multiplexing

Prerequisite: D.1/10 -- RS4/V0x_A_So present

Item	Multiplexing	Reference	Status	Support
1	The RS4/V0x_A_So multiplexes the V0x_CI data (64 kbit/s) into the byte location F1	6.3.7	m	

Table D.29: Demultiplexing

Prerequisite: D.1/11 -- RS4/V0x_A_Sk present

Item	Demultiplexing	Reference	Status	Support
1	The RS4/V0x_A_Sk demultiplexes the user channel data from RS Overhead (byte F1)	6.3.8	m	

D.4.3 Defect, fault and performance monitoring

D.4.3.1 Trail termination point mode management

Table D.30: Trail termination point mode process

Prerequisite: D.1/3 -- RS4_TT_Sk function present

Item	Trail termination point status process	Reference	Status	Support
1	The Trail Termination Point Mode supports "not monitored" (NMON) status	ETS 300 417-1-1 [1] subclause 8.5	m	
2	The Trail Termination Point Mode supports "monitored" (MON) status	ETS 300 417-1-1 [1] subclause 8.5	m	
3	The Trail Termination Point Mode status is provisionable by the EMF.	6.2.2	m	

D.4.3.2 Defect detection and clearance criteria

Table D.31: Trace Identifier Mismatch defect (dTIM)

Prerequisite: D.1/3 -- RS4_TT_Sk function present

Item	Trace Identifier Mismatch defect (dTIM)	Reference	Status	Support
1	The RS4 dTIM defect is detected within a maximum period of 100 ms in the absence of bit errors.	ETS 300 417-1-1 [1] subclause 8.2.1.3	m	
2	The RS4 dTIM defect is cleared within a maximum period of 100 ms in the absence of bit errors.	ETS 300 417-1-1 [1] subclause 8.2.1.3	m	
3	The RS4 dTIM is suppressed during the reception of aSSF from the server layer.	ETS 300 417-1-1 [1] subclause 8.2.1.3	m	
4	The RS4 dTIM detection can be disabled (TIMdis).	ETS 300 417-1-1 [1] subclause 8.2.1.3	m	

D.4.3.3 Consequent action activation and clearance criteria

Table D.32: Alarm Indication Signal action (aAIS)

Prerequisite: C.1/3 OR C.1/4 OR C.1/9 OR C.1/11 -- RS4_TT_Sk and/or RS4/MS1_A_So and/or RS4/P0s_A_Sk and/or RS4/V0X_A_Sk present

Item	Alarm Indication Signal action (aAIS)	Reference	Status	Support
1	The RS4_TT_Sk outputs an all "1s" signal within 250 μs upon RS4 dTIM detection.	6.2.2	c3201	
2	The RS4_TT_Sk outputs an all "1s" signal within 250 μs upon CI_SSF reception.	6.2.2	c3201	
3	The RS4_TT_Sk outputs normal data within 250 μs when there is (are) no more defect(s) active.	6.2.2	c3201	
4	The RS4/MS4_A_So outputs an all "1s" signal within 250 μs upon CI_SSF reception.	6.2.2	c3202	
5	The frequency of the all "1s" signal is within the range of 622 080 kHz kbit/s ± 20 ppm.	6.3.1	c3202	
6	The RS4/MS4_A_So outputs normal data within 250 μs when there is (are) no more defect(s) active.	6.3.1	c3202	
7	The RS4/P0s_A_Sk-N outputs an all "1s" signal within 1 ms upon AI_TSF reception.	6.3.6	c3203	
8	The frequency of the all "1s" signal is within the range of 64 kbit/s ± 20 ppm.	6.3.6	c3203	
9	The RS4/P0s_A_Sk-N outputs normal data within 1 ms when there is (are) no more defect(s) active.	6.3.6	c3203	
10	The RS4/V0x_A_Sk outputs an all "1s" signal within 1 ms upon AI_TSF reception.	6.3.8	c3204	
11	The frequency of the all "1s" signal is within the frequency limits for this signal.	6.3.8	c3204	
12	The RS4/V0x_A_Sk outputs normal data within 1 ms when there is (are) no more defect(s) active.	6.3.8	c3204	

c3201:IF D.1/3 THEN m ELSE n/a -- RS4_TT_Sk present
c3202:IF (D.1/4) THEN m ELSE n/a -- RS4/MS4_A_So present
c3203:IF D.1/9 THEN m ELSE n/a -- RS4/P0s_A_Sk-N present
c3204:IF D.1/11 THEN m ELSE n/a -- RS4/V0x_A_Sk present

Table D.33: Server Signal Fail action (aSSF)

Prerequisite: D.1/5 OR D.1/7 -- RS4/MS4_A_Sk and /or RS4/DCC_A_Sk function present

Item	Server Signal Fail action (aSSF)	Reference	Status	Support
1	The RS4/MS4_A_Sk sets CI_SSF to TRUE on AI_TSF reception.	6.3.2	c3301	
2	The RS4/MS4_A_Sk sets CI_SSF to FALSE as soon as AI_TSF is no longer received.	6.3.2	c3301	
3	The RS4/DCC_A_Sk sets CI_SSF to TRUE on AI_TSF reception.	6.3.4	c3302	
4	The RS4/DCC _A_Sk sets CI_SSF to FALSE as soon as AI_TSF is no longer received.	6.3.4	c3302	
5	The RS4/P0s_A_Sk sets CI_SSF to TRUE on AI_TSF reception.	6.3.6	c3303	
6	The RS4/ P0s _A_Sk sets CI_SSF to FALSE as soon as AI_TSF is no longer received.	6.3.6	c3303	
7	The RS4/V0x_A_Sk sets CI_SSF to TRUE on AI_TSF reception.	6.3.8	c3304	
8	The RS4/ V0x _A_Sk sets CI_SSF to FALSE as soon as AI_TSF is no longer received.	6.3.8	c3304	

c3301:IF D.1/5 THEN m ELSE n/a -- RS4/MS4_A_Sk present
c3302:IF D.1/7 THEN m ELSE n/a -- RS4/DCC_A_Sk present
c3303:IF D.1/9 THEN m ELSE n/a -- RS4/P0s_A_Sk present
c3304:IF D.1/11 THEN m ELSE n/a -- RS4/V0x_A_Sk present

Table D.34: Trail Signal Fail action (aTSF)

Prerequisite: D.1/3 -- RS4_TT_Sk function present

Item	Trail Signal Fail action (aTSF)	Reference	Status	Support
1	The RS4_TT_Sk sets AI_TSF to TRUE on RS4 dTIM detection.	6.3.2	m	
2	The RS4_TT_Sk sets AI_TSF to TRUE on CI_SSF reception.	6.3.2	m	
3	The RS4_TT_Sk sets AI_TSF to FALSE when there is (are) no more defect(s) active.	6.3.2	m	

D.4.3.4 Defect correlation

Table D.35: Defect correlation

Prerequisite: D.2/2 -- Defect correlation process supported

Item	Defect correlation	Reference	Status	Support
1	Under RS4 dTIM detection the RS4_TT_Sk generates a RS4 cTIM report if the port is in the monitoring state (MON).	6.2.2	c3501	
2	All the generated fault cause (cXXX) are reported to the EMF.	ETS 300 417-1-1 [1] subclause 8.1, figure 36	m	

c3501: IF D.1/3 THEN m ELSE n/a -- RS4_TT_Sk present

Annex E (normative): ICS proforma for STM-4 multiplex section layer

E.1 Identification of the implementation

In this ETS, an Implementation Under Test (IUT), and of course the identification of an IUT refers to an STM-4 Multiplex Section (MS4) layer instance implemented inside the System Under Test (SUT).

Identification of the IUT and the SUT in which it resides should be filled in so as to provide as much detail as possible regarding version numbers and configuration options.

The product supplier information and client information should both be filled in if they are different.

A person who can answer queries regarding information supplied in the ICS should be named as the contact person.

E.1.1 Date of the statement

.....

E.1.2 Implementation Under Test (IUT) identification

IUT name:

.....

.....

IUT version

Hardware version:

.....

Software version:

.....

Firmware version:

.....

E.1.3 System Under Test (SUT) identification

SUT name:

.....

.....

Hardware configuration:

.....

SUT Software version:

.....

SUT Firmware version:

.....

Operating system:

.....

E.1.4 Product supplier

Name:

.....

Address:

.....

.....

.....

Telephone number:

.....

Facsimile number:

.....

E-mail address:

.....

Additional information:

.....

.....

.....

E.1.5 Client

Name:

.....

Address:

.....

.....

.....

Telephone number:

.....

Facsimile number:

.....

E-mail address:

.....

Additional information:

.....

.....

.....

E.1.6 ICS contact person

Name:

.....

Telephone number:

.....

Facsimile number:

.....

E-mail address:

.....

Additional information:

.....

.....

E.2 Identification of the ETS

This ICS proforma applies to the following standard:

ETS 300 417-3-1 [2]: "Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment: STM-N regenerator and multiplex section layer functions".

E.3 Global statement of conformance of STM-4 Multiplex Section (MS4) layer

Are all mandatory capabilities implemented (Yes/No)

NOTE: Answering "No" to this question indicates non-conformance to the ETS specification. Non-supported mandatory capabilities are to be identified in the ICS, with an explanation of why the implementation is non-conforming, on pages attached to the ICS proforma.

Answering "Yes" to this question indicates only that all the capabilities with the explicit status "m" are supported. It is not necessary to fill in the support column of the associated item.

E.4 MS4 layer function

E.4.1 MS4 layer Description

Table E.1: MS4 layer functions

Item	MS4 layer functions	Reference	Status	Support
1	Multiplex Section Connection function (MS4_C)	7, figure 51	o	
2	Multiplex Section Trail Termination Source function (MS4_TT_So)	7, figure 51	o.101	
3	Multiplex Section Trail Termination Sink function (MS4_TT_Sk)	7, figure 51	o.101	
4	Multiplex Section to S4 layer Adaptation Source function (MS4/S4_A_So-N).	7, figure 51	c101	
5	Multiplex Section to S4 layer Adaptation Sink function (MS4/S4_A_Sk-N)	7, figure 51	c102	
6	Multiplex Section to SD Layer Adaptation Source function (MS4/SD_A_So)	7, figure 51	c103	
7	Multiplex Section to SD Layer Adaptation Sink function (MS4/SD_A_Sk)	7, figure 51	c104	
8	Multiplex Section to DCC Layer Adaptation Source function (MS4/DCC_A_So)	7, figure 51	c105	
9	Multiplex Section to DCC Layer Adaptation Sink function (MS4/DCC_A_Sk)	7, figure 51	c104	
10	Multiplex Section to P0s Layer Adaptation Source function (MS4/P0s_A_So)	7, figure 51	c105	
11	Multiplex Section to P0s Layer Adaptation Sink function (MS4/P0s_A_Sk)	7, figure 51	c104	
12	Multiplex Section to S4-4c Layer Adaptation Source function (MS4/S4-4c_A_So)	7, figure 51	c101	
13	Multiplex Section to S4-4c Layer Adaptation Sink function (MS4/S4-4c_A_Sk)	7, figure 51	c102	
14	MS4 1+1 Linear Trail protection.	7, figure 51, table A.1	o	
15	MS4 1:n Linear Trail protection	7, figure 51, table A.1	c106	

c101: IF E.1/2 THEN o.102 ELSE x -- a TT_So function should exist for A_So function
c102: IF E.1/3 THEN o.103 ELSE x -- a TT_Sk function should exist for A_Sk function
c103: IF E. 1/2 THEN m ELSE x -- a TT_So function should exist for MS16/SD_A_So
c104: IF E.1/3 THEN o ELSE x -- a TT_Sk function should exist for A_Sk
c105: IF E.1/2 THEN o ELSE x -- a TT_So function should exist for A_So
c106: IF (E.1/2 AND E.1/3) THEN o ELSE x -- bi-directional layer needed
o.101: It is mandatory to support at least one of these items -- at least one TT function present
o.102: It is mandatory to support at least one of these items -- at least one A_So function present
o.103: It is mandatory to support at least one of these items -- at least one A_Sk function present

Comments: in E.1/4 and E.1/5 the value of N is an integer number in the range from 1 to 4.

Table E.2: Number of adaptation functions to S4 and S4-4c

Prerequisite: (E.1/4 XOR E.1/12) OR (E.1/5 XOR E.1/13) -- single payload type for one direction

Item	Number of adaptation functions to S4 and S4-4c layers	Reference	Status	Support
1	The number of supported MS4/S4_A_So is 4	7, figure 51	c201	
2	The number of supported MS4/S4_A_Sk is 4	7, figure 51	c202	
3	The number of supported MS4/S4-4c_A_So is 1	7, figure 51	c203	
4	The number of supported MS4/S4-4c_A_Sk is 1	7, figure 51	c204	

c201: IF E.1/4 THEN m ELSE n/a -- MS4/S4_A_So supported
c202: IF E.1/5 THEN m ELSE n/a -- MS4/S4_A_Sk supported
c203: IF E.1/12 THEN m ELSE n/a -- MS4/S4-4c_A_So supported
c204: IF E.1/13 THEN m ELSE n/a -- MS4/S4-4c_A_Sk supported

Table E.3: STM-4 Multiplex Section Linear Trail Protection schemes

Prerequisite: E.1/14 OR E.1/14 -- STM-4 Linear Trail Protection scheme supported

Item	STM-1 Multiplex Section Linear Trail Protection functions	Reference	Status	Support
1	MS4 1+1 Linear Trail Protection with unidirectional switching and revertive operation	7.5.1.1	c301	
2	MS4 1+1 Linear Trail Protection with unidirectional switching and non-revertive operation	7.5.1.1	c301	
3	MS4 1+1 Linear Trail Protection with bi-directional switching and revertive operation	7.5.1.1	c302	
4	MS4 1+1 Linear Trail Protection with bi-directional switching and non-revertive operation	7.5.1.1	c302	
5	MS4 1:n Linear Trail Protection with bi-directional switching and revertive operation	7.5.1.2	c303	

o.301: It is mandatory to support at least one of these items -- at least one 1+1 protection scheme
c301: IF E.1/14 THEN o.301 ELSE x -- 1+1 MS Linear Trail Protection supported
c302: IF E.1/14 AND (E.1/2 AND E.1/3) THEN o.301 ELSE x -- 1+1 MS Linear Trail Protection and bi-directional layer supported
c303: IF E.1/15 THEN m ELSE x -- 1:n MS Linear Trail Protection supported

Table E.4: MS4 linear trail protection functions

Prerequisite: E.1/14 OR E.1/15 -- STM-4 Linear Trail Protection scheme supported

Item	MS4 linear trail protection functions	Reference	Status	Support
1	Multiplex Section Linear Trail Protection Connection function	7, figure 54	m	
2	Multiplex Section Protection Trail Termination Source function (MS4P_TT_So)	7, figure 54	c401	
3	Multiplex Section Protection Trail Termination Sink function (MS4P_TT_Sk)	7, figure 54	c402	
4	Multiplex Section to Multiplex Section Protection Layer Adaptation Source function (MS4/MS4P_A_So)	7, figure 54	c401	
5	Multiplex Section to Multiplex Section Protection Layer Adaptation Sink function (MS4/MS4P_A_Sk)	7, figure 54	c402	

c401: IF E.1/2 THEN m ELSE x -- a TT_So function should exist for protection Source functions
c402: IF E.1/3 THEN m ELSE x -- a TT_Sk function should exist for protection Sink functions

Table E.5: Supervision processes

Item	Supervision process	Reference	Status	Support
1	Near-end Performance monitoring process	ETS 300 417-1-1 [1] subclauses 8.2 to 8.4	c501	
2	Far-end Performance monitoring process	ETS 300 417-1-1 [1] subclauses 8.2 to 8.4	c502	
3	Pointer Performance monitoring process	ETS 300 417-1-1 [1] subclauses 8.2 to 8.4	c503	
4	Protection Performance monitoring process	ETS 300 417-1-1 [1] subclauses 8.2 to 8.4	c504	
5	Defect correlation process	ETS 300 417-1-1 [1] subclauses 8.2 to 8.3	c505	

c501: IF E.1/3 THEN m ELSE n/a -- MS4_TT_Sk present
c502: IF (E.1/2 AND E.1/3) THEN m ELSE n/a -- both TT_So and TT_Sk present
c503: IF (E.1/4 OR E.1/12) THEN m ELSE n/a -- MS4/S4_A_So and/or MS4/S4-4c_A_So present
c504: IF (E.1/14 OR E.1/15 OR E.1/16)
THEN m ELSE n/a -- STM-16 Linear Trail Protection supported
c505: IF (E.1/3 OR E.1/5 OR E.1/13)
THEN m ELSE n/a -- MS4_TT_Sk and/or MS4/S4_A_Sk and/or MS4/S4-4c_A_Sk present

E.4.2 MS4 layer transmission tables

Table E.6: Data stream structure

Item	Data stream structure	Reference	Status	Support
1	The CI at the MS4 connection point is octet structured and 125 μs framed with co-directional timing.	7	m	
2	The MS4_CI is an STM-4 data stream without the Regenerator Section Overhead.	7	m	
3	Multiplex Section OverHead (MS-OH) bytes are placed in rows 5 to 9 of columns 1 to 36 of the STM-4 frame.	7, figure 52	m	

Table E.7: Payload composition

Item	Payload composition	Reference	Status	Support
1	The payload is composed of four VC-4s of 150 336 kbit/s.	7	c701	
2	The payload is composed of one VC-4-4c of 601 344 kbit/s.	7	c702	

c701: IF (E.1/4 OR E.1/5) THEN m ELSE n/a -- MS4/S4_A_So and/or MS4/S4_A_Sk present
c702: IF(E.1/12 OR E.1/13) THEN m ELSE n/a -- MS4/S4-4c_A_So and/or MS4/S4-4c_A_Sk present

E.4.2.1 MS4 connection function: MS4_C

Table E.8: Connection functionalities

Prerequisite: E.1/1 -- MS4_C present

Item	Connection functionalities	Reference	Status	Support
1	For further study	7.1	n/a	

E.4.2.2 MS4 layer trail termination functions: MS4_TT_So and MS4_TT_Sk

E.4.2.2.1 In service error monitoring process

Table E.9: In service error monitoring: principles

Item	In service error monitoring: principles	Reference	Status	Support
1	An EDC is part of the characteristic information for in service monitoring purposes.	ETS 300 417-1-1 [1] subclause 7.3	m	
2	In service error monitoring parameter definition is block-based.	G.707 [14] subclause 9.2.2.4 note	m	
3	The block length is 2 403 bytes (within an STM-16, the STM-1 frame structure without the Regenerator Section Overhead).	G.707 [14] subclause 9.2.2.4	m	
4	The error monitoring is performed using Bit Interleaved Parity 96 (BIP-96).	7.2.1, G.707 [14] subclause 9.2.2.4 note	m	
5	The BIP-96 is calculated using even parity in such a manner that the bit in position x provides even parity over the x-bits of all the 96-bits sequences within the specified block.	G.707 [14] subclause 9.2.2.4 note	m	

Comments: The BIP-n is interpreted as checking 'n' separate interleaved parity check blocks. If any of the 'n' parity check fails (EDC Violation), the block is assumed to be in error.

Table E.10: EDC location

Item	Error Detection Code (EDC) location	Reference	Status	Support
1	Multiplex Section EDC is located in bytes B2 from (5,1) to (5,12) of the STM-4 frame.	7, figure 52	m	

Table E.11: EDC processing: source direction

Prerequisite: E.1/2 -- MS4_TT_So present

Item	Error Detection Code (EDC) processing: source direction	Reference	Status	Support
1	The BIP-96 is calculated over all bits, except those in the RSOH bytes, of the previous STM-4 frame.	7.2.1	m	
2	BIP-96 code is inserted in the 12 B2 bytes of the current STM-4 frame.	7.2.1	m	

Table E.12: EDC processing: sink direction

Prerequisite: E.1/3 -- MS4_TT_Sk function present

Item	Error Detection Code (EDC) processing: sink direction	Reference	Status	Support
1	The incoming error monitoring bytes B2 are recovered from the MSOH signal.	7.2.2	m	
2	The BIP-96 is calculated over all bits, except of those in the RSOH bytes, of the previous STM-4 frame.	7.2.2	m	
3	Recovered B2 bytes are compared with the calculated BIP-96.	7.2.2	m	
4	A difference between the computed and recovered B2 values is taken as evidence of one or more errors (nN_B) in the computation block.	7.2.2	m	

E.4.2.2.2 Server layer status monitoring process

E.4.2.2.2.1 MS4 Alarm Indication Signal (MS4 AIS)

Table E.13: Alarm Indication Signal (AIS) processing: sink direction

Prerequisite: E.1/3 -- MS4_TT_Sk present

Item	Alarm Indication Signal (AIS) processing: sink direction	Reference	Status	Support
1	MS4_TT_Sk extracts and monitors bits 6 to 8 of K2 byte in order to detect the '111' bit pattern as evidence of MS AIS condition.	7.2.2	m	

E.4.2.2.3 Remote indicators monitoring process

E.4.2.2.3.1 MS4 Remote Defect Indication (RDI) (MS4 RDI)

Table E.14: Remote Defect Indication (RDI) location

Prerequisite: E.1/2 AND E.1/3 -- bi-directional layer supported

Item	Remote Defect Indication (RDI) location	Reference	Status	Support
1	The MS RDI is located in bits 6,7 and 8 of byte K2(5,25) of the STM-4 frame.	7.2.1, 7.2.2	m	

Table E.15: Remote Defect Indication (RDI) processing: source direction

Prerequisite: E.1/2 AND E.1/3 -- bi-directional layer supported

Item	Remote Defect Indication (RDI) processing: source direction	Reference	Status	Support
1	MS4 RDI is set upon activation of MS4_RI_RDI determined by the associated MS4_TT_Sk.	7.2.1	m	
2	MS4 RDI is cleared upon deactivation of MS4_RI_RDI determined by the associated MS4_TT_Sk.	7.2.1	m	
3	MS4 RDI signal is coded as a '110' bit pattern.	7.2.1	m	
4	If MS4_RI_RDI is inactive bits 6 to 8 of byte K2 are passed through transparently except for incoming codes "111" and "110".	7.2.1	m	
5	The '000' bit pattern is inserted if no MS4_RI_RDI signal is active and the incoming content of bits 6 to 8 in byte K2 is "111" or "110".	7.2.1	m	

Table E.16: Remote Defect Indication (RDI) processing: sink direction

Prerequisite: E.1/3 -- MS4_TT_Sk present

Item	Remote Defect Indication (RDI) processing: sink direction	Reference	Status	Support
1	MS4_TT_Sk extracts and monitors bits 6 to 8 of K2 byte in order to detect the '110' bit pattern as evidence of MS RDI condition.	7.2.2	m	

E.4.2.2.3.2 MS4 Remote Error Indication (REI) (MS4 REI)

Table E.17: Remote Error Indication (REI): principles

Prerequisite: E.1/2 AND E.1/3 -- -- bi-directional layer supported

Item	Remote Error Indication (REI): principles	Reference	Status	Support
1	The REI signal contains the exact number of Errored Block (EB) detected in the trail signal at the far-end trail termination	G.707 [14] subclause 9.2.2.12	m	
2	The block length is 801 bits. The EDC is BIP-1.	G.707 [14] subclause 9.2.2.12	m	

Table E.18: Remote Error Indication (REI) location

Prerequisite: E.1/2 AND E.1/3 -- -- bi-directional layer supported

Item	Remote Error Indication (REI) location	Reference	Status	Support
1	The MS REI is located in bits 1 to 8 of M1(9,15) byte of the STM-4 frame.	G.707 [14] subclause 9.2.2.12	m	

Table E.19: Remote Error Indication (REI) processing: source direction

Prerequisite: E.1/2 AND E.1/3 -- -- bi-directional layer supported

Item	Remote Error Indication (REI) processing: source direction	Reference	Status	Support
1	The MS4_TT_So sets REI to the equivalent binary value of the number of EDCV detected by the monitoring process	G.707 [14] subclause 9.2.2.12	m	

Table E.20: Remote Error Indication (REI) processing: sink direction

Prerequisite: E.1/3 -- MS4_TT_Sk present

Item	Remote Error Indication (REI) processing: sink direction	Reference	Status	Support
1	The MS4_TT_Sk extracts the MS4 REI from the incoming STM-4 signal .	7.2.2	m	
2	The MS4_TT_Sk interprets the MS4 REI as given in G.707 [14] subclause 9.2.2.12	G.707 [14] subclause 9.2.2.12	m	

E.4.2.3 MS4 layer to S4 layer adaptation functions: MS4/S4_A_So and MS4/S4_A_Sk

Table E.21: Adaptation process

Prerequisite: E.1/4 OR E.1/5 -- MS4/S4_A_So and/or MS4/S4_A_Sk present

Item	Adaptation process	Reference	Status	Support
1	The MS4/S4_A_So function provides frequency justification and bitrate adaptation for a VC-4 signal, represented by a nominally (261×9×64) = 150 336 kbit/s information stream and the related frame phase with a frequency accuracy within ±4,6 ppm.	7.3.1	c2101	
2	The MS4/S4_A_So-N has access to a specific AU-4 of the MS4 access point. The AU-4 is defined by the parameter N (or AUnum) with N=1,...,4.	7.3.1	c2101	
3	The MS4/S4_A_Sk recovers the VC-4 data with frame phase information.	7.3.2	c2102	
4	The MS4/S4_A_Sk-N has access to a specific AU-4 of the MS4 access point. The AU-4 is defined by the parameter N (or AUnum) with N=1,...,4.	7.3.2	c2102	

c2101: IF E.1/4 THEN m ELSE n/a -- MS4/S4_A_So present
c2102: IF E.1/5 THEN m ELSE n/a -- MS4/S4_A_Sk present

E.4.2.3.1 MS4 layer to S4 layer frequency justification and bitrate adaptation processes

Table E.22: Frequency justification and bitrate adaptation: principles

Prerequisite: E.1/4 -- MS4/S4_A_So present

Item	Frequency justification and bitrate adaptation: principles	Reference	Status	Support
1	Frequency justification is performed by pointer adjustments.	7.3.1	m	

Table E.23: Frequency justification and bitrate adaptation: source direction

Prerequisite: E.1/4 -- MS4/S4_A_So present

Item	Frequency justification and bitrate adaptation: source direction	Reference	Status	Support
1	The MS4/S4_A_So function provides for an elastic store (buffer) process. The data and frame start signals are written into the store under control of the associated input clock. The data and frame start signals are read out of the store under control of the STM-4 clock, frame position and justification decision.	7.3.1	m	
2	Each justification decision results in a corresponding negative/positive justification action. Upon a positive justification action, the reading of 24 data bits are cancelled once and no data written at the three positions H3+1. Upon a negative justification action, an extra 24 data bits are read out once into the three positions H3.	7.3.1	m	
3	Consecutive pointer operations shall be separated by at least three frames (i.e. every fourth frame) in which the pointer value remains constant	7.3.1	m	
4	The buffer hysteresis is at least 12 bytes.	7.3.1	m	
5	The size of the buffer for the elastic store process is [for further study]	7.3.1	n/a	

E.4.2.3.2 MS4 layer to S4 layer alignment process

Table E.24: Alignment process principles

Prerequisite: E.1/4 OR E.1/5 -- MS4/S4_A_So and/or MS4/S4_Sk present

Item	Alignment process principles	Reference	Status	Support
1	The alignment process is carried out by the processing of the AU-4 pointer which is aligned in the STM-4 payload in fixed position relative to the STM-4 frame.	G.707 [14] subclause 8.1	m	
2	The location of the first byte of the VC-4 with respect to the STM-4 is given by the related AU-4 pointer value.	G.707 [14] subclause 8.1.2	m	

Comments: The pointer value gives a measure of the phase offset between the VC-4 stream and the STM-4 frame.

Table E.25: AU-4 pointer and alignment byte location

Prerequisite: E.1/4 OR E.1/5 -- MS4/S4_A_So and/or MS4/S4_Sk present

Item	AU-4 pointer and alignment byte location	Reference	Status	Support
1	The 36 bytes at the beginning of row 4 in the STM-4 frame are allocated to the alignment process.	5.3.1, G.707 [14] subclauses 8.1 to 8.1.1	m	
2	The AU-4 pointer is located into H1 (4,AUnum) and H2 (4,12+AUnum) of the STM-4 frame.	5.3.1, G.707 [14] subclauses 8.1 to 8.1.1	m	

Comments: The parameter AUnum (AUnum=1,..,4) indicates the Administrative Unit number within the STM-16 frame.

Table E.26: AU-4 Pointer and alignment byte structure

Prerequisite: E.1/4 OR E.1/5 -- MS4/S4_A_So and/or MS4/S4_Sk present

Item	AU-4 Pointer and alignment byte structure	Reference	Status	Support
1	The content of H1 (4,AUnum) and H2 (4,12+AUnum) bytes is viewed as one pointer word.	G.707 [14] subclause 8.1.2	m	
2	Bits 1 through 4 of the pointer word carry the New Data Flag (NDF).	G.707 [14] subclause 8.1.2	m	
3	Bits 5 and 6 of the pointer word, named ss bits, carry the AU-n type code. They are set to '10'.	7.3.1, G.707 [14] subclause 8.1.2	m	
4	Bits 7 through 16 (last ten bits) of the pointer word carry the pointer value.	G.707 [14] subclause 8.1.2	m	
5	The AU-4 pointer value is a binary number with a range of 0 to 782.	G.707 [14] subclause 8.1.2	m	
6	Bytes from (4,5) to (4,12) contain the fixed stuff code Y = 1001 ss11. Bits ss are undefined.	7.3.1, G.707 [14] subclause 8.1.2	m	
7	Bytes from (4,17) to (4,24) contain the fixed stuff code '1' = 1111 1111.	7.3.1, G.707 [14] subclause 8.1.2	m	
8	H3(4,24+AUnum), H3(4,28+AUnum), H3(4,32+AUnum) bytes are the negative justification opportunity bytes.	G.707 [14] subclause 8.1.2	m	
9	Bits 7,9,11,13,15 of the pointer word (I bits) are the pointer incrementation indication bits.	G.707 [14] subclause 8.1.2	m	
10	Bits 8,10,12,14,16 of the pointer word (D bits) are the pointer decrementation indication bits.	G.707 [14] subclause 8.1.2	m	

Comments: The parameter AUnum (AUnum=1,..,4) indicates the Administrative Unit number within the STM-16 frame.

NOTE: Items E.26/3 and E.26/6 are contradictory but just reflect the base specification in ITU–T Recommendation G.707 [14] and ETS 300 417-3-1 [2].

E.4.2.3.2.1 AU pointer generation

Table E.27: Pointer generation principles

Prerequisite: E.1/4 OR E.1/12 -- MS4/S4_A_So and/or MS4/S4-4c_A_So present

Item	Pointer generation principles	Reference	Status	Support
1	The pointer is generated according to the pointer generation algorithm.	7.3.1, ETS 300 417-1-1 [1] annex A	m	
2	The pointer generation algorithm can be modelled by a finite state machine as shown in ETS 300 417-1-1 [1] figure A.1. Four states can be identified: - NORM_state - NDF_state - INC_state - DEC_state	ETS 300 417-1-1 [1] annex A	m	
3	The transitions from the NORM state to the INC, DEC and NDF states are initiated by Elastic Store process events.	ETS 300 417-1-1 [1] annex A	m	
4	The transitions from INC, DEC and NDF states to the NORM state occur autonomously under the generation of special pointer patterns.	ETS 300 417-1-1 [1] annex A	m	
5	Definition of excessive pointer adjustments is for further study.	ETS 300 417-1-1 [1] annex A	n/a	

Table E.28: Pointer generation events

Prerequisite: E.1/4 OR E.1/12 -- MS4/S4_A_So and/or MS4/S4-4c_A_So present

Item	Pointer generation events	Reference	Status	Support
1	**thr_exc**: elastic store filling exceeds an upper threshold	ETS 300 417-1-1 [1] annex A	m	
2	**thr_und**: elastic store filling falls below a lower threshold	ETS 300 417-1-1 [1] annex A	m	
3	**FO_normal**: normal frame offset	ETS 300 417-1-1 [1] annex A	m	
4	**FO_discont**: frame offset discontinuity	ETS 300 417-1-1 [1] annex A	m	
5	A frame offset discontinuity occurs if an incoming NDF_enable or 3*new_point is received by the pointer interpreter controlling the process of writing into the elastic store.	ETS 300 417-1-1 [1] annex A	m	
6	A frame offset discontinuity occurs if the Elastic Store overflow/underflow condition is detected.	ETS 300 417-1-1 [1] annex A	m	
7	The active offset is defined as the phase between the outgoing STM-4 and the VC-4 (or VC-4-4c).	ETS 300 417-1-1 [1] annex A	m	
8	The active offset is undefined during a signal fail condition.	ETS 300 417-1-1 [1] annex A	m	

Table E.29: Pointer generation actions

Prerequisite: E.1/4 OR E.1/12 -- MS4/S4_A_So and/or MS4/S4-4c_A_So present

Item	Pointer generation actions	Reference	Status	Support
1	The **norm_point action** generates a transmitted pointer word with: - NDF disabled (NDF bytes set to 0110), - pointer value set to active offset.	ETS 300 417-1-1 [1] annex A	m	
2	The **inc_ind action** generates a transmitted pointer word with: NDF disabled (NDF bytes set to 0110), - pointer value set to the active offset and I-bits inverted. After this action 3 (or 12) stuffing bytes are transmitted in the 3 (or 12) H3+1 byte positions (see figure 53 in ETS 300 417-3-1) of the AU-4 (or AU-4-4c) and the active offset is incremented by one unit. If the previous pointer value is set to its maximum value, the subsequent pointer is set to zero.	ETS 300 417-1-1 [1] annex A, G.707 [14] subclause 8.1.5	m	
3	The **dec_ind action** generates a transmitted pointer word with: - NDF disabled (NDF bytes set to 0110), - pointer value set to the active offset and D-bits inverted. After this action 3 (or 12) data bytes are transmitted in the 3 (or 12) H3 byte positions of the AU-4 (or AU-4-4c) and the active offset is decremented by one. If the previous pointer value is zero, the subsequent pointer is set to its maximum value.	ETS 300 417-1-1 [1] annex A, G.707 [14] subclause 8.1.5	m	
4	The **NDF_enable action** generates a pointer word with: - NDF enabled (NDF bytes set to 1001), - pointer value set to the new offset. After this action the active offset is updated to the new offset value.	ETS 300 417-1-1 [1] annex A	m	

Comments: I bits and D bits are, respectively, bits 7,9,11,13,15 and 8,10,12,14,16 of the pointer word.

Table E.30: Pointer generation: operation in NORM state

Prerequisite: E.1/4 OR E.1/12 -- MS4/S4_A_So and/or MS4/S4-4c_A_So present

Item	Pointer generation: operation in NORM state	Reference	Status	Support
1	Reception: FO_normal Transition to state: NORM Action: norm_point	ETS 300 417-1-1 [1] annex A	m	
2	Reception: thr_exc Transition to state: DEC Action: dec_ind	ETS 300 417-1-1 [1] annex A	m	
3	Reception: thr_und Transition to state: INC Action: inc_ind	ETS 300 417-1-1 [1] annex A	m	
4	Reception: FO_discont Transition to state: NDF Action: NDF_enable	ETS 300 417-1-1 [1] annex A	m	

Table E.31: Pointer generation: operation in INC state

Prerequisite: E.1/4 OR E.1/12 -- MS4/S4_A_So and/or MS4/S4-4c_A_So present

Item	Pointer generation: operation in INC state	Reference	Status	Support
1	Reception: FO_normal Transition to state: INC Action: norm_point	ETS 300 417-1-1 [1] annex A	m	
2	Reception: 3*FO_normal Transition to state: NORM Action: norm_point	ETS 300 417-1-1 [1] annex A	m	
3	Reception: FO_discont Transition to state: NDF Action: NDF_enable	ETS 300 417-1-1 [1] annex A	m	

Table E.32: Pointer generation: operation in DEC state

Prerequisite: E.1/4 OR E.1/12 -- MS4/S4_A_So and/or MS4/S4-4c_A_So present

Item	Pointer generation: operation in DEC state	Reference	Status	Support
1	Reception: FO_normal Transition to state: DEC Action: norm_point	ETS 300 417-1-1 [1] annex A	m	
2	Reception: 3*FO_normal Transition to state: NORM Action: norm_point	ETS 300 417-1-1 [1] annex A	m	
3	Reception: FO_discont Transition to state: NDF Action: NDF_enable	ETS 300 417-1-1 [1] annex A	m	

Table E.33: Pointer generation: operation in NDF state

Prerequisite: E.1/4 OR E.1/12 -- MS4/S4_A_So and/or MS4/S4-4c_A_So present

Item	Pointer generation: operation in NDF state	Reference	Status	Support
1	Reception: FO_normal Transition to state: NDF Action: norm_point	ETS 300 417-1-1 [1] annex A	m	
2	Reception: FO_discont Transition to state: NDF Action: NDF_enable	ETS 300 417-1-1 [1] annex A	m	
3	Reception: 3*FO_normal Transition to state: NORM Action: norm_point	ETS 300 417-1-1 [1] annex A	m	

E.4.2.3.2.2 AU pointer interpretation

Table E.34: Pointer interpretation principles

Prerequisite: E.1/5 OR E.1/13 -- MS4/S4_A_Sk and/or MS4/S4-4c_A_Sk present

Item	Pointer interpretation principles	Reference	Status	Support
1	The pointer is interpreted according to the pointer interpretation algorithm.	7.3.2, 7.3.4, ETS 300 417-1-1 [1] annex B	m	
2	The pointer interpretation algorithm can be globally described by a state diagram as shown in ETS 300 417-1-1 [1] figure B.1. Six states are defined: – NORMal_state (NORM) – AIS_state (AIS) – LOP_state (LOP) – INCrement_state (INC) – DECrement_state (DEC) – NDF_state (NDF)	ETS 300 417-1-1 [1] annex B	m	
3	The transitions between the states will be initiated either by single or consecutive events.	ETS 300 417-1-1 [1] annex B	m	
4	The kind and number of consecutive indications activating a transition is chosen such that the behaviour is stable and insensitive to signal degradations.	ETS 300 417-1-1 [1] annex B	m	

Table E.35: Pointer interpretation events

Prerequisite: E.1/5 OR E.1/13 -- MS4/S4_A_Sk and/or MS4/S4-4c_A_Sk present

Item	Pointer interpretation events	Reference	Status	Support
1	**NDF Enabled** occurs when any of the following bit patterns is received: "1001", "0001", "1101", "1011", "1000"	ETS 300 417-1-1 [1] annex B	m	
2	**NDF Disabled** occurs when any of the following bit patterns is received: "0110", "1110", "0010", "0100", "0111"	ETS 300 417-1-1 [1] annex B	m	
3	The **norm_point event** corresponds to a received pointer word with: NDF disabled AND ss-bits set to 10 (indicating AU-4) AND received pointer offset value equal to active offset value	ETS 300 417-1-1 [1] annex B	m	
4	The **NDF_enable event** corresponds to a received pointer word with: NDF enabled AND ss-bits set to 10 (indicating AU-4) AND received pointer offset value in range	ETS 300 417-1-1 [1] annex B	m	
5	The **AIS_ind event** corresponds to a received pointer word set to 11111111 11111111 (FF FF Hex)	ETS 300 417-1-1 [1] annex B	m	
6	The **inc_ind event** corresponds to a received pointer word with: NDF disabled AND ss-bits set to 10 (indicating AU-4) AND majority of I-bits inverted AND no majority of D-bits inverted	ETS 300 417-1-1 [1] annex B	m	
7	The **inv_point event** corresponds to any other received pointer word: NOT norm_point AND NOT NDF_enable AND NOT AIS_ind AND NOT [(inc_ind OR dec_ind) AND NORM_state]	ETS 300 417-1-1 [1] annex B	m	
8	The **new_point event** corresponds to a received pointer word with: NDF disabled AND ss-bits set to 10 (indicating AU-4) AND received pointer offset value in range but not equal to active offset value	ETS 300 417-1-1 [1] annex B	m	
9	The remaining six **NDF codes** ("0000", "0011", "0101", "1010", "1100", "1111") result in an **inv_pointer** indication.	ETS 300 417-1-1 [1] annex B	m	
10	The **8*NDF_enable event** corresponds to 8 consecutive NDF_enable events.	ETS 300 417-1-1 [1] annex B	m	
11	The **3*AIS_ind** corresponds to three consecutive AIS_ind events.	ETS 300 417-1-1 [1] annex B	m	
12	The **8* inv_point event** corresponds to 8 consecutive inv_point events.	ETS 300 417-1-1 [1] annex B	m	
13	The **3*any_point** corresponds to the following combination of events: 3*NOT NDF_enable AND NOT 3*AIS_ind AND NOT 3*new_point	ETS 300 417-1-1 [1] annex B	m	
14	The **3*new_point** corresponds to three consecutive equal new_point events.	ETS 300 417-1-1 [1] annex B	m	

Table E.36: Operation in NORM state

Prerequisite: E.1/5 OR E.1/13 -- MS4/S4_A_Sk and/or MS4/S4-4c_A_Sk present

Item	Operation in NORM state	Reference	Status	Support
1	Reception: inc_ind Transition to state: INC Action: increment active offset	ETS 300 417-1-1 [1] annex B	m	
2	Reception: dec_ind Transition to state: DEC Action: decrement active offset	ETS 300 417-1-1 [1] annex B	m	
3	Reception: NDF_enable Transition to state: NDF Action: accept new offset	ETS 300 417-1-1 [1] annex B	m	
4	Reception: 3*new_point Transition to state: NORM Action: accept new offset	ETS 300 417-1-1 [1] annex B	m	
5	Reception: 8*inv_point Transition to state: LOP Action: offset undefined	ETS 300 417-1-1 [1] annex B	m	
6	Reception: 3*AIS_ind Transition to state: AIS Action: offset undefined	ETS 300 417-1-1 [1] annex B	m	

Table E.37: Operation in INC state

Prerequisite: E.1/5 OR E.1/13 -- MS4/S4_A_Sk and/or MS4/S4-4c_A_Sk present

Item	Operation in INC state	Reference	Status	Support
1	Reception: 3*new_point Transition to state: NORM Action: accept new offset	ETS 300 417-1-1 [1] annex B	m	
2	Reception: 3*AIS_ind Transition to state: AIS Action: offset undefined	ETS 300 417-1-1 [1] annex B	m	
3	Reception: 3*any_point Transition to state: NORM Action: none	ETS 300 417-1-1 [1] annex B	m	
4	Reception: NDF_enable Transition to state: NDF Action: accept new offset	ETS 300 417-1-1 [1] annex B	m	

Table E.38: Operation in DEC state

Prerequisite: E.1/5 OR E.1/13 -- MS4/S4_A_Sk and/or MS4/S4-4c_A_Sk present

Item	Operation in DEC state	Reference	Status	Support
1	Reception: 3*new_point Transition to state: NORM Action: accept new offset	ETS 300 417-1-1 [1] annex B	m	
2	Reception: 3*AIS_ind Transition to state: AIS Action: offset undefined	ETS 300 417-1-1 [1] annex B	m	
3	Reception: 3*any_point Transition to state: NORM Action: none	ETS 300 417-1-1 [1] annex B	m	
4	Reception: NDF_enable Transition to state: NDF Action: accept new offset	ETS 300 417-1-1 [1] annex B	m	

Table E.39: Operation in NDF state

Prerequisite: E.1/5 OR E.1/13 -- MS4/S4_A_Sk and/or MS4/S4-4c_A_Sk present

Item	Operation in NDF state	Reference	Status	Support
1	Reception: 3*new_point Transition to state: NORM Action: accept new offset	ETS 300 417-1-1 [1] annex B	m	
2	Reception: 3*AIS_ind Transition to state: AIS Action: offset undefined	ETS 300 417-1-1 [1] annex B	m	
3	Reception: 3*any_point Transition to state: NORM Action: none	ETS 300 417-1-1 [1] annex B	m	
4	Reception: FO_discont Transition to state: NDF Action: accept new offset	ETS 300 417-1-1 [1] annex B	m	
5	Reception: 8*NDF_enable Transition to state: LOP Action: offset undefined	ETS 300 417-1-1 [1] annex B	m	

Table E.40: Operation in LOP state

Prerequisite: E.1/5 OR E.1/13 -- MS4/S4_A_Sk and/or MS4/S4-4c_A_Sk present

Item	Operation in LOP state	Reference	Status	Support
1	Reception: 3*new_point Transition to state: NORM Action: accept new offset	ETS 300 417-1-1 [1] annex B	m	
2	Reception: 3*AIS_ind Transition to state: AIS Action: offset undefined	ETS 300 417-1-1 [1] annex B	m	

Table E.41: Operation in AIS state

Prerequisite: E.1/5 OR E.1/13 -- MS4/S4_A_Sk and/or MS4/S4-4c_A_Sk present

Item	Operation in AIS state	Reference	Status	Support
1	Reception: 3*new_point Transition to state: NORM Action: accept new offset	ETS 300 417-1-1 [1] annex B	m	
2	Reception: 3*AIS_ind Transition to state: AIS Action: offset undefined	ETS 300 417-1-1 [1] annex B	m	
3	Reception: 8*inv_point Transition to state: LOP Action: offset undefined	ETS 300 417-1-1 [1] annex B	m	
4	Reception: NDF_enable Transition to state: NDF Action: accept new offset	ETS 300 417-1-1 [1] annex B		

Table E.42: Pointer interpretation: complements

Prerequisite: E.1/5 OR E.1/13 -- MS4/S4_A_Sk and/or MS4/S4-4c_A_Sk present

Item	Pointer interpretation: complements	Reference	Status	Support
1	Non-consecutive invalid indications do not activate the transition to the LOP_state.	ETS 300 417-1-1 [1] annex B	m	
2	The pointer processor maintains its current phase on detection of an invalid pointer and searches in parallel for a new phase.	9.3.2, 9.3.4	m	
3	The reception of 3*new_point takes precedence over any other events.	ETS 300 417-1-1 [1] annex B	m	
4	The second and third offset value received in 3*new_point needs to be identical with the first.	ETS 300 417-1-1 [1] annex B	m	
5	The "consecutive new_point" counter is reset to zero on a change of state, except for transitions occurring among INC, DEC, NDF states and the NORM state.	ETS 300 417-1-1 [1] annex B	m	
6	The "consecutive inv_point counter" can be incremented in all states. The "consecutive inv_point" counter is not reset on a change of state.	ETS 300 417-1-1 [1] annex B	m	
7	The "consecutive AIS_ind" counter is not reset on a change of state.	ETS 300 417-1-1 [1] annex B	m	
8	The "consecutive NDF_enable" counter is reset to zero on a change of AIS to NDF state; otherwise the counter is not reset.	ETS 300 417-1-1 [1] annex B	m	

E.4.2.3.3 MS4 layer to S4 layer multiplexing and demultiplexing processes

Table E.43: Multiplexing

Prerequisite: E.1/4 -- MS4/S4_A_So present

Item	Multiplexing	Reference	Status	Support
1	Bytes allocated to the AU-4 pointer are multiplexed into MS4_AI at the AU tributary location indicated by MI_AUnum.	7.3.1	m	
2	The VC-4 is multiplexed into MS4_AI according to the pointer generation algorithm	7.3.1	m	

Table E.44: Demultiplexing

Prerequisite: E.1/5 -- MS4/S4_A_Sk present

Item	Demultiplexing	Reference	Status	Support
1	The AU-4 pointer is recovered from MS4_AI from the AU pointer location of the STM-4 stream indicated by MI_AUnum.	7.3.2	m	
2	The VC-4 is recovered from MS4_AI according to the pointer interpretation algorithm.	7.3.2	m	

E.4.2.4 MS4 layer to S4-4c layer adaptation functions: MS4/S4-4c_A_So and MS4/S4-4c_A_Sk

Table E.45: Adaptation process

Prerequisite: E.1/12 OR E.1/13 -- MS4/S4-4c_A_So and/or MS4/S4-4c_A_Sk present

Item	Adaptation process	Reference	Status	Support
1	The MS4/S4-4c_A_So function provides frequency justification and bitrate adaptation for a VC-4-4c signal, represented by a nominally (1 044 × 9 × 64) = 601 344 kbit/s information stream and the related frame phase with a frequency accuracy within ±4,6 ppm.	7.3.3	c4501	
2	The MS4/S4-4c_A_Sk recovers the VC-4-4c data with frame phase information.	7.3.4	c4502	

c4501: IF E.1/12 THEN m ELSE n/a -- MS4/S4-4c_A_So present
c4502: IF E.1/13 THEN m ELSE n/a -- MS4/S4-4c_A_Sk present

E.4.2.4.1 MS4 layer to S4-4c layer frequency justification and bitrate adaptation processes

Table E.46: Frequency justification and bitrate adaptation: principles

Prerequisite: E.1/12 -- MS4/S4-4c_A_So present

Item	Frequency justification and bitrate adaptation: principles	Reference	Status	Support
1	Frequency justification is performed by pointer adjustments.	7.3.3	m	

Table E.47: Frequency justification and bitrate adaptation: source direction

Prerequisite: E.1/12 -- MS4/S4-4c_A_So present

Item	Frequency justification and bitrate adaptation: source direction	Reference	Status	Support
1	The MS4/S4-4c_A_So function provides for an elastic store (buffer) process. The data and frame start signals are written into the store under control of the associated input clock. The data and frame start signals are read out of the store under control of the STM-4 clock, frame position and justification decision.	7.3.3	m	
2	Each justification decision results in a corresponding negative/positive justification action. Upon a positive justification action, the reading of 96 data bits are cancelled once and no data written at the twelve positions H3+1. Upon a negative justification action, an extra 96 data bits are read out once into the twelve positions H3.	7.3.3	m	
3	Consecutive pointer operations shall be separated by at least three frames (i.e. every fourth frame) in which the pointer value remains constant	7.3.3	m	

E.4.2.4.2 MS4 layer to S4-4c layer alignment process

Table E.48: Alignment process principles

Prerequisite: E.1/12 OR E.1/13 -- MS4/S4-4c_A_So and/or MS4/S4-4c_A_Sk present

Item	Alignment process principles	Reference	Status	Support
1	The alignment process is carried out by the processing of the AU-4-4c pointer which is aligned in the STM-4 payload in fixed position relative to the STM-4 frame.	G.707 [14] subclause 8.1	m	
2	The location of the first byte of the VC-4-4c with respect to the STM-4 is given by the related AU-4-4c pointer value.	G.707 [14] subclause 8.1.2	m	

Comments: The pointer value gives a measure of the phase offset between the VC-4-4c stream and the STM-4 frame.

Table E.49: AU-4-4c pointer and alignment byte location

Prerequisite: E.1/12 OR E.1/13 -- MS4/S4-4c_A_So and/or MS4/S4-4c_A_Sk present

Item	AU-4-4c pointer and alignment byte location	Reference	Status	Support
1	The 36 bytes at the beginning of row 4 in the STM-4 frame are allocated to the alignment process.	7.3.3, G.707 [14] subclauses 8.1 to 8.1.1	m	
2	The AU-4-4c pointer is located into bytes from (4,1) to (4,4) and from (4,13) to (4,16) of the STM-4 frame.	7.3.3, G.707 [14] subclauses 8.1 to 8.1.1	m	

Table E.50: AU-4-4c pointer and alignment byte structure

Prerequisite: E.1/12 OR E.1/13-- MS4/S4-4c_A_So and/or MS4/S4-4c_A_Sk present

Item	AU-4-4c Pointer and alignment byte structure	Reference	Status	Support
1	The content of H1 (4,1) and H2 (4,13) bytes is viewed as one pointer word.	G.707 [14] subclauses 8.1.2 and 8.1.7.1	m	
2	Bits 1 through 4 of the pointer word carry the New Data Flag (NDF).	G.707 [14] subclause 8.1.2 and 8.1.7.1	m	
3	Bits 5 and 6 of the pointer word, named ss bits, carry the AU-n type code. They are set to '10'.	7.3.3, G.707 [14] subclause 8.1.2 and 8.1.7.1	m	
4	Bits 7 through 16 (last ten bits) of the pointer word carry the pointer value.	G.707 [14] subclause 8.1.2 and 8.1.7.1	m	
5	The AU-4-4c pointer value is a binary number with a range of 0 to 782.	G.707 [14] subclause 8.1.2 and 8.1.7.1	m	
6	The pointer locations H1 (4,2) to (4,4) and H2 (4,14) to (4,16) carry the concatenation indicator, defined as 1001ss11 11111111, with ss being undefined bits.	7.3.3, G.707 [14] subclause 8.1.2 and 8.1.7.1	m	
7	Bytes from (4,5) to (4,12) contain the fixed stuff code Y = 1001 ss11. Bits ss are undefined.	7.3.3, G.707 [14] subclause 8.1.2 and 8.1.7.1	m	
8	Bytes from (4,17) to (4,24) contain the fixed stuff code '1' = 1111 1111.	7.3.3, G.707 [14] subclause 8.1.2 and 8.1.7.1	m	
9	Bytes H3 from (4,25) to (4,36) are the negative justification opportunity bytes.	G.707 [14] subclause 8.1.2 and 8.1.7.1	m	
10	Bits 7,9,11,13,15 of the pointer word (I bits) are the pointer incrementation indication bits.	G.707 [14] subclause 8.1.2 and 8.1.7.1	m	
11	Bits 8,10,12,14,16 of the pointer word (D bits) are the pointer decrementation indication bits.	G.707 [14] subclause 8.1.2 and 8.1.7.1	m	

E.4.2.4.2.1 Concatenation indicator recovery process

Table E.51: Concatenation indicator recovery process: principles

Prerequisite: E.1/13 -- MS4/S4-4c_A_Sk present

Item	Concatenation Indicator recovery process: principles	Reference	Status	Support
1	The Concatenation Indicator recovery algorithm can be globally described by a state diagram as shown in ETS 300 417-1-1 [1] figure B.2. Three states are defined: - CONCatenated_state (CONC) - AIS_state (AISC) - LOP_state (LOPC)	ETS 300 417-1-1 [1] annex B	m	

Table E.52: Concatenation indicator recovery process events

Prerequisite: E.1/13 -- MS4/S4-4c_A_Sk present

Item	Concatenation Indicator recovery events	Reference	Status	Support
1	The **conc_ind event** corresponds to a received word (in bytes [4,2] and [4,14], [4,3] and [4,15], [4,4] and [4,16]) with: NDF enabled AND dd 11 11111111. Bits indicated as 'dd' are undefined.	ETS 300 417-1-1 [1] annex B	m	
2	The **AIS_ind event** corresponds to a received word (in bytes [4,2] and [4,14], [4,3] and [4,15], [4,4] and [4,16]) with: 11111111 11111111.	ETS 300 417-1-1 [1] annex B	m	
3	The **inv_point event** corresponds to a received word (in bytes [4,2] and [4,14], [4,3] and [4,15], [4,4] and [4,16]) with: NOT conc_ind AND NOT AIS_ind.	ETS 300 417-1-1 [1] annex B	m	
4	The **3*AIS_ind** corresponds to three consecutive AIS_ind events.	ETS 300 417-1-1 [1] annex B	m	
5	The **8* inv_point** corresponds to eight consecutive inv_point events.	ETS 300 417-1-1 [1] annex B	m	
6	The **3*conc_ind** corresponds to three consecutive conc_ind events.	ETS 300 417-1-1 [1] annex B	m	

Table E.53: Operation in CONC state

Prerequisite: E.1/13 -- MS4/S4-4c_A_Sk present

Item	Operation in CONC state	Reference	Status	Support
1	Reception: 3*AIS_ind Transition to state: AISC.	ETS 300 417-1-1 [1] annex B	m	
2	Reception: 8*inv_ipoint Transition to state: LOPC.	ETS 300 417-1-1 [1] annex B	m	

Table E.54: Operation in LOPC state

Prerequisite: E.1/13 -- MS4/S4-4c_A_Sk present

Item	Operation in LOPC state	Reference	Status	Support
1	Reception: 3*conc_ind Transition to state: CONC.	ETS 300 417-1-1 [1] annex B	m	
2	Reception: 3*AIS_ind Transition to state: AISC.	ETS 300 417-1-1 [1] annex B	m	

Table E.55: Operation in AISC state

Prerequisite: E.1/13 -- MS4/S4-4c_A_Sk present

Item	Operation in AISC state	Reference	Status	Support
1	Reception: 3*conc_ind Transition to state: CONC.	ETS 300 417-1-1 [1] annex B	m	
2	Reception: 8*inv_point Transition to state: LOPC.	ETS 300 417-1-1 [1] annex B	m	

Table E.56: Pointer interpretation: complements

Prerequisite: E.1/13 -- MS4/S4-4c_A_Sk present

Item	Pointer interpretation: complements	Reference	Status	Support
1	Operation condition **AISX**: AIS#1 AND AISC#2 AND ... AND AISC#4.	ETS 300 417-1-1 [1] annex B	m	
2	Operation condition **NORMX**: NORM#1 AND CONC#2 AND ... AND CONC#4.	ETS 300 417-1-1 [1] annex B	m	
3	Operation condition **NDFX**: NDF#1 AND CONC#2 AND ... AND CONC#4.	ETS 300 417-1-1 [1] annex B	m	
4	Operation condition **INCX**: INC#1 AND CONC#2 AND ... AND CONC#4.	ETS 300 417-1-1 [1] annex B	m	
5	Operation condition **DECX**: DEC#1 AND CONC#2 AND ... AND CONC#4.	ETS 300 417-1-1 [1] annex B	m	
6	Operation condition **LOPX**: NOT AISX AND NOT NORMX AND NOT INCX AND NOT DECX AND NOT NDFX	ETS 300 417-1-1 [1] annex B	m	

NOTE: Some ambiguities about this functionality seem to appear in the base specification.

E.4.2.4.3 MS4 layer to S4-4c layer multiplexing and demultiplexing processes

Table E.57: Multiplexing

Prerequisite: E.1/12 -- MS4/S4-4c_A_So present

Item	Multiplexing	Reference	Status	Support
1	Bytes allocated to the AU-4-4c pointer are multiplexed into MS4_AI.	7.3.3	m	
2	The VC-4-4c is multiplexed into MS4_AI according to the pointer generation algorithm	7.3.3	m	

Table E.58: Demultiplexing

Prerequisite: E.1/13 -- MS4/S4-4c_A_Sk present

Item	Demultiplexing	Reference	Status	Support
1	The AU-4-4c pointer is recovered from MS4_AI.	7.3.4	m	
2	The VC-4-4c is recovered from MS4_AI according to the pointer interpretation algorithm.	7.3.4	m	

E.4.2.5 MS4 layer to DCC Layer adaptation functions: MS4/DCC_A_So and MS4/DCC_A_Sk

E.4.2.5.1 MS4 layer to DCC layer multiplexing and demultiplexing processes

Table E.59: Multiplexing

Prerequisite: E.1/8 -- MS4/DCC_A_So present

Item	Multiplexing	Reference	Status	Support
1	The DCC_CI data (576 kbit/s) are multiplexed into D4(6,1), D5(6,13), D6(6,25), D7(7,1), D8(7,13), D9(7,25), D10(8,1), D11(8,13), D12(8,25) bytes of the STM-4 frame.	7.3.5	m	

Table E.60: Demultiplexing

Prerequisite: E.1/9 -- MS4/DCC_A_Sk present

Item	Demultiplexing	Reference	Status	Support
1	The DCC_CI data (576 kbit/s) are demultiplexed from byte locations D4 to D12.	7.3.6	m	

E.4.2.6 MS4 layer to P0s layer adaptation functions: MS4/P0s_A_So and MS4/P0s_A_Sk

E.4.2.6.1 MS4 layer to P0s layer frequency justification and bitrate adaptation processes

Table E.61: Frequency justification and bitrate adaptation: principles

Prerequisite: E.1/8 -- MS4/P0s_A_So present

Item	Frequency justification and bitrate adaptation: principles	Reference	Status	Support
1	The MS4/ P0s _A_So function provides frequency justification and bitrate adaptation for a 64 kbit/s orderwire information stream. It takes P0s_CI as an unstructured bit-stream with a rate of 64 kbit/s ± 100 ppm and inserts it into the MSOH.	7.3.7	m	

Table E.62: Frequency justification and bitrate adaptation

Prerequisite: E.1/8 -- MS4/P0s_A_So present

Item	Frequency justification and bitrate adaptation	Reference	Status	Support
1	The MS4/P0s_A_So function provides for an elastic store (slip buffer) process. The data and frame start signals are written into the store under control of the associated input clock. The data and frame start signals are read out of the store under control of the STM-4 clock, frame position and justification decision.	7.3.7	m	
2	Each justification decision results in a corresponding negative/positive justification action. Upon a positive justification (slip) action, the reading of one 64 kbit/s octet (9 bits) is cancelled once. Upon a negative justification (slip) action, the same 64 kbit/s octet (9 bits) is read out a second time.	7.3.7	m	
3	The elastic store (slip buffer) size accommodates at least 18 µs of wander without introducing errors.is at least 2 octets.	7.3.7	m	

E.4.2.6.2 MS4 layer to P0s layer multiplexing and demultiplexing processes

Table E.63: Multiplexing

Prerequisite: E.1/8 -- MS4/P0s_A_So present

Item	Multiplexing	Reference	Status	Support
1	The P0s_CI data (64 kbit/s) are multiplexed into E2(9,25) byte of the STM-4 frame.	7.3.7	m	

Table E.64: Demultiplexing

Prerequisite: E.1/9 -- MS4/P0s_A_Sk present

Item	Demultiplexing	Reference	Status	Support
1	The P0s_ CI data (64 kbit/s) are demultiplexed from byte location E2.	7.3.8	m	

E.4.3 MS4 Linear Trail Protection Transmission Tables

Table E.65: Protection operation

Prerequisite: E.1/14 OR E.1/15 -- STM-4 Linear Trail Protection supported

Item	Protection operation	Reference	Status	Support
1	The APS channel is a 13 bits channel carried into bits K1[1-8] and K2[1-5].	7.5.1.1, 7.5.1.2, A.1	c6501	
2	The signal switching procedure is started under Signal Fail (SF) or Signal Degrade (SD) conditions.	7.5.1.1, 7.5.1.2, A.1	m	
3	In revertive operation the available external commands are LO, FSw-#1, MSw-#1, CLR, EXER-#1.	7.5.1.1, 7.5.1.2, A.1	c6502	
4	In non-revertive operation the available external commands are LO or FSw, FSw-#i, MSw, MSw-#i, CLR, EXER-#i.	7.5.1.1, 7.5.1.2, A.1	c6503	
5	In revertive operation the available external commands are LO, FSw-#i, MSw-#i, CLR, EXER-#i.	9.5.1.1, 9.5.1.2, A.1	c6504	
6	Extra Traffic is supported	7.5.1.2, A.1	c6505	
7	The Wait-To-Restore (WTR) time is provisionable	7.5.1.1, 7.5.1.2	c6506	

c6501: IF (E.3/3 OR E.3/4 OR E.3/5)
THEN m ELSE o -- bi-directional switching supported
c6502: IF (E.3/1 OR E.3/3) THEN m ELSE n/a -- 1+1 revertive operation supported
c6503: IF (E.3/2 OR E.3/4) THEN m ELSE n/a -- 1+1 non-revertive operation supported
c6504: IF E.1/15 THEN m ELSE n/a -- 1:n protection architecture supported
c6505: IF E.1/15 THEN o ELSE n/a -- 1:n protection architecture supported
c6506: IF (E.3/1 OR E.3/3 OR E.3/5)
THEN m ELSE n/a -- revertive operation supported

Comments: The Linear Protection Switching Operation is generically described in annex A of ETS 300 417-3-1 [2].

Table E.66: Protection architecture characteristic parameters

Prerequisite: E.1/14 OR E.1/15 -- STM-4 Linear Trail Protection supported

Item 1	Protection architecture characteristic parameters	Reference	Status	Support	Values	
					Allowed	Supported
1	Working trails: n value.	7.5.1.2, A.1	c6601		$1 \leq n \leq 14$	
2	Wait-To-Restore (WTR) time: X value	7.5.1.1, 7.5.1.2, A.1	c6602		$0 \leq X \leq 12$ minutes	
3	Switching time: Y value	7.5.1.1, 7.5.1.2, A.1	m		$0 \leq Y \leq$ 50 ms	

c6601: IF E.1/16 THEN m ELSE n/a -- 1:n protection architecture supported
c6602: IF (E.3/1 OR E.3/3 OR E.3/5)
THEN m ELSE n/a -- revertive operation supported

Table E.67: APS channel bits structure

Prerequisite: E.65/1 -- APS channel supported

Item	APS channel bits structure	Reference	Status	Support
1	The request type is transported in K1[1-4] bits of the APS channel.	A.7.2, figure A.3	m	
2	The request signal number is transported in K1[4-8] bits of the APS channel.	A.7.2, figure A.3	m	
3	The local bridged signal number is transported in K2[1-4] bits of the APS channel.	A.7.2, figure A.3	m	
4	The architecture type is transported in K1[5] bit of the APS channel.	A.7.2, figure A.3	m	

Table E.68: APS signal fields

Prerequisite: E.65/1 -- APS channel supported

Item	APS signal fields	Reference	Status	Support
1	The content of the request type field conforms to table A.3 (subclause A.7.1) of annex A in ETS 300 417-3-1 [2].	A.7.1, table A.3	m	
2	The content of the request signal number field conforms to table A.4 (subclause A.7.1) of annex A in ETS 300 417-3-1 [2].	A.7.1, table A.4	m	
3	The content of local bridge signal number field conforms to table A.5 (subclause A.7.1) of annex A in ETS 300 417-3-1 [2].	A.7.1, table A.5	m	
4	The content of the architecture type field conforms to table A.6 (subclause A.7.1) of annex A in ETS 300 417-3-1 [2].	A.7.1, table A.6	m	

E.4.3.1 MS4 Linear Trail Protection Connection Functions: MS4P1+1_C and MS4P1:n_C

Table E.69: Connectivity functionalities: generalities

Prerequisite: E.4/1-- MS Protection Connection function present

Item	Connectivity functionalities: generalities	Reference	Status	Support
1	The MS4P1+1_C connection function performs the STM-4 linear multiplex section protection process for 1+1 protection architectures.	7.5.1.1	c6901	
2	The MS4P1+1_C connection function performs the bridge and selector functionality.	7.5.1.1	c6901	
3	The MS4P1:n_C connection function performs the STM-4 linear multiplex section protection process for 1:n protection architectures.	7.5.1.2	c6902	
4	The MS4P1:n_C connection function performs the bridge and selector functionality.	7.5.1.2	c6902	
5	Provided no protection switching action is activated/required it is possible to change between switching types without disturbing the CI passing the connection.	7.5.1.1, 7.5.1.2	c6903	
6	Provided no protection switching action is activated/required it is possible to change between operation types without disturbing the CI passing the connection.	7.5.1.1, 7.5.1.2	c6904	
7	Provided no protection switching action is activated/required it is possible to change the WTR time without disturbing the CI passing the connection.	7.5.1.1, 7.5.1.2	c6905	
8	The priority associated to SD for both protection and working sections is fixed high.	7.5.1.1	c6901	
9	The priority associated to SF for both protection and working sections is fixed high.	7.5.1.1	c6901	
10	The switching type (uni- or bi-directional) is provisionable from the EMF	7.5.1.1	c6901	
11	The priority associated to SD (high or low) for each working section is provisionable from the EMF. The priority associated to SD for the protection section is fixed high.	7.5.1.2	c6902	
12	The priority associated to SF (high or low) for each working section is provisionable from the EMF. The priority associated to SF for the protection section is fixed high.	7.5.1.2	c6902	
13	The switching type (uni- or bi-directional) is provisionable from the EMF	7.5.1.2	c6903	
14	The operation type (revertive or non revertive) is provisionable from the EMF	7.5.1.1	c6904	
15	The use of extra traffic (true or false) is provisionable from the EMF	7.5.1.2	c6906	

c6901: IF E.1/14 THEN m ELSE n/a -- 1+1 protection architecture supported
c6902: IF E.1/15 THEN m ELSE n/a -- 1:n protection architecture supported
c6903: IF (E.3/1 OR E.3/2) AND (E.3/3 OR E.3/4) THEN m ELSE n/a -- both unidirectional and bi-directional switching supported
c6904: IF (E.3/1 OR E.3/3) AND (E.3/2 OR E.3/4) THEN m ELSE n/a -- both revertive and non- revertive operation supported
c6905: IF E.65/7 THEN m ELSE n/a -- WTR time programmable
c6906: IF E.65/6 THEN m ELSE n/a -- 1:n architecture with extra traffic supported

Table E.70: Connectivity functionalities: source direction

Prerequisite: E.4/1-- MS Protection Connection function present

Item	Connectivity functionalities: source direction	Reference	Status	Support
1	The working outputs are connected to the associated normal inputs for 1+1 protection.	7.5.1.1	c7001	
2	The protection output is connected to the normal #1 input.	7.5.1.1	c7001	
3	The working outputs are connected to the associated normal inputs for 1:n protection.	7.5.1.2	c7002	
4	The protection output is unsourced (no input connected), connected to the extra traffic input, or connected to any normal input.	7.5.1.2	c7002	

c7001: IF E.1/14 THEN m ELSE n/a -- 1+1 protection architecture supported
c7002: IF E.1/15 THEN m ELSE n/a -- 1:n protection architecture supported

Table E.71: Connectivity functionalities: sink direction

Prerequisite: E.4/1-- MS Protection Connection function present

Item	Connectivity functionalities: sink direction	Reference	Status	Support
1	The signal output at the normal #1 reference point can be the signal received via either the associated working #1 section or the protection section for 1+1 protection.	7.5.1.1	c7101	
2	The signal output at the normal #i reference point can be the signal received via either the associated working #i section or the protection section for 1:n protection.	7.5.1.2	c7102	

c7101: IF E.1/14 THEN m ELSE n/a -- 1+1 protection architecture supported
c7102: IF E.1/15 THEN m ELSE n/a -- 1:n protection architecture supported

E.4.3.2 MS4 Linear Protection Trail Termination Functions: MS4P_TT_So and MS4P_TT_Sk

Table E.72: Trail termination process

Prerequisite: E.4/2 OR E.4/3 -- MS4P_TT_So and/or MS4P_TT_Sk function present

Item	Trail termination process	Reference	Status	Support
1	The MS4_AI at the output of the MS4P_TT_So is identical to the MS4P_CI at its input.	7.5.2.1	c7201	
2	The MS4P_TT_Sk function reports the state of the protected MS4 trail.	7.5.2.2	c7202	
3	In case all connections are unavailable the MS4P_TT_Sk reports the signal fail condition of the protected trail.	7.5.2.2	c7202	

c7201: IF E.4/2 THEN m ELSE n/a -- MS4P_TT_So function supported
c7202: IF E.4/3 THEN m ELSE n/a -- MS4P_TT_Sk function supported

E.4.3.3 MS4 Linear Trail Protection Adaptation Functions: MS4/MS4P_A_So and MS4/MS4P_A_Sk

E.4.3.3.1 MS4 layer to MS4 Protection layer multiplexing and demultiplexing processes

Table E.73: Multiplexing

Prerequisite: E. 4/4 -- MS4/MS4P_A_So present

Item	Multiplexing	Reference	Status	Support
1	The MS4/MS4P_A_So multiplexes the MS4 APS signal and MS4 data signal into the MS4_AI of the Protection Section.	7.5.3.1	m	

Table E.74: Demultiplexing

Prerequisite: E. 4/5 -- MS4/MS4P_A_Sk present

Item	Demultiplexing	Reference	Status	Support
1	The MS4/MS4P_A_Sk extracts the MS4P_CI_D signal from the MS4_AI_D signal.	7.5.3.2	m	
2	The MS4/MS4P_A_Sk extracts the MS4 APS signal from the MS4_AI.	7.5.3.2	m	

Table E.75: APS channel processing: sink direction

Prerequisite: E.3/3 OR E.3/4 OR E.3/5 -- -- bi-directional switching supported

Item	APS channel processing: sink direction	Reference	Status	Support
1	A new value for the APS message is accepted when the value of the 13 APS bits is identical for three consecutive frames. This value is output via MS4P_CI_APS.	7.5.3.2	m	
2	The APS signal processing is performed only on the Protection Section.	7.5.3.2	m	

E.4.3.4 MS4 Linear Trail Protection processes

E.4.3.4.1 Automatic Protection Switching (APS) externally initiated commands

Table E.76: Issuing of External Switching Commands

Prerequisite: E.1/14 OR E.1/15 -- STM-4 Linear Trail Protection supported

Item	Issuing of External Switching Commands	Reference	Status	Support
1	The external commands are received from the EMF.	ETS 300 746 [15] subclause 5.1.2.1	m	

Table E.77: Transmission of External Switching Requests

Prerequisite: E.76/1 -- External Switching Command issuing is supported

Item	Transmission of External Switching Requests	Reference	Status	Support
1	The external requests are issued via the APS bytes.	ETS 300 746 [15] subclause 5.1.2.1	c7701	
2	The external requests are issued via the EMF.	ETS 300 746 [15] subclause 5.1.2.1	c7701	

o.7701: It is mandatory to support exactly one of these items -- Transmission of external bridge request is supported by one of the allowed ways.

c7701: IF (E.3/3 OR E.3/4 OR E.3/5)
THEN o.7701 ELSE o -- bi-directional switching supported

Table E.78: External Switching Commands

Prerequisite: E.76/1 OR E.76/2 -- External Switching Command issuing is supported

Item	External Switching Commands	Reference	Status	Support
1	The external command Clear (CLR) conforms to the definition given in the whole point 1) clause A.2 of annex A in ETS 300 417-3-1 [2].	A.2	m	
2	The external command Lockout of Protection (LO) conforms to the definition given in the whole point 2) clause A.2 of annex A in ETS 300 417-3-1 [2].	A.2	m	
3	The external command Forced Switch #i (FSw-#i) conforms to the definition given in the whole point 3) of clause A.2 of annex A in ETS 300 417-3-1 [2].	A.2	m	
4	The external command Manual Switch #i (MSw-#i) conforms to the definition given in the whole point 4) clause A.2 of annex A in ETS 300 417-3-1 [2].	A.2	m	
5	The external command Exercise #i (EXER #i) conforms to the definition given in the whole point 5) clause A.2 of annex A in ETS 300 417-3-1 [2].	A.2	m	
6	The descending order of priority for external switching commands is: CLR, LO, FSw-#i, MSw-#i, EXER #i.	A.2	m	

E.4.3.4.2 Automatic Protection Switching (APS) automatically initiated commands

Table E.79: Automatic Generation of Requests

Prerequisite: E.1/14 OR E.1/15 -- STM-4 Linear Trail Protection scheme supported

Item	Automatic Generation of Requests	Reference	Status	Support
1	The NE initiates the following automatic requests: Signal Failure (SF), Signal Degrade (SD).	ETS 300 746 [15] subclause 5.1.2.2	m	
2	The NE initiates the following automatic requests: Reverse Request (RR).	ETS 300 746 [15] subclause 5.1.2.2	c7901	
3	The NE initiates the following automatic requests: Wait To Restore (WTR).	ETS 300 746 [15] subclause 5.1.2.2	c7902	

c7901: IF (E.3/3 OR E.3/4 OR E.3/5) THEN m ELSE x -- dual-ended switching supported
c7902: IF (E.3/1 OR E.3/3 OR E.3/5) THEN m ELSE x -- revertive switching supported

Table E.80: Transmission of automatically generated requests

Prerequisite: E.1/14 OR E.1/15 -- STM-4 Linear Trail Protection supported

Item	Transmission of Automatically Generated Requests	Reference	Status	Support
1	The automatically generated requests are issued via the APS bytes.	ETS 300 746 [15] subclause 5.1.2.2	c8001	

c8001: IF (E.3/3 OR E.3/4 OR E.3/5)
THEN m ELSE o -- bi-directional switching supported

Table E.81: Automatically generated requests

Prerequisite: E.1/14 OR E.1/15 -- STM-4 Linear Trail Protection supported

Item	Automatically Generated Requests	Reference	Status	Support
1	In the Wait-To-Restore (WTR) state the operation is such that in the revertive mode of operation, the normal signal will be restored when the working trail has recovered from the fault.	A.4	c8101	
2	An SF or SD condition will override the WTR.	A.4	c8101	
3	After the WTR period is completed, a No Request state will be entered.	A.4	c8101	
4	In the Reverse Request state the operation is such that for the case of bi-directional switching, a reverse request is returned for exerciser and for all other requests of higher priority.	A.4	c8102	
5	In unidirectional switching, Reverse Request is never indicated.	A.4	c8103	
6	In the Do not Revert state the operation is such that in the non-revertive mode of operation, assuming the normal signal is on protection when the working trail is repaired or a switch command is released, the tail end maintains the selection and issues Do not Revert for normal signal 1.	A.4	c8104	
7	For the case of bi-directional switching, the head end also maintains the selection and continues indicating reverse request.	A.4	c8105	
8	The Do not Revert is removed when pre-empted by a defect condition or an external request.	A.4	c8104	
9	In the No Request state none of the trail signal conditions is active, none of the external commands is active, and none of the states described above is active.	A.4	m	

c8101: IF (E.3/1 OR E.3/3 OR E.3/5) THEN m ELSE n/a -- revertive operation supported
c8102: IF (E.3/3 OR E.3/4 OR E.3/5) THEN m ELSE n/a -- bi-directional switching supported
c8103: IF (E.3/1 OR E.3/2) THEN m ELSE n/a -- unidirectional operation supported
c8104: IF (E.3/2 OR E.3/4) THEN m ELSE n/a -- non-revertive operation supported
c8105: IF E.3/4 THEN m ELSE n/a -- non-revertive and bi-directional switching supported

E.4.3.4.3 Automatic Protection Switching (APS) generalities

Table E.82: Allocation of extra traffic

Item	Allocation of extra traffic	Reference	Status	Support
1	Extra traffic is allocated to the protection trail when this one is not transporting a normal signal and the protection trail is not "locked out".	A.5	c8201	

c8201: IF E.65/6 THEN m ELSE n/a -- Extra traffic supported

Table E.83: Priority of request types

Prerequisite: E.1/14 OR E.1/15 -- STM-4 Linear Trail Protection supported

Item	Priority of request types	Reference	Status	Support
1	The priority of request types conforms to the priority order given in table A.2 (clause A.6) of annex A in ETS 300 417-3-1 [2].	A.6, table A.2	m	

E.4.3.4.4 Automatic Protection Switching (APS) switch performance

Table E.84: Switch completion time

Prerequisite: E.1/14 OR E.1/15 -- STM-4 Linear Trail Protection supported

Item	Switch completion time	Reference	Status	Support
1	The switch completion time is less than 50 ms.	A.8	m	

E.4.3.4.5 Automatic Protection Switching (APS) subprocesses

Table E.85: Signal request process

Prerequisite: E.1/14 OR E.1/15 -- STM-4 Linear Trail Protection supported

Item	Signal request processes	Reference	Status	Support
1	The SRSN is "0" (zero) for the protection trail and "i" ($1 \leq i \leq n$) for working trail #i.	A.9	m	
2	The SRT is generated based on the inputs SF, SD, SFpriority, SDpriority, as specified in the clause "Signal request (type & signal number) processes" in clause A.9 of annex A in ETS 300 417-3-1 [2].	A.9	m	

c8501: IF (E.3/3 OR E.3/4 OR E.3/5)
THEN m ELSE o -- bi-directional switching supported

Comments: The signal request process transfers the input SF and SD signals from a trail into a Signal Request Type (SRT) and Signal Request Signal Number (SRSN).

Table E.86: External request process

Prerequisite: E.1/14 OR E.1/15 -- STM-4 Linear Trail Protection supported

Item	External request processes	Reference	Status	Support
1	The ERSN is "0" (zero) if no normal signal is indicated, "i" ($1 \leq i \leq nmax$) for normal signal #i, and "nmax+1" for the extra traffic signal.	A.9	m	
2	The ERT/ERN is generated as specified in the clause "External request (type & signal number) processes" in clause A.9 of annex A in ETS 300 417-3-1 [2].	A.9	m	

c8601: IF (E.3/3 OR E.3/4 OR E.3/5)
THEN m ELSE o -- bi-directional switching supported

Comments: The external request process transfers the external commands (EXTCMD) into an External Request Type (ERT) and External Request Signal Number (ERSN).

Table E.87: Local request priority process

Prerequisite: E.1/14 OR E.1/15 -- STM-4 Linear Trail Protection supported

Item	Local request priority processes	Reference	Status	Support
1	The status of the protection and working input signals (SRT/SRSN #0 to SRT/SRSN #n), the external command (ERT/ERSN), and protection parameters OPERtype and EXTRAtraffic is evaluated by a three step priority logic as specified in the clause "Local request (type & signal number) priority processes" in clause A.9 of annex A in ETS 300 417-3-1 [2].	A.9	m	

c8701: IF (E.3/3 OR E.3/4 OR E.3/5)
THEN m ELSE o -- bi-directional switching supported

Comments: The local request priority process determines the highest priority local request.

Table E.88: Global request priority process

Prerequisite: E.1/14 OR E.1/15 -- STM-4 Linear Trail Protection supported

Item	Global request priority processes	Reference	Status	Support
1	The local request (LRT,LRSN) and the remote request (RRT,RRSN) are compared to decide which has priority, according to the descending order of priorities in table A.2 of annex A in ETS 300 417-3-1 [2].	A.9	c8801	
2	A received reverse request is not considered in the comparison.	A.9	c8801	
3	The Global Request Type (GRT) and Global Request Signal Number (GRSN) is determined as specified in the clause "Global request (type & signal number) priority processes" in clause A.9 of annex A in ETS 300 417-3-1 [2].	A.9	m	

c8801: IF (E.3/3 OR E.3/4 OR E.3/5)
THEN m ELSE n/a -- bi-directional switching supported

Comments: The global request priority process determines the Global Request Type (GRT) and Global Request Signal Number (GRSN).

Table E.89: Bridge control process

Prerequisite: E.1/14 OR E.1/15 -- STM-4 Linear Trail Protection supported

Item	Bridge control process	Reference	Status	Support
1	The bridge control process is performed as specified in the clause "Bridge control process" in clause A.9 of annex A in ETS 300 417-3-1 [2].	A.9	m	

Comments: The bridge control process controls which of the normal/extra traffic signals is bridged to the protection trail.

Table E.90: Control of the selector

Prerequisite: E.1/14 OR E.1/15 -- STM-4 Linear Trail Protection supported

Item	Control of the selector	Reference	Status	Support
1	The control of the selector is performed as specified in the clause "Control of the selector" in clause A.9 of annex A in ETS 300 417-3-1 [2].	A.9	m	

Comments: The control of the selector controls which of the normal/extra traffic signals is connected to/extracted from the protection trail.

E.4.3.4.6 Automatic Protection Switching (APS) signal generation

Table E.91: APS generation process

Prerequisite: E.1/14 OR E.1/15 -- STM-4 Linear Trail Protection supported

Item	APS generation process	Reference	Status	Support
1	The Global Request Type (GRT) is translated into the transmitted Request Type (TxRT) in accordance to table EA.8 (clause A.9) of annex A in ETS 300 417-3-1 [2].	A.9	c9101	
2	The transmitted Request Signal Number (TxRSN) equals the Global Request Signal Number (GRSN).	A.9	c9101	
3	The transmitted Local Bridged Signal Number (TxLBSN) is set to '0' if the Remote Request Signal Number (RRSN) equals '0' else it is set to the Local Bridged Signal Number (LBSN) value.	A.9	c9101	
4	The transmitted (TxARCH) is set to "0" (zero) if the Architecture type (ARCHtype) is 1+1 else it is set to "1" (one).	A.9	c9101	

c9101: IF (E.3/3 OR E.3/4 OR E.3/5)
THEN m ELSE o -- bi-directional switching supported

Comments: The APS generation process translates the signals Global Request Type (GRT), Global Request Channel Number (GRSN), Local Bridged Signal Number (LBSN) and local Architecture type (ARCHtype) into a transmitted APS signal

E.4.3.4.7 Automatic Protection Switching (APS) signal interpretation

Table E.92: APS interpretation process

Prerequisite: E.1/14 OR E.1/15 -- STM-4 Linear Trail Protection supported

Item	APS interpretation process	Reference	Status	Support
1	The accepted Request Type (AcRT) is translated into the Remote Request Type (RRT) in accordance to table A.7 (clause A.9) of annex A in ETS 300 417-3-1 [2].	A.9	c9201	
2	The Remote Request Signal Number (RRSN) equals the accepted Request Signal Number (AcRSN).	A.9	c9201	
3	The Remote Bridged Signal Number (RBSN) equals the accepted Local Bridged Signal Number (AcLBSN).	A.9	c9201	
4	The Remote Architecture type (RARCH) equals the accepted Architecture type (AcARCH).	A.9	c9201	

c9201: IF (E.3/3 OR E.3/4 OR E.3/5)
THEN m ELSE o -- bi-directional switching supported

Comments: The APS interpretation process translates the accepted APS signal into the signals Remote Request Type (RRT), Remote Request Signal Number (RRSN), Remote Bridged Signal Number (RBSN) and Remote Architecture type (RARCH).

Table E.93: Use of the accepted APS message

Prerequisite: E.1/14 OR E.1/15 -- STM-16 Linear Trail Protection supported

Item	Use of the accepted APS message	Reference	Status	Support
1	The accepted Request Type, Remote Request Signal Number, Remote Bridged Signal Number and Remote Architecture type are used for protection switching operation.	A.9	c9301	

c9301: IF (E.3/3 OR E.3/4 OR E.3/5)
THEN m ELSE x -- bi-directional switching supported

E.4.3.4.8 Automatic Protection Switching (APS) status report

Table E.94: APS reporting process

Prerequisite: E.1/14 OR E.1/15 -- STM-4 Linear Trail Protection supported

Item	APS reporting process	Reference	Status	Support
1	The active external request are reported to the Equipment Management Function (EMF).	A.9	m	
2	The active local request are reported to the Equipment Management Function (EMF).	A.9	m	
3	The active remote request are reported to the Equipment Management Function (EMF).	A.9	c9401	
4	The reason of denial of an external command are reported to the Equipment Management Function (EMF).	A.9	m	
5	The condition (SF,SD) of the working and protection trails are reported to the Equipment Management Function (EMF).	A.9	m	

c9401: IF (E.3/3 OR E.3/4 OR E.3/5)
THEN m ELSE o -- bi-directional switching supported

E.4.4 MS4 layer defect, fault and performance monitoring tables

E.4.4.1 Port status management

Table E.95: Trail termination point mode process

Prerequisite: E.1/3 -- MS4_TT_Sk function present.

Item	Trail termination point mode process	Reference	Status	Support
1	The Trail Termination Point Mode supports "not monitored" (NMON) status	ETS 300 417-1-1 [1] subclause 8.5	m	
2	The Trail Termination Point Mode supports "monitored" (MON) status	ETS 300 417-1-1 [1] subclause 8.5	m	
3	The Trail Termination Point Mode status is provisionable by the EMF.	7.2.2	m	

E.4.4.2 Defect detection and clearance criteria

Table E.96: MS4 Alarm Indication Signal defect (MS4 dAIS)

Prerequisite: E.1/3 -- MS4_TT_Sk function present

Item	MS4 Alarm Indication Signal defect (MS4 dAIS)	Reference	Status	Support
1	The MS4 dAIS is detected if at least *x* consecutive frames contain the '111' pattern in bits 6, 7 and 8 of the K2 byte.	7.2.2	m	
2	The MS4 dAIS is cleared if in at least *x* consecutive frames any pattern other than '111' is detected in bits 6, 7 and 8 of the K2 byte.	7.2.2	m	

Table E.97: MS4 dAIS parameters value

Prerequisite: E.1/3 -- MS4_TT_Sk function present

Item	MS4 dAIS parameters value	Reference	Status	Support	Values	
					Allowed	Supported
1	MS4 dAIS threshold: *x* parameter	7.2.2	m		$3 \leq x \leq 5$	

Table E.98: Remote Defect Indication (RDI) defect (dRDI)

Prerequisite: E.1/3 -- MS4_TT_Sk function present

Item	Remote Defect Indication (RDI) defect (dRDI)	Reference	Status	Support
1	The MS4 RDI defect is detected if 5 consecutive frames contain the '110' pattern in bits 6, 7 and 8 of the K2 byte.	ETS 300 417-1-1 [1] subclause 8.2.1.5	m	
2	The MS4 RDI defect is cleared if 5 consecutive frames any pattern other than '110' is detected in bits 6, 7 and 8 of the K2 byte.	ETS 300 417-1-1 [1] subclause 8.2.1.5	m	
3	The MS4 RDI defect is cleared during reception of an RS4 aSSF	ETS 300 417-1-1 [1] subclause 8.2.1.5	m	

Table E.99: Trail performance monitoring

Prerequisite: E.1/3 -- MS4_TT_Sk function present

Item	Trail performance monitoring	Reference	Status	Support
1	An MS4 near-end block is errored if one or more EDC Violations (EDCV) - BIP-24 parity - are detected.	7.2.2	m	
2	The EDCV process assumes "zero" EDCVs in the incoming all "1s" (AIS) signal during reception of Server Signal Fail (aSSF) from the server layer.	7.2.2	m	
3	Every second the number of MS4 Near-end Errored Block (MS4 N_Bs) within that second is counted as the MS4 Near-end Error Block Count (MS4 pN_EBC).	7.2.2	m	

Table E.100: Degraded defect (dDEG)

Prerequisite: E.1/3 -- MS4_TT_Sk function present

Item	Degraded defect (dDEG)	Reference	Status	Support
1	Once every second, MS4 pNEBC is compared with DEGTHR	7.2.2	m	
2	If MS4 pNEBC>=DEGTHR the corresponding second is declared BAD, otherwise it is declared GOOD	7.2.2	m	
3	The MS4 dDEG is detected if M consecutive BAD seconds have occurred.	7.2.2	m	
4	The MS4 dDEG is cleared if M consecutive GOOD seconds have occurred.	7.2.2	m	
5	The MS4 dDEG is cleared during reception of an RS1 aSSF	7.2.2	m	
6	The DEGTHR parameter is provisionable by the EMF	7.2.2	m	
7	The DEGM parameter is provisionable by the EMF	7.2.2	m	

Table E.101: DEG defect parameters value

Prerequisite: E.1/3 -- MS4_TT_Sk function present

Item	DEG defect parameters	Reference	Status	Support	Values	
					Allowed	Supported
1	MS4 dDEG DEGTHR parameter	7.2.2	c10101		0< DEGTHR ≤ 32 000	
2	MS4 dDEG M parameter	7.2.2	c10102		2 ≤ M ≤ 10	

c10101: IF E.100/6 THEN m ELSE n/a -- DEGTHR programmable
c10102: IF E.100/7 THEN m ELSE n/a -- DEGM programmable

Table E.102: AU-4 Alarm Indication Signal defect (AU4 dAIS)

Prerequisite: E.1/5 -- MS4/S4_A_Sk function present

Item	AU-4 Alarm Indication Signal defect (AU4 dAIS)	Reference	Status	Support
1	The AU4 dAIS is detected if the pointer interpreter enters the AIS_state	7.3.2	m	
2	The AU4 dAIS is cleared if the pointer interpreter exits the AIS_state	7.3.2	m	

Table E.103: AU-4-4c Alarm Indication Signal defect (AU4-4c dAIS)

Prerequisite: E.1/13 -- MS4/S4-4c_A_Sk function present

Item	AU-4-4c Alarm Indication Signal defect (AU4-4c dAIS)	Reference	Status	Support
1	The AU4-4c dAIS is detected if the pointer interpreter enters the AISX_state	7.3.4	m	
2	The AU4-4c dAIS is cleared if the pointer interpreter exits in the AISX_state	7.3.4	m	

Table E.104: Loss of AU-4 Pointer defect (AU4 dLOP)

Prerequisite: E.1/5 -- MS4/S4_A_Sk function present

Item	Loss of AU-4 Pointer defect (AU4 dLOP)	Reference	Status	Support
1	The High Order Path dLOP (related to an AU-4 pointer) is detected if the pointer interpreter enters the LOP_state.	7.3.2	m	
2	The High Order Path dLOP (related to an AU-4 pointer) is cleared if the pointer interpreter exits the LOP_state.	7.3.2	m	

Table E.105: Loss of AU-4-4c Pointer defect (AU4-4c dLOP)

Prerequisite: E.1/13 -- MS4/S4-4c_A_Sk function present

Item	Loss of AU-4-4c Pointer defect (AU4-4c dLOP)	Reference	Status	Support
1	The High Order Path dLOP (related to an AU-4-4c pointer) is detected if the pointer interpreter enters the LOPX_state.	7.3.4	m	
2	The High Order Path dLOP (related to an AU-4-4c pointer) is cleared if the pointer interpreter exits the LOPX_state.	7.3.4	m	

E.4.4.3 Consequent action activation and clearance criteria

Table E.106: Alarm Indication Signal action (aAIS)

Item	Alarm Indication Signal action (aAIS)	Reference	Status	Support
1	The MS4_TT_Sk outputs an all "1s" signal within 250 μs upon MS4 dAIS detection	7.2.2	c10601	
2	The MS4_TT_Sk outputs normal data within 250 μs when there is (are) no more defect(s) active.	7.2.2	c10601	
3	The MS4/S4_A_So outputs an all "1s" signal within 250 μs upon CI_SSF reception.	7.3.1	c10602	
4	The MS4/S4_A_So outputs normal data within 250 μs when there is (are) no more defect(s) active.	7.3.1	c10602	
5	The MS4/S4-4c_A_So outputs an all "1s" signal within 250 μs upon CI_SSF reception.	7.3.3	c10603	
6	The MS4/S4-4c_A_So outputs normal data within 250 μs when there is (are) no more defect(s) active.	7.3.3	c10603	
7	The MS4/S4_A_Sk outputs an all "1s" signal within 250 μs upon AU4 dAIS detection.	7.3.2	c10604	
8	The MS4/S4_A_Sk outputs an all "1s" signal within 250 μs upon HO dLOP detection.	7.3.2	c10604	
9	The MS4/S4_A_Sk outputs normal data within 250 μs when there is (are) no more defect(s) active.	7.3.2	c10604	
10	The MS4/S4-4c_A_Sk outputs an all "1s" signal within 250 μs upon AU4-4c dAIS detection.	7.3.4	c10605	
11	The MS4/S4-4c_A_Sk outputs an all "1s" signal within 250 μs upon HO dLOP detection.	7.3.4	c10605	
12	The MS4/S4-4c_A_Sk outputs normal data within 250 μs when there is (are) no more defect(s) active.	7.3.4	c10605	
13	The MS4/P0s_A_Sk outputs an all "1s" signal within 1 ms upon AI_TSF reception.	7.3.8	c10606	
14	The MS4/P0s_A_Sk outputs normal data within 1 ms when there is (are) no more defect(s) active.	7.3.8	c10606	

c10601: IF E.1/3 THEN m ELSE n/a -- MS4_TT_Sk present
c10602: IF E.1/4 THEN m ELSE n/a -- MS4/S4_A_So present
c10603: IF E.1/12 THEN m ELSE n/a -- MS4/S4-4c_A_So present
c10604: IF E.1/5 THEN m ELSE n/a -- MS4/S4_A_Sk present
c10605: IF E.1/13 THEN m ELSE n/a -- MS4/S4-4c_A_Sk present
c10606: IF E.1/11 THEN m ELSE n/a -- MS4/P0s_A_Sk present

Table E.107: Remote Defect Indication (RDI) defect action (aRDI)

Prerequisite: E.1/2 AND E.1/3 -- MS4_TT_So and MS4_TT_Sk function present

Item	Remote Defect Indication (RDI) defect action (aRDI)	Reference	Status	Support
1	The MS4_TT_Sk outputs an RDI request generation (RI_RDI) on MS4 dAIS detection.	7.2.2	m	
2	The MS4_TT_Sk clears the RDI request when there is (are) no more defect(s) active.	7.2.2	m	
3	The MS4_TT_So inserts the RDI code within 250 µs upon RI_RDI reception.	7.2.1	m	
4	The MS4_TT_So outputs normal data within 250 µs upon RI_RDI clearing.	7.2.1	m	

Table E.108: Remote Error Indication (REI) action (aREI)

Prerequisite: E.1/2 AND E.1/3 -- MS4_TT_So and MS4_TT_Sk function present

Item	Remote Error Indication (REI) action (aREI)	Reference	Status	Support
1	The MS4_TT_So inserts the REI value in the next REI bits.	7.2.1	m	

Table E.109: Server Signal Fail action (aSSF)

Prerequisite: E.1/5 OR E.1/13 OR E.1/9 -- MS4/S4_A_Sk and /or MS4/S4-4c_A_Sk and /or MS4/DCC_A_Sk function present.

Item	Server Signal Fail action (aSSF)	Reference	Status	Support
1	The MS4/S4_A_Sk sets CI_SSF to TRUE on AU4 dAIS detection.	7.3.2	c10901	
2	The MS4/S4_A_Sk sets CI_SSF to TRUE on HO dLOP detection.	7.3.2	c10901	
3	The MS4/S4_A_Sk sets CI_SSF to FALSE when there is (are) no more defect(s) active.	7.3.2	c10901	
4	The MS4/S4-4c_A_Sk sets CI_SSF to TRUE on AU4-4c dAIS detection.	7.3.4	c10902	
5	The MS4/S4-4c_A_Sk sets CI_SSF to TRUE on HO dLOP detection.	7.3.4	c10902	
6	The MS4/S4-4c_A_Sk sets CI_SSF to FALSE when there is (are) no more defect(s) active.	7.3.4	c10902	
7	The MS4/DCC_A_Sk sets CI_SSF to TRUE on AI_TSF reception.	7.3.6	c10903	
8	The MS4/ DCC _A_Sk sets CI_SSF to FALSE when there is (are) no more defect(s) active.	7.3.6	c10903	
9	The MS4/P0s_A_Sk sets CI_SSF to TRUE on AI_TSF reception.	7.3.8	c10904	
10	The MS4/P0s _A_Sk sets CI_SSF to FALSE when there is (are) no more defect(s) active.	7.3.8	c10904	

c10901: IF E.1/5 THEN m ELSE n/a -- MS4/S4_A_Sk present
c10902: IF E.1/13 THEN m ELSE n/a -- MS4/S4-4c_A_Sk present
c10903: IF E.1/9 THEN m ELSE n/a -- MS4/DCC_A_Sk present
c10904: IF E.1/11 THEN m ELSE n/a -- MS4/P0s_A_Sk present

Table E.110: Trail Signal Fail action (aTSF)

Prerequisite: E.1/3 -- MS4_TT_Sk function present

Item	Trail Signal Fail action (aTSF)	Reference	Status	Support
1	The MS4_TT_Sk sets AI_TSF to TRUE on MS4 dAIS detection.	7.2.2	m	
2	The MS4_TT_Sk sets AI_TSF to FALSE when there is (are) no more defect(s) active.	7.2.2	m	

Table E.111: Trail Signal Degrade action (aTSD)

Prerequisite: E.1/3 OR E.1/9 -- MS4_TT_Sk and /or MS4/DCC_A_Sk function present

Item	Trail Signal Degrade action (aTSD)	Reference	Status	Support
1	If the dDEG is detected in the trail termination sink the aTSD is performed.	ETS 300 417-1-1 [1] subclause 8.2.2.6	m	
2	It ceases aTSD insertion after the dDEG defect is cleared.	ETS 300 417-1-1 [1] subclause 8.2.2.6	m	
3	The aTSD is equivalent to send the Signal Degrade (SD) signal as defined in the Automatic Protection Switching (APS).	ETS 300 417-1-1 [1] subclause 8.2.2.6	m	

E.4.4.4 Defect correlation

Table E.112: Defect correlation

Prerequisite: E.4/5 -- Defect correlation process supported

Item	Defect correlation	Reference	Status	Support
1	Under MS4 dAIS detection the MS4_TT_Sk generates a MS4 cAIS report if the port is in the monitoring state (MON) and no CI_SSF is received from the server layer.	7.2.2	c11201	
2	The MS4 cAIS is reported only if selected MS4 AIS_reported is set to TRUE by the NEM. By default MS4 AIS_reported is set to FALSE.	7.2.2	c11201	
3	Under MS4 dAIS detection the MS4_TT_Sk generates a MS4 cSSF report if the port is in the monitoring state (MON).	7.2.2	c11201	
4	The MS4 cSSF is reported only if selected MS4 SSF_reported is set to TRUE by the NEM. By default MS4 SSF_reported is set to FALSE.	7.2.2	c11201	
5	Under MS4 dRDI detection the MS4_TT_Sk generates a MS4 cRDI report if the port is in the monitoring state (MON).	7.2.2	c11201	
6	The MS4 cRDI is reported only if MS4 RDI_reported is set to TRUE by the NEM. By default MS4 RDI_reported is set to FALSE.	7.2.2	c11201	
7	Under MS4 dDEG detection the MS4_TT_Sk generates a MS4 cDEG report if the port is in the monitoring state (MON).	7.2.2	c11201	
8	Under AU4 dAIS detection the MS4/S4_A_Sk generates a AU4 cAIS report if the port is in the monitoring state (MON) and no AI_TSF is received from the MS4_TT_Sk.	7.3.2	c11202	
9	The AU4 cAIS is reported only if AU4 AIS _reported is set to TRUE by the NEM. By default AU4 cAIS_reported is set to FALSE.	7.3.2	c11202	
10	Under HO dLOP detection the MS4/S4_A_Sk generates a HO cLOP report.	7.3.2	c11202	
11	Under AU4-4c dAIS detection the MS4/S4-4c_A_Sk generates a AU4 cAIS report if the port is in the monitoring state (MON) and no AI_TSF is received from the MS4_TT_Sk.	7.3.4	c11203	
12	The AU4-4c cAIS is reported only if AU4-4c AIS _reported is set to TRUE by the NEM. By default AU4-4c cAIS_reported is set to FALSE.	7.3.4	c11203	
13	Under HO dLOP detection the MS4/S4-4c_A_Sk generates a HO cLOP report.	7.3.4	c11203	
14	All the generated fault cause (cXXX) are reported to the EMF.	ETS 300 417-1-1 [1] subclause 8.1, figure 36	m	

c11201: IF E.1/3 THEN m ELSE n/a -- MS4_TT_Sk present
c11202: IF E. 1/5 THEN m ELSE n/a -- MS4/S4_A_Sk present
c11203: IF E. 1/13 THEN m ELSE n/a -- MS4/S4-4c_A_Sk present

E.4.4.5 Performance monitoring

E.4.4.5.1 Near end performance monitoring

Table E.113: pN_DS performance parameter

Prerequisite: E.4/1 -- Near-end performance monitoring process supported

Item	pN_DS performance parameter	Reference	Status	Support
1	The MS4_TT_Sk indicates a MS4 pN_DS every second with at least one occurrence of MS4 aTSF or an equipment defect (dEQ) and reports it to the EMF.	7.2.2	m	

Table E.114: pN_EBC performance parameter

Prerequisite: E.4/1 -- Near-end performance monitoring process supported

Item	pN_EBC performance parameter	Reference	Status	Support
1	Every second the MS4_TT_Sk counts the number of MS4 Near-end Errored Block (MS4 N_Bs) within that second as the MS4 pN_EBC (MS4 Near-end Error Block Count) and reports it to the EMF.	7.2.2	m	

Comments: A "Near-end Block" (N_B) is errored if one or more BIP-24 violations are detected.

E.4.4.5.2 Far end performance monitoring

Table E.115: pF_DS performance parameter

Prerequisite: E.4/2 -- Far-end performance monitoring process supported

Item	pF_DS performance parameter	Reference	Status	Support
1	The MS4_TT_Sk indicates a MS4 pF_DS every second with at least one occurrence of MS4 dRDI and reports it to the EMF.	7.2.2	m	

Table E.116: pF_EBC performance parameter

Prerequisite: E.4/2 -- Far-end performance monitoring process supported

Item	pF_EBC performance parameter	Reference	Status	Support
1	Every second the MS4_TT_Sk counts the number of MS4 Far-end Errored Block (MS4 F_Bs) within that second as the MS4 pF_EBC (MS4 Far-end Error Block Count) and reports it to the EMF.	7.2.2	m	

Comments: A "Far-end Block" (F_B) is errored if the REI count indicates one or more errors.

E.4.4.5.3 Pointer performance monitoring

Table E.117: PJE performance parameter

Prerequisite: E.5/3 -- Pointer performance monitoring process supported

Item	PJE performance parameter	Reference	Status	Support
1	Every second the number of generated AU-4 pointer increments is counted as the HO pPJE+ and reported to the EMF.	7.3.1	c11701	
2	Every second the number of generated AU-4-4c pointer increments is counted as the HO pPJE+ and reported to the EMF.	7.3.3	c11702	
3	Every second the number of generated AU-4 pointer decrements within that second is counted as the HO pPJE- and reported to the EMF.	7.3.1	c11701	
4	Every second the number of generated AU-4-4c pointer decrements within that second is counted as the HO pPJE- and reported to the EMF.	7.3.3	c11702	

c11701: IF E.1/4 THEN m ELSE n/a -- MS4/S4_A_So present
c11702: IF E.1/12 THEN m ELSE n/a -- MS4/S4-4c_A_So present

E.4.5 MS4 linear trail protection defect, fault and performance monitoring tables

E.4.5.1 Defect detection and clearance criteria

Table E.118: Protection Architecture Mismatch defect (dPAM)

Prerequisite: E.3/3 OR E.3/4 OR E.3/5 -- -- bi-directional switching supported

Item	Protection Architecture Mismatch defect (dPAM)	Reference	Status	Support
1	The MS4P dPAM is detected if the received APS Architecture (RARCH) value differs from the local architecture type (ARCHtype) for a period of 50 ms.	A.9	m	
2	The MS4P dPAM is cleared when the there is again a match between the received APS Architecture (RARCH) value and the local architecture type (ARCHtype).	A.9	m	

Comments: This defect concerns the APS interpretation process.

Table E.119: Invalid Command defect (dINV)

Prerequisite: E.3/3 OR E.3/4 OR E.3/5 -- -- bi-directional switching supported

Item	Invalid Command defect (dINV)	Reference	Status	Support
1	The MS4P dINV is detected if the request type bits (RT) in the APS signal indicate an invalid request code, or the RSN or LBSC indicate a non-existing trail signal number for Y ms.	A.9	m	
2	The MS4P dINV is cleared when the RT indicates a valid code and the RSN or LBSN indicate an existing signal number.	A.9	m	

Comments: This defect concerns the APS interpretation process.

Table E.120: INV defect parameters value

Prerequisite: E.3/3 OR E.3/4 OR E.3/5 -- -- bi-directional switching supported

Item	INV defect parameters value	Reference	Status	Support	Values	
					Allowed	Supported
1	MS4P dINV parameter (Y)	A.9	m		TBD	

Table E.121: Acknowledge Timeout defect (dTMOUT)

Prerequisite: E.3/3 OR E.3/4 OR E.3/5 -- -- bi-directional switching supported

Item	Acknowledge Timeout defect (dTMOUT)	Reference	Status	Support
1	The MS4P dTMOUT is detected if a head end response on a tail end request does not comply to the protocol within a period of 50 ms.	A.9	m	
2	The MS4P dTMOUT is cleared when the head-end response complies again.	A.9	m	
3	The MS4P dTMOUT is cleared if the protection trail is in SF condition.	A.9	m	

Comments: This defect concerns the global request priority process.

Table E.122: Selector Control Mismatch defect (dSCM)

Prerequisite: E.3/3 OR E.3/4 OR E.3/5 -- -- bi-directional switching supported

Item	Selector Control Mismatch defect (dSCM)	Reference	Status	Support
1	The MS4P dSCM is detected if a mismatch between RRSN and GRSN persists for Y ms.	A.9	m	
2	The MS4P dSCM is cleared when RRSN is identical to GRSN.	A.9	m	
3	The MS4P dSCM is cleared if the protection trail is in SF condition.	A.9	m	

Comments: This defect concerns the selector control.

Table E.123: SCM defect parameters value

Prerequisite: E.3/3 OR E.3/4 OR E.3/5 -- -- bi-directional switching supported

Item	INV defect parameters value	Reference	Status	Support	Values	
					Allowed	Supported
1	MS4P dSCM parameter (Y)	A.9	m		TBD	

E.4.5.2 Consequent action activation and clearance criteria

Table E.124: Null Signal insertion

Prerequisite: E.1/15 -- 1:n MS Linear Trail Protection supported

Item	Null Signal insertion	Reference	Status	Support
1	If neither the extra traffic nor a normal signal input is to be connected to the protection section output, the null signal is connected to the protection output.	7.5.1.2	m	
2	If the extra traffic output (if applicable) is disconnected from the protection input it is set to all-ONEs signal (AIS).	7.5.1.2	c12401	

c12401: IF E.65/6 THEN m ELSE n/a -- Extra traffic channel supported

Table E.125: Server Signal Fail action (aSSF)

Prerequisite: E.1/15-- 1:n MS Linear Trail Protection supported

Item	Server Signal Fail action (aSSF)	Reference	Status	Support
1	The MS4P1:n_C sets the CI_SSF to TRUE on the extra traffic connection point if the extra traffic output (if applicable) is disconnected from the protection input.	7.5.1.2	c12501	
2	The MS4/MS4P_A_Sk sets CI_SSF to TRUE on AI_TSF reception.	7.5.3.2	c12502	
3	The MS4/MS4P_A_Sk sets CI_SSF to FALSE when there is (are) no more defect(s) active.	7.5.3.2	c12502	

c12501: IF (E.1/15 AND E.65/6) THEN m ELSE n/a -- 1:n MS Linear Trail Protection and extra traffic channel present
c12502: IF E.4/5 THEN m ELSE n/a -- MS4/MS4P_A_Sk present

Table E.126: Trail Signal Fail action (aTSF)

Prerequisite: E.4/3 -- MS4P_TT_Sk present

Item	Trail Signal Fail action (aTSF)	Reference	Status	Support
1	The MS4P_TT_Sk sets AI_TSF to TRUE on CI_SSF reception.	7.5.2.2	m	
2	The MS4P_TT_Sk sets AI_TSF to FALSE when there is (are) no more defect(s) active.	7.5.2.2	m	

Table E.127: Server Signal Degrade action (aSSD)

Prerequisite: E.4/5 -- MS4/MS4P_A_Sk present

Item	Server Signal Degrade action (aSSD)	Reference	Status	Support
1	The MS4/MS4P_A_Sk sets CI_SSD to TRUE on AI_TSD reception.	7.5.3.2	m	
2	The MS4/MS4P_A_Sk sets CI_SSD to FALSE when there is (are) no more defect(s) active.	7.5.3.2	m	

Table E.128: Selector release

Prerequisite: E.3/3 OR E.3/4 OR E.3/5 -- -- bi-directional switching supported

Item	Selector release	Reference	Status	Support
1	The selector is released if one or more of the four defects dPAM, dSCM, dTMOUT, dINV is active.	A.9	m	

Comments: This consequent action concerns the selector control.

E.4.5.3 Defect correlation

Table E.129: Defect correlation

Prerequisite: E.5/5 AND (E.1/14 OR E.1/15) -- Defect correlation process supported and STM-4 Linear Trail Protection supported

Item	Defect correlation	Reference	Status	Support
1	Under MS4P dSCM detection a MS4P cFOP (Failure Of Protocol) report is generated.	A.9	c12901	
2	Under MS4P dPAM detection a MS4P cFOP (Failure Of Protocol) report is generated.	A.9	c12901	
3	Under MS4P dTMOUT detection a MS4P cFOP (Failure Of Protocol) report is generated.	A.9	c12901	
4	Under MS4P dINV detection a MS4P cFOP (Failure Of Protocol) report is generated.	A.9	c12901	
5	Under MS4P CI_SSF reception a MS4P cSSF report is generated.	7.5.2.2	c12902	
6	The MS4P cSSF is reported only if selected MS4P SSF_reported is set to TRUE by the NEM. By default MS4P SSF_reported is set to FALSE.	7.5.2.2	c12902	
7	All the generated fault cause (cXXX) are reported to the EMF.	ETS 300 417-1-1 [1] subclause 8.1, figure 36	m	

c12901: IF (E.3/3 OR E.3/4 OR E.3/5) THEN m ELSE n/a -- bi-directional switching supported
c12901: IF E.4/3 THEN m ELSE n/a -- MS4P_TT_Sk present

E.4.5.4 Performance monitoring

Table E.130: pPSC performance parameter

Prerequisite: E.4/4 AND (E.1/14 OR E.1/15) -- Protection performance monitoring process supported and STM-4 Linear Trail Protection supported.

Item	pPSC performance parameter	Reference	Status	Support
1	Every second the MS4P1+1_C indicates as MS4P pPSC (Protection Switching Count) the number of Protection Switching actions within that second and reports it to the EMF.	A.9	c13001	
2	Every second the MS4P1:n_C indicates as MS4P pPSC (Protection Switching Count) the number of Protection Switching actions within that second and reports it to the EMF.	A.9	c13002	

c13001: IF E.1/14 THEN m ELSE n/a -- 1+1 MS Linear Trail Protection supported
c13002: IF E.1/15 THEN m ELSE n/a -- 1:n MS Linear Trail Protection supported

Table E.131: pPSD performance parameter

Prerequisite: E.4/3 AND (E.3/1 OR E.3/3 OR E.3/5) -- Protection performance monitoring process supported and revertive protection supported

Item	pPSD performance parameter	Reference	Status	Support
1	Every second that the normal signal #i is not selected from the Working trail #i is reported as a pPSD/i (i≥1) to the EMF.	A.9	m	
2	Every second that the normal signal is selected from the Protection trail is reported as a pPSD/0 to the EMF.	A.9	m	

Annex F (normative): ICS proforma for STM-16 regenerator section layer

F.1 Identification of the implementation

In this ETS, an Implementation Under Test (IUT), and of course the identification of an IUT refers to an STM 16 Regenerator Section (RS16) layer instance implemented inside the System Under Test (SUT).

Identification of the IUT and the SUT in which it resides should be filled in so as to provide as much detail as possible regarding version numbers and configuration options.

The product supplier information and client information should both be filled in if they are different.

A person who can answer queries regarding information supplied in the ICS should be named as the contact person.

F.1.1 Date of the statement

.....

F.1.2 Implementation Under Test (IUT) identification

IUT name:

.....

.....

IUT version

Hardware version:

.....

Software version:

.....

Firmware version:

.....

F.1.3 System Under Test (SUT) identification

SUT name:

.....

.....

Hardware configuration:

.....

SUT Software version:

.....

SUT Firmware version:

.....

Operating system:

.....

F.1.4 Product supplier

Name:

.....

Address:

.....

.....

.....

Telephone number:

.....

Facsimile number:

.....

E-mail address:

.....

Additional information:

.....

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F.1.5 Client

Name:

.....

Address:

.....

.....

.....

Telephone number:

.....

Facsimile number:

.....

E-mail address:

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Additional information:

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F.1.6 ICS contact person

Name:

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Telephone number:

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Facsimile number:

.....

E-mail address:

.....

Additional information:

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.....

F.2 Identification of the ETS

This ICS proforma applies to the following standard:

ETS 300 417-3-1 [2]: "Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment: STM-N regenerator and multiplex section layer functions".

F.3 Global statement of conformance of STM-16 Regenerator Section (RS16) layer

Are all mandatory capabilities implemented (Yes/No)

NOTE: Answering "No" to this question indicates non-conformance to the ETS specification. Non-supported mandatory capabilities are to be identified in the ICS, with an explanation of why the implementation is non-conforming, on pages attached to the ICS proforma.

Answering "Yes" to this question indicates only that all the capabilities with the explicit status "m" are supported. It is not necessary to fill in the support column of the associated item.

F.4 RS16 Section Layer function

F.4.1 RS16 layer description

Table F.1: RS16 layer functions

Item	STM-16 Regenerator section layer	Reference	Status	Support
1	Regenerator section connection function (RS16_C)	8, figure 74	o	
2	Regenerator section trail termination source function (RS16_TT_So)	8, figure 74	o.101	
3	Regenerator section trail termination sink function (RS16_TT_Sk)	8, figure 74	o.101	
4	Regenerator Section to MS46 Layer Adaptation Source function (RS16/MS46_A_So)	8, figure 74	c101	
5	Regenerator Section to MS46 Layer Adaptation Sink function (RS16/MS46_A_Sk)	8, figure 74	c102	
6	Regenerator Section to DCC Layer Adaptation Source function (RS16/DCC_A_So)	8, figure 74	c103	
7	Regenerator Section to DCC Layer Adaptation Sink function (RS16/DCC_A_Sk)	8, figure 74	c104	
8	Regenerator Section to P0s Layer Adaptation Source function (RS16/P0s_A_So-N)	8, figure 74	c103	
9	Regenerator Section to P0s Layer Adaptation Sink function (RS16/P0s_A_Sk-N)	8, figure 74	c104	
10	Regenerator Section to V0x Layer Adaptation Source function (RS16/V0x_A_So)	8, figure 74	c103	
11	Regenerator Section to V0x Layer Adaptation Sink function (RS16/V0x_A_Sk)	8, figure 74	c104	
12	This RS16 layer is part of an SDH Regenerator equipment.	ETS 300 417-2-2 [17] table D.1/1	o	

c101: IF F.1/2 THEN m ELSE x -- a TT_So function should exist for A_So function
c102: IF F.1/3 THEN m ELSE x -- a TT_Sk function should exist for A_Sk function
c103: IF F.1/2 THEN o ELSE x -- a TT_So function should exist for A_So function
c104: IF F.1/3 THEN o ELSE x -- a TT_Sk function should exist for A_Sk function
o.101: It is mandatory to support at least one of these items -- at least one TT function present

Comment: for a bi-directional layer both TT_So and TT_Sk functions are present, for a unidirectional layer just one of them can be present.
Item F.1/12 is the same as the one given in the reference column.

Table F.2: Supervision processes

Item	Supervision process	Reference	Status	Support
1	Performance monitoring process	ETS 300-417-1-1 [1] subclauses 8.2 to 8.4	c201	
2	Defect correlation process	ETS 300-417-1-1 [1] subclauses 8.2 to 8.3	c201	

c201: IF F.1/3 THEN m ELSE n/a -- RS16_TT_Sk present

F.4.2 STM-16 regenerator section layer transmission tables

Table F.3: Data stream structure

Item	Data stream structure	Reference	Status	Support
1	The CI at the RS16 connection point is octet structured and 125 μs framed with co-directional timing.	8	m	
2	The RS16_CI is a fully formatted STM-16 data stream.	8	m	
3	Regenerator Section OverHead (RS-OH) bytes are placed in rows 1 to 3 of columns 1 to 144 of the STM-16 frame.	8, figure 75	m	

F.4.2.1 STM-16 Regenerator section connection function: RS16_C

Table F.4: Connection functionalities

Prerequisite: F.1/1 -- RS16_C present

Item	Connection functionalities	Reference	Status	Support
1	For further study	8.1	n/a	

F.4.2.2 RS16 layer trail termination functions: RS16_TT_So and RS16_TT_Sk

F.4.2.2.1 FAS

Table F.5: FAS byte location

Item	Frame Alignment Signal (FAS) byte location	Reference	Status	Support
1	The FAS is located in A1 from (1,1) to (1,48) and A2 from (1,49) to (1,96) of the STM-16 frame.	8.2.1, G.707 [14] subclause 9.2.2.1	m	

Table F.6: FAS byte structure

Item	Frame Alignment Signal (FAS) byte structure	Reference	Status	Support
1	A1 byte is coded '1111 0110' and A2 byte is coded'0010 1000',	G.707 [14] subclause 9.2.2.1	m	

F.4.2.2.2 Frame Alignment Signal generation

Table F.7: FAS insertion

Prerequisite: F.1/2 -- RS16_TT_So present

Item	Frame Alignment Signal (FAS) insertion	Reference	Status	Support
1	The RS16_TT_So inserts the STM-16 FAS A1...A1A2...A2 into the RSOH.	8.2.1, G.707 [14] subclause 9.2.2.1	m	

F.4.2.2.3 Signal scrambling/descrambling

Table F.8: Scrambling/descrambling: principles

Item	Scrambling/descrambling: principles	Reference	Status	Support
1	The operation of the scrambler/ descrambler is functionally identical to that of a frame synchronous scrambler/ descrambler of sequence length 127 operating at the line rate.	8.2.1, 8.2.2	m	
2	The generating polynomial is $1 + X^6 + X^7$	8.2.1, 8.2.2	m	

Table F.9: Scrambling process

Prerequisite: F.1/2 -- RS16_TT_So present

Item	Scrambling process	Reference	Status	Support
1	The scrambler is reset to '1111 1111' on the MSB of the byte (1,145) following the last byte of the STM-16 SOH in the first row.	8.2.1	m	
2	This bit and all subsequent bits to be scrambled are modulo 2 added to the output of the X^7 position of the scrambler.	8.2.1	m	
3	The scrambler runs continuously throughout the remaining STM-16 frame	8.2.1	m	

Table F. 10: Descrambling process

Prerequisite: F.1/3 -- RS16_TT_Sk function present

Item	Descrambling process	Reference	Status	Support
1	The RS16_TT_Sk descrambles the incoming STM-16 signal except the first row of the RSOH.	8.2.2	m	

F.4.2.2.4 In service error monitoring process

Table F.11: In service error monitoring: principles

Item	In service error monitoring: principles	Reference	Status	Support
1	An EDC is part of the characteristic information for in service error monitoring	ETS 300-417-1-1 [1] subclause 7.3	m	
2	In service error monitoring parameter definition is block-based.	G.707 [14] subclause 9.2.2.4 note	m	
3	The block length is 38 880 bytes, corresponding to the STM-16 frame structure		m	
4	The error monitoring is performed using Bit Interleaved Parity 8 (BIP-8).	8.2.1, G.707 [14] subclause 9.2.2.4	m	
5	The BIP-8 is calculated using even parity in such a manner that the bit in position x provides even parity over the x-bits of all the 8-bits sequences within the specified block.	G.707 [14] subclause 9.2.2.4 note	m	

Comments: The BIP-n is interpreted as checking 'n' separate interleaved parity check blocks. If any of the 'n' parity check fails (EDC Violation), the block is assumed to be in error.

Table F.12: EDC location

Item	Error Detection Code (EDC) location	Reference	Status	Support
1	Regenerator Section EDC is located in byte B1(2,1) of the STM-16 frame.	8.2.1	m	

Table F.13: EDC processing: source direction

Prerequisite: F.1/2 -- RS16_TT_So present

Item	Error Detection Code (EDC) processing: source direction	Reference	Status	Support
1	The BIP-8 is calculated over all bits of the previous STM-16 frame after scrambling.	8.2.1	m	
2	BIP-8 code is inserted in B1 byte of the current STM-16 frame before scrambling.	8.2.1	m	

Table F.14: EDC processing: sink direction

Prerequisite: F.1/3 -- RS16_TT_Sk function present

Item	Error Detection Code (EDC) processing: sink direction	Reference	Status	Support
1	The incoming error monitoring byte B1 is recovered from the STM-16 signal after descrambling.	8.2.2	m	
2	The BIP-8 is calculated over all bits of the previous STM-16 frame before descrambling.	8.2.2	m	
3	Recovered B1 byte is compared with the calculated BIP-8.	8.2.2	m	
4	A difference between the computed and recovered B1 value is taken as evidence of one or more errors (nN_B) in the computation block.	8.2.2	m	

F.4.2.2.5 Trail Trace Identifier (TTI)

Table F.15: Trail Trace Identifier (TTI): principles

Item	Trail Trace Identifier (TTI): principles	Reference	Status	Support
1	A Trail Trace Identifier (TTI) is inserted by the termination source containing the local Access Point Identifier (APId) and TTI header (TxTI).	8.2.1, ETS 300-417-1-1 [1] subclause 7.1	c1501	
2	The content of the accepted TTI (AcTI) is compared by the trail termination sink function with the provisioned "expected TTI" (ExTI), identifying the expected remote AP.	8.2.2, ETS 300-417-1-1 [1] subclause 7.1 and 8.2.1.3	c1502	

c1501: IF F.1/2 THEN m ELSE n/a -- RS16_TT_So present
c1502: IF F.1/3 THEN m ELSE n/a -- RS16_TT_Sk present

Table F.16: Trail Trace Identifier (TTI) byte location

Item	Trail Trace Identifier (TTI) byte location	Reference	Status	Support
1	The Regenerato Section Trail trace Identifier (TTI) is located in byte J0(1,97) of the STM-16 frame.	8.2.1	m	

Table F.17: Trail Trace Identifier (TTI) byte structure

Item	Trail Trace Identifier (TTI) byte structure	Reference	Status	Support
1	The RS TTI is a 16 byte string containing the 15 byte APId and a 1 byte header. The MSB of the header is a "1", the remaining 9 bits contain the CRC-7 value of the RS TTI. The MSB of the 15 APId bytes is "0".	ETS 300-417-1-1 [1] subclause 7.1	m	
2	The CRC-7 word is the remainder after multiplication by x^7 and then division (modulo 2) by the generator polynomial $x^7 + x^3 + 1$, of the polynomial representation of the RS TTI with the CRC bits set to binary zeroes.	ETS 300-417-1-1 [1] subclause 7.1	m	
3	The 16 byte RS TxTI is transferred via the Management Point to and from the trail termination function.	ETS 300-417-1-1 [1] subclause 8.2.1.3	c1701	
4	The 16 byte RS ExTI and 16 byte RS AcTI are transferred via the Management Point to and from the trail termination function.	ETS 300-417-1-1 [1] subclause 8.2.1.3	c1702	

c1701: IF F.1/2 THEN m ELSE n/a -- RS16_TT_So present
c1702: IF F.1/3 THEN m ELSE n/a -- RS16_TT_Sk present

Table F.18: Trail Trace identification: source direction

Prerequisite: F.1/2 -- RS16_TT_So present

Item	Trail Trace identification: source direction	Reference	Status	Support
1	The 16 byte RS TTI is transmitted continuously.	ETS 300-417-1-1 [1] subclause 7.1	m	

Table F.19: Trail Trace identification: sink direction

Prerequisite: F.1/3 -- RS16_TT_Sk present

Item	Trail Trace identification: sink direction	Reference	Status	Support
1	The RS16_TT_Sk supports mode 1	ETS 300-417-1-1 [1] subclause 7.1	m	
2	The RS16_TT_Sk supports mode 2	ETS 300-417-1-1 [1] subclause 7.1	m	
3	The TTI mode is provisionable by the EMF.	8.2.2	m	
4	The RS16_TT_Sk recovers the 16 byte multiframe carried in byte J0 and assumes it as Received Trail Trace Identifier (RxTI). The RxTI is made available as AcTI for network management purposes	8.2.2	m	

F.4.2.3 STM-16 regenerator section layer to MS16 Layer adaptation functions: RS16/MS16_A_So and RS16/MS16_A_Sk

F.4.2.3.1 RS16 layer to MS16 layer multiplexing and demultiplexing processes

Table F.20: Multiplexing

Prerequisite: F.1/4 -- RS16/MS16_A_So present

Item	Multiplexing	Reference	Status	Support
1	The RS16/MS16_A_So function multiplexes the MS16_CI data (38 448 bytes/frame) into the STM-16 frame.	8.3.1	m	

Table F.21: Demultiplexing

Prerequisite: F.1/5 -- RS16/MS16_A_Sk present

Item	Demultiplexing	Reference	Status	Support
1	The RS16/MS16_A_Sk recovers the MS16_CI data from the STM-16 frame.	8.3.2	m	

F.4.2.4 RS16 layer to DCC layer adaptation functions: RS16/DCC_A_So and RS16/DCC_A_Sk

F.4.2.4.1 RS16 layer to DCC layer multiplexing and demultiplexing processes

Table F.22: Multiplexing

Prerequisite: F.1/6 -- RS16/DCC_A_So present

Item	Multiplexing	Reference	Status	Support
1	The DCC_CI data (192 kbit/s) are multiplexed in D1, D2 and D3 bytes of the STM-16 frame.	8.3.3	m	

Table F.23: Demultiplexing

Prerequisite: F.1/7 -- RS16/DCC_A_Sk present

Item	Demultiplexing	Reference	Status	Support
1	The DCC_CI data (192 kbit/s) are demultiplexed from bytes D1 to D3.	8.3.4	m	

F.4.2.5 RS16 layer to P0s layer adaptation functions: RS16/P0s_A_So-N and RS16/P0s_A_Sk-N

F.4.2.5.1 RS16 layer to P0s layer multiplexing and demultiplexing processes

Table F.24: Multiplexing

Prerequisite: F.1/8 -- RS16/P0s_A_So-N present

Item	Multiplexing	Reference	Status	Support
1	The RS16/P0sP0x_A_So-N multiplexes either a 64 kbit/s orderwire or a 64 kbit/s user channel information stream into the RSOH byte E1or F1.	8.3.5	m	
2	The RS16/P0sP0x_A_So-N function has access to a specific 64 kbit/s of the RS access point. The specific 64 kbit/s channel is defined by the parameter N (N = E1, F1).	8.3.5	m	

o.2401: It is mandatory to support at least one of these items -- at least one RS16/P0s_A_So-N function present

Table F.25: Demultiplexing

Prerequisite: F.1/9 -- RS16/P0s_A_Sk-N present

Item	Demultiplexing	Reference	Status	Support
1	The RS16/P0s_A_Sk-E1 demultiplexes the P0s data from byte E1 of the RS Overhead.	8.3.6	**o.2501**	
2	The RS16/P0s_A_Sk-F1 demultiplexes the P0s data from byte F1 of the RS Overhead.	8.3.6	**o.2501**	

o.2501: It is mandatory to support at least one of these items -- at least one RS16/P0s_A_Sk-N function present.

F.4.2.5.2 RS16 layer to P0s layer frequency justification and bitrate adaptation processes

Table F.26: Frequency justification and bitrate adaptation: principles

Prerequisite: F.1/8 -- RS16/P0s_A_So-N present

Item	Frequency justification and bitrate adaptation: principles	Reference	Status	Support
1	The RS16/P0s_A_So-N function provides frequency justification and bitrate adaptation for a 64 kbit/s information stream. It takes P0s_CI as an unstructured bit-stream with a rate of 64 kbit/s ± 100 ppm and inserts it into the RSOH.	8.3.5	m	
2	Frequency justification is performed by octet slip buffering.	8.3.5	m	

Table F.27: Frequency justification and bitrate adaptation: source direction

Prerequisite: F.1/8 -- RS16/P0s_A_So-N present

Item	Frequency justification and bitrate adaptation: source direction	Reference	Status	Support
1	The RS16/P0s_A_So-N function provides for an elastic store (slip buffer) process. The are written into the store under control of the associated input clock. The data are read out of the store under control of the STM-16 clock, frame position and justification decision.	8.3.5	m	
2	Each justification decision results in a corresponding negative/positive justification action. Upon a positive justification (slip) action, the reading of one 64 kbit/s octet (9 bits) is cancelled once. Upon a negative justification (slip) action, the same 64 kbit/s octet (9 bits) is read out a second time.	8.3.5	m	
3	The elastic store (slip buffer) size accommodates at least 18 µs of wander without introducing errors.is at least 2 octets.	4.3.5	m	

F.4.2.6 RS16 layer to V0x layer adaptation functions: RS16/V0x_A_So and RS16/V0x_A_Sk

F.4.2.6.1 RS16 layer to V0x layer multiplexing and demultiplexing processes

Table F.28: Multiplexing

Prerequisite: F.1/10 -- RS16/V0x_A_So present

Item	Multiplexing	Reference	Status	Support
1	The RS16/V0x_A_So multiplexes the V0x_CI data (64 kbit/s) into the byte location F1	8.3.7	m	

Table F.29: Demultiplexing

Prerequisite: F.1/11 -- RS16/V0x_A_Sk-N present

Item	Demultiplexing	Reference	Status	Support
1	The RS16/V0x_A_Sk demultiplexes the user channel data from RS Overhead (byte F1)	8.3.7	m	

F.4.3 Defect, fault and performance monitoring

F.4.3.1 Trail termination point mode management

Table F.30: Trail termination point mode process

Prerequisite: F.1/3 -- RS16_TT_Sk function present

Item	Trail Termination Point Status process	Reference	Status	Support
1	The Trail Termination Point Mode supports "not monitored" (NMON) status	ETS 300 417-1-1 [1] subclause 8.5	m	
2	The Trail Termination Point Mode supports "monitored" (MON) status	ETS 300 417-1-1 [1] subclause 8.5	m	
3	The Trail Termination Point Mode status is provisionable by the EMF.	8.2.2	m	

F.4.3.2 Defect detection and clearance criteria

Table F.31: Trace Identifier Mismatch defect (dTIM)

Prerequisite: F.1/3 -- RS16_TT_Sk function present

Item	Trace Identifier Mismatch defect (dTIM)	Reference	Status	Support
1	The RS16 dTIM defect is detected within a maximum period of 100 ms in the absence of bit errors.	ETS 300 417-1-1 [1] subclause 8.2.1.3	m	
2	The RS16 dTIM defect is cleared within a maximum period of 100 ms in the absence of bit errors.	ETS 300 417-1-1 [1] subclause 8.2.1.3	m	
3	The RS16 dTIM is suppressed during the reception of aSSF from the server layer.	ETS 300 417-1-1 [1] subclause 8.2.1.3	m	
4	The RS16 dTIM detection can be disabled (TIMdis).	ETS 300 417-1-1 [1] subclause 8.2.1.3	m	

F.4.3.3 Consequent action activation and clearance criteria

Table F.32: Alarm Indication Signal action (aAIS)

Prerequisite: F.1/3 OR F.1/4 OR F.1/9 OR F.1/11 -- RS16_TT_Sk and/or RS16/MS1_A_So and/or RS16/P0s_A_Sk and/or RS16/V0X_A_Sk present

Item	Alarm Indication Signal action (aAIS)	Reference	Status	Support
1	The RS16_TT_Sk outputs an all "1s" signal within 250 μs upon RS16 dTIM detection.	8.2.2	c3201	
2	The RS16_TT_Sk outputs an all "1s" signal within 250 μs upon CI_SSF reception.	8.2.2	c3201	
3	The RS16_TT_Sk outputs normal data within 250 μs when there is (are) no more defect(s) active.	8.2.2	c3201	
4	The RS16/MS16_A_So outputs an all "1s" signal within 250 μs upon CI_SSF reception.	8.2.2	c3202	
5	The frequency of the all "1s" signal is within the range of 2 488 320 kHz kbit/s ± 20 ppm.	8.3.1	c3202	
6	The RS16/MS16_A_So outputs normal data within 250 μs when there is (are) no more defect(s) active.	8.3.1	c3202	
7	The RS16/P0s_A_Sk-N outputs an all "1s" signal within 1 ms upon AI_TSF reception.	8.3.6	c3203	
8	The frequency of the all "1s" signal is within the range of 64 kbit/s ± 20 ppm.	8.3.6	c3203	
9	The RS16/P0s_A_Sk-N outputs normal data within 1 ms when there is (are) no more defect(s) active.	8.3.6	c3203	
10	The RS16/V0x_A_Sk outputs an all "1s" signal within 1 ms upon AI_TSF reception.	8.3.8	c3204	
11	The frequency of the all "1s" signal is within the frequency limits for this signal.	8.3.8	c3204	
12	The RS16/V0x_A_Sk outputs normal data within 1 ms when there is (are) no more defect(s) active.	8.3.8	c3204	

c3201:IF F.1/3 THEN m ELSE n/a -- RS16_TT_Sk present
c3202:IF (F.1/4) THEN m ELSE n/a -- RS16/MS16_A_So present
c3203:IF F.1/9 THEN m ELSE n/a -- RS16/P0s_A_Sk-N present
c3204:IF F.1/11 THEN m ELSE n/a -- RS16/V0x_A_Sk present

Table F.33: Server Signal Fail action (aSSF)

Prerequisite: F.1/5 OR F.1/7 -- RS16/MS16_A_Sk and /or RS16/DCC_A_Sk function present

Item	Server Signal Fail action (aSSF)	Reference	Status	Support
1	The RS16/MS16_A_Sk sets CI_SSF to TRUE on AI_TSF reception.	8.3.2	c3301	
2	The RS16/MS16_A_Sk sets CI_SSF to FALSE as soon as AI_TSF is no longer received.	8.3.2	c3301	
3	The RS16/DCC_A_Sk sets CI_SSF to TRUE on AI_TSF reception.	8.3.4	c3302	
4	The RS16/ DCC _A_Sk sets CI_SSF to FALSE as soon as AI_TSF is no longer received.	8.3.4	c3302	
5	The RS16/P0s_A_Sk sets CI_SSF to TRUE on AI_TSF reception.	8.3.6	c3303	
6	The RS16/ P0s _A_Sk sets CI_SSF to FALSE as soon as AI_TSF is no longer received.	8.3.6	c3303	
7	The RS16/V0x_A_Sk sets CI_SSF to TRUE on AI_TSF reception.	8.3.8	c3304	
8	The RS16/ V0x _A_Sk sets CI_SSF to FALSE as soon as AI_TSF is no longer received.	8.3.8	c3304	

c3301:IF F.1/5 THEN m ELSE n/a -- RS166/MS16_A_Sk present
c3302:IF F.1/7 THEN m ELSE n/a -- RS166/DCC_A_Sk present
c3303:IF B.1/9 THEN m ELSE n/a -- RS16/P0s_A_Sk present
c3304:IF B.1/11 THEN m ELSE n/a -- RS16/V0x_A_Sk present

Table F.34: Trail Signal Fail action (aTSF)

Prerequisite: F.1/3 -- RS16_TT_Sk function present

Item	Trail Signal Fail action (aTSF)	Reference	Status	Support
1	The RS16_TT_Sk sets AI_TSF to TRUE on RS16 dTIM detection.	8.3.2	m	
2	The RS16_TT_Sk sets AI_TSF to TRUE on CI_SSF reception.	8.3.2	m	
3	The RS16_TT_Sk sets AI_TSF to FALSE when there is (are) no more defect(s) active.	8.3.2	m	

F.4.3.4 Defect correlation

Table F.35: Defect correlation

Prerequisite: F.2/2 -- Defect correlation process supported

Item	Defect correlation	Reference	Status	Support
1	Under RS16 dTIM detection the RS16_TT_Sk generates a RS16 cTIM report if the port is in the monitoring state (MON).	8.2.2	c3501	

c3501: IF F.1/3 THEN m ELSE n/a -- RS16_TT_Sk present

Annex G (normative): ICS proforma for STM-16 multiplex section layer

G.1 Identification of the implementation

In this ETS, an Implementation Under Test (IUT), and of course the identification of an IUT refers to an STM-16 Multiplex Section (MS16) layer instance implemented inside the System Under Test (SUT).

Identification of the IUT and the SUT in which it resides should be filled in so as to provide as much detail as possible regarding version numbers and configuration options.

The product supplier information and client information should both be filled in if they are different.

A person who can answer queries regarding information supplied in the ICS should be named as the contact person.

G.1.1 Date of the statement

.....

G.1.2 Implementation Under Test (IUT) identification

IUT name:

.....

.....

IUT version

Hardware version:

.....

Software version:

.....

Firmware version:

.....

G.1.3 System Under Test (SUT) identification

SUT name:

.....

.....

Hardware configuration:

.....

SUT Software version:

.....

SUT Firmware version:

.....

Operating system:

.....

G.1.4 Product supplier

Name:

.....

Address:

.....

.....

.....

Telephone number:

.....

Facsimile number:

.....

E-mail address:

.....

Additional information:

.....

.....

.....

G.1.5 Client

Name:

.....

Address:

.....

.....

.....

Telephone number:

.....

Facsimile number:

.....

E-mail address:

.....

Additional information:

.....

.....

.....

G.1.6 ICS contact person

Name:

.....

Telephone number:

.....

Facsimile number:

.....

E-mail address:

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Additional information:

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G.2 Identification of the ETS

This ICS proforma applies to the following standard:

ETS 300 417-3-1 [2]: "Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment: STM-N regenerator and multiplex section layer functions".

G.3 Global statement of conformance of STM-16 Multiplex Section (MS16) layer

Are all mandatory capabilities implemented (Yes/No)

NOTE: Answering "No" to this question indicates non-conformance to the ETS specification. Non-supported mandatory capabilities are to be identified in the ICS, with an explanation of why the implementation is non-conforming, on pages attached to the ICS proforma.

Answering "Yes" to this question indicates only that all the capabilities with the explicit status "m" are supported. It is not necessary to fill in the support column of the associated item.

G.4 MS16 Section Layer function

G.4.1 MS16 layer description

Table G.1: MS16 layer functions

Item	STM-16 Multiplex Section Layer functions	Reference	Status	Support
1	Multiplex Section Connection function (MS16_C)	9, figure 89	o	
2	Multiplex Section Trail Termination Source function (MS16_TT_So)	9, figure 89	o.101	
3	Multiplex Section Trail Termination Sink function (MS16_TT_Sk)	9, figure 89	o.101	
4	Multiplex Section to S4 layer Adaptation Source function (MS16/S4_A_So-N).	9, figure 89	c101	
5	Multiplex Section to S4 layer Adaptation Sink function (MS16/S4_A_Sk-N)	9, figure 89	c102	
6	Multiplex Section to SD Layer Adaptation Source function (MS16/SD_A_So)	9, figure 89	c103	
7	Multiplex Section to SD Layer Adaptation Sink function (MS16/SD_A_Sk)	9, figure 89	c104	
8	Multiplex Section to DCC Layer Adaptation Source function (MS16/DCC_A_So)	9, figure 89	c105	
9	Multiplex Section to DCC Layer Adaptation Sink function (MS16/DCC_A_Sk)	9, figure 89	c104	
10	Multiplex Section to P0s Layer Adaptation Source function (MS16/P0s_A_So)	9, figure 89	c105	
11	Multiplex Section to P0s Layer Adaptation Sink function (MS16/P0s_A_Sk)	9, figure 89	c104	
12	Multiplex Section to S4-4c Layer Adaptation Source function (MS16/S4-4c-N_A_So)	9, figure 89	c101	
13	Multiplex Section to S4-4c Layer Adaptation Sink function (MS16/S4-4c-N _A_Sk)	9, figure 89	c102	
14	STM-16 Multiplex Section 1+1 Linear Trail protection	9 figure 92, table A.1	c106	
15	STM-16 Multiplex Section 1:n Linear Trail protection	9, figure 92, table A.1	c107	
16	STM-16 Multiplex Section two-fibre Shared Protection Ring.	9, figure 94	c108	

c101: IF G.1/2 THEN o.102 ELSE x -- a TT_So function should exist for A_So function
c102: IF G.1/3 THEN o.103 ELSE x -- a TT_Sk function should exist for A_Sk function
c103: IF G. 1/2 THEN m ELSE x -- a TT_So function should exist for MS16/SD_A_So
c104: IF G.1/3 THEN o ELSE x -- a TT_Sk function should exist for A_Sk
c105: IF G.1/2 THEN o ELSE x -- a TT_So function should exist for A_So
c106: IF NOT G.1/16 THEN o ELSE x -- no MS SPRing protection supported
c107: IF (G.1/2 AND G.1/3) AND NOT G.1/16
THEN o ELSE x -- bi-directional layer needed and no MS SPRingprotection supported
c108: IF (G.1/2 AND G.1/3) AND NOT
(G.1/14 OR G.1/15)
THEN o ELSE x -- bi-directional layer needed and no MS Linear protection supported
o.101: It is mandatory to support at least one of these items -- at least one TT function present
o.102: It is mandatory to support at least one of these items -- at least one A_So function present
o.103: It is mandatory to support at least one of these items -- at least one A_Sk function present

Comments: in G.1/4 and G.1/5 the value of N is an integer number in the range from 1 to 16.
In G.1/12 and G.1/13 the value of N is in the set 1, 5, 9 and 13.

Table G.2: Number of adaptation functions to S4 and S4-4c layers for single payload type for each direction

Prerequisite: (G.1/4 XOR G.1/12) OR (G.1/5 XOR G.1/13) -- single payload type for one direction

Item	Number of adaptation functions to S4 and S4-4c layers for single payload type for each direction	Reference	Status	Support
1	The number of supported MS16/S4_A_So is 16	9, figure 89	c201	
2	The number of supported MS16/S4_A_Sk is 16	9, figure 89	c202	
3	The number of supported MS16/S4-4c_A_So is 4	9, figure 89	c203	
4	The number of supported MS16/S4-4c_A_Sk is 4	9, figure 89	c204	

c201: IF G.1/4 THEN m ELSE n/a -- MS16/S4_A_So-N supported
c202: IF G.1/5 THEN m ELSE n/a -- MS16/S4_A_Sk-N supported
c203: IF G.1/12 THEN m ELSE n/a -- MS16/S4-4c_A_So-N supported
c204: IF G.1/13 THEN m ELSE n/a -- MS16/S4-4c_A_Sk-N supported

Table G.3: Number of adaptation functions to S4 and S4-4c layers

Prerequisite: (G.1/4 AND G.1/12) OR (G.1/5 AND G.1/13) -- both payload adaptation source or adaptation sink functions are present (mixed payload supported at least in one direction

Item	Number of adaptation functions to S4 and S4-4c layers	Reference	Status	Support	Values	
					Allowed	Supported
1	Number of supported MS16/S4_A_So: j1	9, figure 89	c301		j1= 4, 8, 12, 16	
2	Number of supported MS16/S4_A_Sk: j2	9, figure 89	c302		j2= 4, 8, 12, 16	
3	Number of supported MS16/S4-4c_A_So: j3	9, figure 89	c303		j3= 1, 2, 3, 4	
4	Number of supported MS16/S4-4c_A_Sk: j4	9, figure 89	c304		j4= 1, 2, 3, 4	
5	"Equivalent VC-4s" supported in the source direction: j1+4*j3		c305		j1+4*j3 ≥ 16	
6	"Equivalent VC-4s" supported in the sink direction: j2+4*j4		c306		j2+4*j4 ≥ 16	

c301: IF G.1/4 THEN m ELSE n/a -- MS16/S4_A_So supported
c302: IF G.1/5 THEN m ELSE n/a -- MS16/S4_A_Sk supported
c303: IF G.1/12 THEN m ELSE n/a -- MS16/S4-4c_A_So supported
c304: IF G.1/13 THEN m ELSE n/a -- MS16/S4-4c_A_Sk supported
c305: IF (G.1/4 AND G.1/12) THEN m ELSE n/a -- both MS16/S4_A_So and MS16/S4-4c_A_So supported
c306: IF (G.1/5 AND G.1/13) THEN m ELSE n/a -- both MS16/S4_A_Sk and MS16/S4-4c_A_Sk supported

Table G.4: STM-16 Multiplex Section Linear Trail Protection schemes

Prerequisite: G.1/14 OR G.1/15 -- STM-16 Linear Trail Protection scheme supported

Item	STM-1 Multiplex Section Linear Trail Protection functions	Reference	Status	Support
1	MS16 1+1 Linear Trail Protection with unidirectional switching and revertive operation	9.5.1.1	c401	
2	MS16 1+1 Linear Trail Protection with unidirectional switching and non-revertive operation	9.5.1.1	c401	
3	MS16 1+1 Linear Trail Protection with bi-directional switching and revertive operation	9.5.1.1	c402	
4	MS16 1+1 Linear Trail Protection with bi-directional switching and non-revertive operation	9.5.1.1	c402	
5	MS16 1:n Linear Trail Protection with bi-directional switching and revertive operation	9.5.1.2	c403	

o.401: It is mandatory to support at least one of these items -- at least one 1+1 protection scheme
c401: IF G.1/14 THEN o.401 ELSE x -- 1+1 MS Linear Trail Protection supported
c402: IF G.1/14 AND (G.1/2 AND G.1/3) THEN o.401 ELSE x -- 1+1 MS Linear Trail Protection and bi-directional layer supported
c403: IF G.1/15 THEN m ELSE x -- 1:n MS Linear Trail Protection supported

Table G.5: MS16 linear trail protection functions

Prerequisite: G.1/14 OR G.1/15 -- STM-16 Linear Trail Protection scheme supported

Item	MS16 linear trail protection functions	Reference	Status	Support
1	Multiplex Section Linear Trail Protection Connection function	9, figure 92	m	
2	Multiplex Section Protection Trail Termination Source function (MS16P_TT_So)	9, figure 92	c501	
3	Multiplex Section Protection Trail Termination Sink function (MS16P_TT_Sk)	9, figure 92	c502	
4	Multiplex Section to Multiplex Section Protection Layer Adaptation Source function (MS16/MS16P_A_So)	9, figure 92	c501	
5	Multiplex Section to Multiplex Section Protection Layer Adaptation Sink function (MS16/MS16P_A_Sk)	9, figure 92	c502	

c501: IF G.1/2 THEN m ELSE x -- a TT_So function should exist for protection Source functions
c502: IF G.1/3 THEN m ELSE x -- a TT_Sk function should exist for protection Sink functions

Table G.6: MS16 two-fibre shared protection ring functions

Prerequisite: G.1/16 -- STM-16 Multiplex Section two-fibre Shared Protection Ring supported

Item	MS16 two-fibre Shared Protection Ring functions	Reference	Status	Support
1	Multiplex Section two-fibre Shared Protection Ring Connection function (MS16P2fsh_C)	9, figure 94	m	
2	Multiplex Section two-fibre Shared Protection Ring Trail Termination Source function (MS16P2fsh_TT_So)	9, figure 94	m	
3	Multiplex Section two-fibre Shared Protection Ring Trail Termination Sink function (MS16P2fsh_TT_Sk)	9, figure 94	m	
4	Multiplex Section to STM-16 Multiplex Section two-fibre Shared Protection Ring Adaptation Source function (MS16/MS16P2fsh_A_So)	9, figure 94	m	
5	Multiplex Section to STM-16 Multiplex Section two-fibre Shared Protection Ring Adaptation Sink function (MS16/MS16P2fsh_A_Sk)	9, figure 94	m	

Table G.7: Supervision processes

Item	Supervision process	Reference	Status	Support
1	Near-end performance monitoring process Equipment Management Function	ETS 300 417-1-1 [1] subclauses 8.2 to 8.4	c701	
2	Far-end performance monitoring process Equipment Management Function	ETS 300 417-1-1 [1] subclauses 8.2 to 8.4	c702	
3	Pointer performance monitoring process Equipment Management Function	ETS 300 417-1-1 [1] subclauses 8.2 to 8.4	c703	
4	Protection performance monitoring process Equipment Management Function	ETS 300 417-1-1 [1] subclauses 8.2 to 8.4	c704	
5	Defect correlation process Equipment Management Function	ETS 300 417-1-1 [1] subclauses 8.2 to 8.3	c705	

c701: IF G.1/3 THEN m ELSE n/a -- MS16_TT_Sk present
c702: IF (G.1/2 AND G.1/3) THEN m ELSE n/a -- both TT_So and TT_Sk present
c703: IF (G.1/4 OR G.1/12) THEN m ELSE n/a -- MS16/S4_A_So and/or MS16/S4-4c_A_So present
c704: IF (G.1/14 OR G.1/15)
THEN m ELSE n/a -- STM-16 Linear Trail Protection supported
c705: IF (G.1/3 OR G.1/5 OR G.1/13)
THEN m ELSE n/a -- MS16_TT_Sk and/or MS16/S4_A_Sk and/or MS16/S4-4c_A_Sk present

G.4.2 MS16 layer transmission tables

Table G.8: Data stream structure

Item	Data stream structure	Reference	Status	Support
1	The CI at the MS16 connection point is octet structured and 125 μs framed with co-directional timing.	9	m	
2	The MS16_CI is an STM-16 data stream without the Regenerator Section Overhead.	9	m	
3	Multiplex Section OverHead (MS-OH) bytes are placed in rows 5 to 9 of columns 1 to 144 of the STM-16 frame.	9, figure 90	m	

Table G.9: Payload composition

Item	Number of adaptation functions to S4 and S4-4c layers	Reference	Status	Support	Values	
1					Allowed	Supported
2	The payload is composed of sixteen VC-4s of 150 336 kbit/s.	9	c901		___	
3	The payload is composed of k VC-4-4c and (16-4*k) VC-4. Specify the supported value(s) for k.	9	c902		1≤ k ≤3	
4	The payload is composed of four VC-4-4c of 601 344 kbit/s.	9	c903		___	
5	The payload is composed of eight working VC-4s and eight protection VC-4s.	9	c904		___	
6	The payload is composed of two working VC-4-4c and two protection VC-4-4c.	9	c905		___	

c901: IF (G.1/4 OR G.1/5) AND NOT G.1/16
THEN o.901 ELSE n/a -- MS16/S4_A_So and/or MS16/S4_A_Sk present
c902: IF (G.1/4 OR G.1/5) AND (G.1/12 OR G.1/13) AND NOT G.1/16
THEN o.901 ELSE n/a -- MS16 to S4 and MS16 to S4-4c adaptation functions present at the same time
c903: IF (G.1/12 OR G.1/13) AND NOT G.1/16
THEN o.901 ELSE n/a -- MS16/S4-4c_A_So and/or MS16/S4-4c_A_Sk present
c904: IF (G.1/4 OR G.1/5) AND G.1/16
THEN o.902 ELSE n/a -- MS16/S4_A_So and/or MS16/S4_A_Sk present and Shared Protection RING supported
c905: IF (G.1/12 OR G.1/13) AND G.1/16
THEN o.902 ELSE n/a -- MS16/S4-4c_A_So and/or MS16/S4-4c_A_Sk present and Shared Protection RING supported
o.901: It is mandatory to support at least one of these items -- at least one type of payload composition for traffic not being ring protected
o.902: It is mandatory to support at least one of these items -- at least one type of payload composition for ring protected traffic

G.4.2.1 MS16 connection function: MS16_C

Table G.10: Connection functionalities

Prerequisite: G.1/1 -- MS16_C present

Item	Connection functionalities	Reference	Status	Support
1	For further study	9.1	n/a	

G.4.2.2 MS16 layer trail termination functions: MS16_TT_So and MS16_TT_Sk

G.4.2.2.1 In service error monitoring process

Table G.11: In service error monitoring: principles

Item	In service error monitoring: principles	Reference	Status	Support
1	An EDC is part of the characteristic information for in service monitoring purposes.	ETS 300 417-1-1 [1] subclause 7.3	m	
2	In service error monitoring parameter definition is block-based.	G.707 [14] subclause 9.2.2.4 note	m	
3	The block length is 2 403 bytes (within an STM-16, the STM-1 frame structure without the Regenerator Section Overhead).	G.707 [14] subclause 9.2.2.4	m	
4	The error monitoring is performed using Bit Interleaved Parity 384 (BIP-384).	9.2.1, G.707 [14] subclause 9.2.2.4 note	m	
5	The BIP-384 is calculated using even parity in such a manner that the bit in position x provides even parity over the x-bits of all the 384-bits sequences within the specified block.	G.707 [14] subclause 9.2.2.4 note	m	

NOTE: The BIP-n is interpreted as checking 'n' separate interleaved parity check blocks. If any of the 'n' parity check fails (EDC Violation), the block is assumed to be in error.

Table G.12: EDC location

Item	Error Detection Code (EDC) location	Reference	Status	Support
1	Multiplex Section EDC is located in bytes B2 from (5,1) to (5,48) of the STM-16 frame.	9, figure 90	m	

Table G.13: EDC processing: source direction

Prerequisite: G.1/2 -- MS16_TT_So present

Item	Error Detection Code (EDC) processing: source direction	Reference	Status	Support
1	The BIP-384 is calculated over all bits, except those in the RSOH bytes, of the previous STM-16 frame.	9.2.1	m	
2	BIP-384 code is inserted in the 48 B2 bytes of the current STM-16 frame.	9.2.1	m	

Table G.14: EDC processing: sink direction

Prerequisite: G.1/3 -- MS16_TT_Sk function present

Item	Error Detection Code (EDC) processing: sink direction	Reference	Status	Support
1	The incoming error monitoring bytes B2 are recovered from the MSOH signal.	9.2.2	m	
2	The BIP-384 is calculated over all bits, except of those in the RSOH bytes, of the previous STM-16 frame.	9.2.2	m	
3	Recovered B2 bytes are compared with the calculated BIP-384.	9.2.2	m	
4	A difference between the computed and recovered B2 values is taken as evidence of one or more errors (nN_B) in the computation block.	9.2.2	m	

G.4.2.2.2 Server layer status monitoring process

G.4.2.2.2.1 MS16 Alarm Indication Signal (MS16 AIS)

Table G.15: Alarm Indication Signal processing: sink direction

Prerequisite: G.1/3 -- MS16_TT_Sk present

Item	Alarm Indication Signal processing: sink direction	Reference	Status	Support
1	MS16_TT_Sk extracts and monitors bits 6 to 8 of K2 byte in order to detect the '111' bit pattern as evidence of MS AIS condition.	9.2.2	m	

G.4.2.2.3 Remote indicators monitoring process

G.4.2.2.3.1 MS16 Remote Defect Indication (RDI) (MS16 RDI)

Table G.16: Remote Defect Indication (RDI) location

Prerequisite: G.1/2 AND G.1/3 -- bi-directional layer supported

Item	Remote Defect Indication (RDI) location	Reference	Status	Support
1	The MS RDI is located in bits 6,7 and 8 of byte K2(5,97) of the STM-16 frame.	9.2.1, 9.2.2	m	

Table G.17: Remote Defect Indication (RDI) processing: source direction

Prerequisite: G. 1/2 AND G.1/3 -- bi-directional layer supported

Item	Remote Defect Indication (RDI) processing: source direction	Reference	Status	Support
1	MS16 RDI is set upon activation of MS16_RI_RDI determined by the associated MS16_TT_Sk.	9.2.1	m	
2	MS16 RDI is cleared upon deactivation of MS16_RI_RDI determined by the associated MS16_TT_Sk.	9.2.1	m	
3	MS16 RDI signal is coded as a '110' bit pattern.	9.2.1	m	
4	If MS16_RI_RDI is inactive bits 6 to 8 of byte K2 are passed through transparently except for incoming codes "111" and "110".	9.2.1	m	
5	The '000' bit pattern is inserted if no MS16_RI_RDI signal is active and the incoming content of bits 6 to 8 in byte K2 is "111" or "110".	9.2.1	m	

Table G.18: Remote Defect Indication (RDI) processing: sink direction

Prerequisite: G.1/3 -- MS16_TT_Sk present

Item	Remote Defect Indication (RDI) processing: sink direction	Reference	Status	Support
1	MS16_TT_Sk extracts and monitors bits 6 to 8 of K2 byte in order to detect the '110' bit pattern as evidence of MS RDI condition.	9.2.2	m	

G.4.2.2.3.2 MS16 Remote Error Indication (REI) (MS16 REI)

Table G.19: Remote Error Indication (REI): principles

Prerequisite: G. 1/2 AND G.1/3 -- bi-directional layer supported

Item	Remote Error Indication (REI): principles	Reference	Status	Support
1	The REI signal contains the exact number of Errored Block (EB) detected in the trail signal at the far-end trail termination sink	G.707 [14] subclause 9.2.2.12	m	
2	The block length is 801 bits. The EDC is BIP-1.	G.707 [14] subclause 9.2.2.12	m	

Table G.20: Remote Error Indication (REI) location

Prerequisite: G. 1/2 AND G.1/3 -- bi-directional layer supported

Item	Remote Error Indication (REI) location	Reference	Status	Support
1	The MS REI is located in bits 1 to 8 of M1(9,51) byte of the STM-16 frame.	G.707 [14] subclause 9.2.2.12	m	

Table G.21: Remote Error Indication (REI) processing: source direction

Prerequisite: G. 1/2 AND G.1/3 -- bi-directional layer supported

Item	Remote Error Indication (REI) processing: source direction	Reference	Status	Support
1	The MS16_TT_So sets REI to the equivalent binary value of the number of EDCV, truncated to 255, detected by the monitoring process	G.707 [14] subclause 9.2.2.12	m	

Table G.22: Remote Error Indication (REI) processing: sink direction

Prerequisite: G.1/3 -- MS16_TT_Sk present

Item	Remote Error Indication (REI) processing: sink direction	Reference	Status	Support
1	The MS16_TT_Sk extracts the MS16 REI from the incoming STM-16 signal .	9.2.2	m	
2	The MS16_TT_Sk interprets the MS16 REI as given in G.707 [14] subclause 9.2.2.12	G.707 [14] subclause 9.2.2.12	m	

G.4.2.3 MS16 layer to S4 layer adaptation functions: MS16/S4_A_So and MS16/S4_A_Sk

Table G.23: Adaptation process

Prerequisite: G.1/4 OR G.1/5 -- MS16/S4_A_So and/or MS16/S4_A_Sk present

Item	Adaptation process	Reference	Status	Support
1	The MS16/S4_A_So function provides frequency justification and bitrate adaptation for a VC-4 signal, represented by a nominally (261×9×64) = 150 336 kbit/s information stream and the related frame phase with a frequency accuracy within ±4,6 ppm.	9.3.1	c2301	
2	The MS16/S4_A_So-N has access to a specific AU-4 of the MS16 access point. The AU-4 is defined by the parameter N (or AUnum) with N=1,...,16.	9.3.1	c2301	
3	The MS16/S4_A_Sk recovers the VC-4 data with frame phase information.	9.3.2	c2302	
4	The MS16/S4_A_Sk-N has access to a specific AU-4 of the MS16 access point. The AU-4 is defined by the parameter N (or AUnum) with N=1,...,16.	9.3.2	c2302	

c2301: IF G.1/4 THEN m ELSE n/a -- MS16/S4_A_So present
c2302: IF G.1/5 THEN m ELSE n/a -- MS16/S4_A_Sk present

Table G.24: Activation/deactivation of adaptation to S4 and S4-4c layer functions

Prerequisite: (G.1/4 AND G.1/12) OR (G.1/5 AND G.1/13) -- adaptation So functions to S4 and S4-4c layers present at the same time and/or adaptation Sk functions to S4 and S4-4c layers present

Item	Activation/deactivation of adaptation to S4 and S4-4c layer functions	Reference	Status	Support
1	The MS16/S4_A_So-N and MS16/S4-4c_A_So-N can be activated or deactivated when multiple payload adaptation functions are connected to the access point. Only one adaptation source function may have access to a specific AU timeslot. Access to the same AU timeslot by other adaptation source functions is denied.	9.3.1, 9.3.3	c2401	
2	Each of the MS16/S4_A_So-N accesses the access point when it is activated (MI_Active is true). Otherwise, it does not access the access point.	9.3.1	c2402	
3	Each of the MS16/S4-4c_A_So-N accesses the access point when it is activated (MI_Active is true). Otherwise, it does not access the access point.	9.3.3	c2403	
4	The MS16/S4_A_Sk-N can be activated or deactivated to connect to the access point. In contradiction with the source direction, adaptation sink functions may be activated all together.	9.3.2	c2404	
5	The MS16/S4-4c_A_Sk-N can be activated or deactivated to connect to the access point. In contradiction with the source direction, adaptation sink functions may be activated all together.	9.3.4	c2404	
6	Each of the MS16/S4_A_Sk-N performs its tasks when it is activated (MI_Active is true). Otherwise, it transmits the all-ONEs signal at its output (CI_D) and does not report its status via its management point.	9.3.2	c2405	
7	Each of the MS16/S4-4c_A_Sk-N performs its tasks when it is activated (MI_Active is true). Otherwise, it transmits the all-ONEs signal at its output (CI_D) and does not report its status via its management point.	9.3.4	c2406	

c2401: IF G.3/5 AND [(j1+4*j3)>16]
THEN m ELSE x -- the total capacity of MS16/S4_A_So and MS16/S4-4c_A_So exceeds the 16 AU timeslots available in an STM-16 frame

c2402: IF G.24/1 THEN m ELSE x -- MS16/S4_A_So present and activation/deactivation supported

c2403: IF G.24/1 THEN m ELSE x -- MS16/S4-4c_A_So present and activation/deactivation supported

c2404: IF G.3/6 AND [(j2+4*j4)>16]
THEN m ELSE x -- the total capacity of MS16/S4_A_Sk and MS16/S4-4c_A_Sk exceeds the 16 AU timeslots available in an STM-16 frame

c2405: IF G.24/4 THEN m ELSE x -- activation/deactivation of adaptation Sk functions to S4 layer supported

c2406: IF G.24/5 THEN m ELSE x -- activation/deactivation of adaptation Sk functions to S4-4c layer supported

Comment to c2401: in c2401 the values of j1 and j3, if supported, are those given respectively in G.3/1 and G.3/3.

G.4.2.3.1 MS16 layer to S4 layer frequency justification and bitrate adaptation processes

Table G.25: Frequency justification and bitrate adaptation: principles

Prerequisite: G.1/4 -- MS16/S4_A_So present

Item	Frequency justification and bitrate adaptation: principles	Reference	Status	Support
1	Frequency justification is performed by pointer adjustments.	9.3.1	m	

Table G.26: Frequency justification and bitrate adaptation: source direction

Prerequisite: G.1/4 -- MS16/S4_A_So present

Item	Frequency justification and bitrate adaptation: source direction	Reference	Status	Support
1	The MS16/S4_A_So function provides for an elastic store (buffer) process. The data and frame start signals are written into the store under control of the associated input clock. The data and frame start signals are read out of the store under control of the STM-16 clock, frame position and justification decision.	9.3.1	**m**	
2	Each justification decision results in a corresponding negative/positive justification action. Upon a positive justification action, the reading of 24 data bits are cancelled once and no data written at the three positions H3+1. Upon a negative justification action, an extra 24 data bits are read out once into the three positions H3.	9.3.1	m	
3	Consecutive pointer operations shall be separated by at least three frames (i.e. every fourth frame) in which the pointer value remains constant.	9.3.1	m	
4	The buffer hysteresis is at least 12 bytes.	9.3.1	m	
5	The size of the buffer for the elastic store process is [for further study]	9.3.1	n/a	

G.4.2.3.2 MS16 layer to S4 layer alignment process

Table G.27: Alignment process principles

Prerequisite: G.1/4 OR G.1/5 -- MS16/S4_A_So and/or MS16/S4_Sk present

Item	Alignment process principles	Reference	Status	Support
1	The alignment process is carried out by the processing of the AU-4 pointer which is aligned in the STM-16 payload in fixed position relative to the STM-16 frame.	G.707 [14] subclause 8.1	m	
2	The location of the first byte of the VC-4 with respect to the STM-16 is given by the related AU-4 pointer value.	G.707 [14] subclause 8.1.2	m	

Comments: The pointer value gives a measure of the phase offset between the VC-4 stream and the STM-16 frame.

Table G.28: AU-4 pointer and alignment byte location

Prerequisite: G.1/4 OR G.1/5 -- MS16/S4_A_So and/or MS16/S4_Sk present

Item	AU-4 pointer and alignment byte location	Reference	Status	Support
1	The 144 bytes at the beginning of row 4 in the STM-16 frame are allocated to the alignment process.	9.3.1, G.707 [14] subclauses 8.1-8.1.1	m	
2	The AU-4 pointer is located into H1 (4,AUnum) and H2 (4,48+AUnum) of the STM-16 frame.	9.3.1, G.707 [14] subclauses 8.1-8.1.1	m	

Comments: The parameter AUnum (AUnum=1,..,16) indicates the Administrative Unit number within the STM-16 frame.

Table G.29: AU-4 pointer and alignment byte structure

Prerequisite: G.1/4 OR G.1/5 -- MS16/S4_A_So and/or MS16/S4_Sk present

Item	AU-4 Pointer and alignment byte structure	Reference	Status	Support
1	The content of H1 (4,AUnum) and H2 (4,48+AUnum) bytes is viewed as one pointer word.	G.707 [14] subclause 8.1.2	m	
2	Bits 1 through 4 of the pointer word carry the New Data Flag (NDF).	G.707 [14] subclause 8.1.2	m	
3	Bits 5 and 6 of the pointer word, named ss bits, carry the AU-n type code. They are set to '10'.	9.3.1, G.707 [14] subclause 8.1.2	m	
4	Bits 7 through 16 (last ten bits) of the pointer word carry the pointer value.	G.707 [14] subclause 8.1.2	m	
5	The AU-4 pointer value is a binary number with a range of 0 to 782.	G.707 [14] subclause 8.1.2	m	
6	Bytes from (4,17) to (4,48) contain the fixed stuff code Y = 1001 ss11. Bits ss are undefined.	9.3.1, G.707 [14] subclause 8.1.2	m	
7	Bytes from (4,65) to (4,96) contain the fixed stuff code '1' = 1111 1111.	9.3.1, G.707 [14] subclause 8.1.2	m	
8	H3(4,96+AUnum), H3(4,112+AUnum), H3(4,128+AUnum) bytes are the negative justification opportunity bytes.	G.707 [14] subclause 8.1.2	m	
9	Bits 7,9,11,13,15 of the pointer word (I bits) are the pointer incrementation indication bits.	G.707 [14] subclause 8.1.2	m	
10	Bits 8,10,12,14,16 of the pointer word (D bits) are the pointer decrementation indication bits.	G.707 [14] subclause 8.1.2	m	

Comments: The parameter AUnum (AUnum=1,..,16) indicates the Administrative Unit number within the STM-16 frame.

NOTE: Items G.29/3 and G.29/6 are contradictory but just reflect the base specification in ITU-T Recommendation G.707 [14] and ETS 300 417-3-1 [2].

G.4.2.3.2.1 AU pointer generation

Table G.30: Pointer generation principles

Prerequisite: G.1/4 OR G.1/12 -- MS16/S4_A_So and/or MS16/S4-4c_A_So present

Item	Pointer generation principles	Reference	Status	Support
1	The pointer is generated according to the pointer generation algorithm.	9.3.1, ETS 300 417-1-1 [1] annex A	**m**	
2	The pointer generation algorithm can be modelled by a finite state machine as shown in ETS 300 417-1-1 [1] figure A.1. Four states can be identified: - NORM_state - NDF_state - INC_state - DEC_state	ETS 300 417-1-1 [1] annex A	m	
3	The transitions from the NORM state to the INC, DEC and NDF states are initiated by Elastic Store process events.	ETS 300 417-1-1 [1] annex A	m	
4	The transitions from INC, DEC and NDF states to the NORM state occur autonomously under the generation of special pointer patterns.	ETS 300 417-1-1 [1] annex A	m	
5	Definition of excessive pointer adjustments is for further study.	ETS 300 417-1-1 [1] annex A	n/a	

Table G.31: Pointer generation events

Prerequisite: G.1/4 OR G.1/12 -- MS16/S4_A_So and/or MS16/S4-4c_A_So present

Item	Pointer generation events	Reference	Status	Support
1	**thr_exc**: elastic store filling exceeds an upper threshold	ETS 300 417-1-1 [1] annex A	m	
2	**thr_und**: elastic store filling falls below a lower threshold	ETS 300 417-1-1 [1] annex A	m	
3	**FO_normal**: normal frame offset	ETS 300 417-1-1 [1] annex A	m	
4	**FO_discont**: frame offset discontinuity	ETS 300 417-1-1 [1] annex A	m	
5	A frame offset discontinuity occurs if an incoming NDF_enable or 3*new_point is received by the pointer interpreter controlling the process of writing into the elastic store.	ETS 300 417-1-1 [1] annex A	m	
6	A frame offset discontinuity occurs if the Elastic Store overflow/underflow condition is detected.	ETS 300 417-1-1 [1] annex A	m	
7	The active offset is defined as the phase between the outgoing STM-16 and the VC-4 (or VC-4-4c).	ETS 300 417-1-1 [1] annex A	m	
8	The active offset is undefined during a signal fail condition.	ETS 300 417-1-1 [1] annex A	m	

Table G.32: Pointer generation actions

Prerequisite: G.1/4 OR G.1/12 -- MS16/S4_A_So and/or MS16/S4-4c_A_So present

Item	Pointer generation actions	Reference	Status	Support
1	The **norm_point action** generates a transmitted pointer word with: - NDF disabled (NDF bytes set to 0110), - pointer value set to active offset.	ETS 300 417-1-1 [1] annex A	m	
2	The **inc_ind action** generates a transmitted pointer word with: - NDF disabled (NDF bytes set to 0110), - pointer value set to the active offset and I-bits inverted. After this action 3 (or 12) stuffing bytes are transmitted in the 3 (or 12) H3+1 byte positions (see figure 93 in ETS 300 417-3-1) of the AU-4 (or AU-4-4c) and the active offset is incremented by one unit. If the previous pointer value is set to its maximum value, the subsequent pointer is set to zero.	ETS 300 417-1-1 [1] annex A, G.707 [14] subclause 8.1.5	m	
3	The **dec_ind action** generates a transmitted pointer word with: - NDF disabled (NDF bytes set to 0110), - pointer value set to the active offset and D-bits inverted. After this action 3 (or 12) data bytes are transmitted in the 3 (or 12) H3 byte positions of the AU-4 (or AU-4-4c) and the active offset is decremented by one. If the previous pointer value is zero, the subsequent pointer is set to its maximum value.	ETS 300 417-1-1 [1] annex A, G.707 [14] subclause 8.1.5	m	
4	The **NDF_enable action** generates a pointer word with: - NDF enabled (NDF bytes set to 1001), - pointer value set to the new offset. After this action the active offset is updated to the new offset value.	ETS 300 417-1-1 [1] annex A	m	

Comments: I bits and D bits are, respectively, bits 7,9,11,13,15 and 8,10,12,14,16 of the pointer word.

Table G.33: Pointer generation: operation in NORM state

Prerequisite: G.1/4 OR G.1/12 -- MS16/S4_A_So and/or MS16/S4-4c_A_So present

Item	Pointer generation: operation in NORM state	Reference	Status	Support
1	Reception: FO_normal Transition to state: NORM Action: norm_point	ETS 300 417-1-1 [1] annex A	m	
2	Reception: thr_exc Transition to state: DEC Action: dec_ind	ETS 300 417-1-1 [1] annex A	m	
3	Reception: thr_und Transition to state: INC Action: inc_ind	ETS 300 417-1-1 [1] annex A	m	
4	Reception: FO_discont Transition to state: NDF Action: NDF_enable	ETS 300 417-1-1 [1] annex A	m	

Table G.34: Pointer generation: operation in INC state

Prerequisite: G.1/4 OR G.1/12 -- MS16/S4_A_So and/or MS16/S4-4c_A_So present

Item	Pointer generation: operation in INC state	Reference	Status	Support
1	Reception: FO_normal Transition to state: INC Action: norm_point	ETS 300 417-1-1 [1] annex A	m	
2	Reception: 3*FO_normal Transition to state: NORM Action: norm_point	ETS 300 417-1-1 [1] annex A	m	
3	Reception: FO_discont Transition to state: NDF Action: NDF_enable	ETS 300 417-1-1 [1] annex A	m	

Table G.35: Pointer generation: operation in DEC state

Prerequisite: G.1/4 OR G.1/12 -- MS16/S4_A_So and/or MS16/S4-4c_A_So present

Item	Pointer generation: operation in DEC state	Reference	Status	Support
1	Reception: FO_normal Transition to state: DEC Action: norm_point	ETS 300 417-1-1 [1] annex A	m	
2	Reception: 3*FO_normal Transition to state: NORM Action: norm_point	ETS 300 417-1-1 [1] annex A	m	
3	Reception: FO_discont Transition to state: NDF Action: NDF_enable	ETS 300 417-1-1 [1] annex A	m	

Table G.36: Pointer generation: operation in NDF state

Prerequisite: G.1/4 OR G.1/12 -- MS16/S4_A_So and/or MS16/S4-4c_A_So present

Item	Pointer generation: operation in NDF state	Reference	Status	Support
1	Reception: FO_normal Transition to state: NDF Action: norm_point	ETS 300 417-1-1 [1] annex A	m	
2	Reception: FO_discont Transition to state: NDF Action: NDF_enable	ETS 300 417-1-1 [1] annex A	m	
3	Reception: 3*FO_normal Transition to state: NORM Action: norm_point	ETS 300 417-1-1 [1] annex A	m	

G.4.2.3.2.2 AU pointer interpretation

Table G.37: Pointer interpretation principles

Prerequisite: G.1/5 OR G.1/13 -- MS16/S4_A_Sk and/or MS16/S4-4c_A_Sk present

Item	Pointer interpretation principles	Reference	Status	Support
1	The pointer is interpreted according to the pointer interpretation algorithm.	9.3.2, 9.3.4, ETS 300 417-1-1 [1] annex B	m	
2	The pointer interpretation algorithm can be globally described by a state diagram as shown in ETS 300 417-1-1 [1] figure B.1. Six states are defined: – NORMal_state (NORM) – AIS_state (AIS) – LOP_state (LOP) – INCrement_state (INC) – DECrement_state (DEC) – NDF_state (NDF)	ETS 300 417-1-1 [1] annex B	m	
3	The transitions between the states will be initiated either by single or consecutive events.	ETS 300 417-1-1 [1] annex B	m	
4	The kind and number of consecutive indications activating a transition is chosen such that the behaviour is stable and insensitive to signal degradations.	ETS 300 417-1-1 [1] annex B	m	

Table G.38: Pointer interpretation events

Prerequisite: G.1/5 OR G.1/13 -- MS16/S4_A_Sk and/or MS16/S4-4c_A_Sk present

Item	Pointer interpretation events	Reference	Status	Support
1	•**NDF Enabled** occurs when any of the following bit patterns is received: "1001", "0001", "1101", "1011", "1000"	ETS 300 417-1-1 [1] annex B	m	
2	**NDF Disabled** occurs when any of the following bit patterns is received: "0110", "1110", "0010", "0100", "0111"	ETS 300 417-1-1 [1] annex B	m	
3	The **norm_point event** corresponds to a received pointer word with: NDF disabled AND ss-bits set to 10 (indicating AU-4) AND received pointer offset value equal to active offset value	ETS 300 417-1-1 [1] annex B	m	
4	The **NDF_enable event** corresponds to a received pointer word with: NDF enabled AND ss-bits set to 10 (indicating AU-4) AND received pointer offset value in range	ETS 300 417-1-1 [1] annex B	m	
5	The **AIS_ind event** corresponds to a received pointer word set to 11111111 11111111 (FF FF Hex)	ETS 300 417-1-1 [1] annex B	m	
6	The **inc_ind event** corresponds to a received pointer word with: NDF disabled AND ss-bits set to 10 (indicating AU-4) AND majority of I-bits inverted AND no majority of D-bits inverted	ETS 300 417-1-1 [1] annex B	m	
7	The **inv_point event** corresponds to any other received pointer word: NOT norm_point AND NOT NDF_enable AND NOT AIS_ind AND NOT [(inc_ind OR dec_ind) AND NORM_state]	ETS 300 417-1-1 [1] annex B	m	
8	The **new_point event** corresponds to a received pointer word with: NDF disabled AND ss-bits set to 10 (indicating AU-4) AND received pointer offset value in range but not equal to active offset value	ETS 300 417-1-1 [1] annex B	m	
9	The remaining six **NDF codes** ("0000", "0011", "0101", "1010", "1100", "1111") result in an **inv_pointer** indication.	ETS 300 417-1-1 [1] annex B	m	
10	The **8*NDF_enable event** corresponds to 8 consecutive NDF_enable events.	ETS 300 417-1-1 [1] annex B	m	
11	The **3*AIS_ind** corresponds to three consecutive AIS_ind events.	ETS 300 417-1-1 [1] annex B	m	
12	The **8* inv_point event** corresponds to 8 consecutive inv_point events.	ETS 300 417-1-1 [1] annex B	m	
13	The **3*any_point** corresponds to the following combination of events: 3*NOT NDF_enable AND NOT 3*AIS_ind AND NOT 3*new_point	ETS 300 417-1-1 [1] annex B	m	
14	The **3*new_point** corresponds to three consecutive equal new_point events.	ETS 300 417-1-1 [1] annex B	m	

Table G.39: Operation in NORM state

Prerequisite: G.1/5 OR G.1/13 -- MS16/S4_A_Sk and/or MS16/S4-4c_A_Sk present

Item	Operation in NORM state	Reference	Status	Support
1	Reception: inc_ind Transition to state: INC Action: increment active offset	ETS 300 417-1-1 [1] annex B	m	
2	Reception: dec_ind Transition to state: DEC Action: decrement active offset	ETS 300 417-1-1 [1] annex B	m	
3	Reception: NDF_enable Transition to state: NDF Action: accept new offset	ETS 300 417-1-1 [1] annex B	m	
4	Reception: 3*new_point Transition to state: NORM Action: accept new offset	ETS 300 417-1-1 [1] annex B	m	
5	Reception: 8*inv_point Transition to state: LOP Action: offset undefined	ETS 300 417-1-1 [1] annex B	m	
6	Reception: 3*AIS_ind Transition to state: AIS Action: offset undefined	ETS 300 417-1-1 [1] annex B	m	

Table G.40: Operation in INC state

Prerequisite: G.1/5 OR G.1/13 -- MS16/S4_A_Sk and/or MS16/S4-4c_A_Sk present

Item	Operation in INC state	Reference	Status	Support
1	Reception: 3*new_point Transition to state: NORM Action: accept new offset	ETS 300 417-1-1 [1] annex B	m	
2	Reception: 3*AIS_ind Transition to state: AIS Action: offset undefined	ETS 300 417-1-1 [1] annex B	m	
3	Reception: 3*any_point Transition to state: NORM Action: none	ETS 300 417-1-1 [1] annex B	m	
4	Reception: NDF_enable Transition to state: NDF Action: accept new offset	ETS 300 417-1-1 [1] annex B	m	

Table G.41: Operation in DEC state

Prerequisite: G.1/5 OR G.1/13 -- MS16/S4_A_Sk and/or MS16/S4-4c_A_Sk present

Item	Operation in DEC state	Reference	Status	Support
1	Reception: 3*new_point Transition to state: NORM Action: accept new offset	ETS 300 417-1-1 [1] annex B	m	
2	Reception: 3*AIS_ind Transition to state: AIS Action: offset undefined	ETS 300 417-1-1 [1] annex B	m	
3	Reception: 3*any_point Transition to state: NORM Action: none	ETS 300 417-1-1 [1] annex B	m	
4	Reception: NDF_enable Transition to state: NDF Action: accept new offset	ETS 300 417-1-1 [1] annex B	m	

Table G.42: Operation in NDF state

Prerequisite: G.1/5 OR G.1/13 -- MS16/S4_A_Sk and/or MS16/S4-4c_A_Sk present

Item	Operation in NDF state	Reference	Status	Support
1	Reception: 3*new_point Transition to state: NORM Action: accept new offset	ETS 300 417-1-1 [1] annex B	m	
2	Reception: 3*AIS_ind Transition to state: AIS Action: offset undefined	ETS 300 417-1-1 [1] annex B	m	
3	Reception: 3*any_point Transition to state: NORM Action: none	ETS 300 417-1-1 [1] annex B	m	
4	Reception: NDF_enable Transition to state: NDF Action: accept new offset	ETS 300 417-1-1 [1] annex B	m	
5	Reception: 8*NDF_enable Transition to state: LOP Action: offset undefined	ETS 300 417-1-1 [1] annex B	m	

Table G.43: Operation in LOP state

Prerequisite: G.1/5 OR G.1/13 -- MS16/S4_A_Sk and/or MS16/S4-4c_A_Sk present

Item	Operation in LOP state	Reference	Status	Support
1	Reception: 3*new_point Transition to state: NORM Action: accept new offset	ETS 300 417-1-1 [1] annex B	m	
2	Reception: 3*AIS_ind Transition to state: AIS Action: offset undefined	ETS 300 417-1-1 [1] annex B	m	

Table G.44: Operation in AIS state

Prerequisite: G.1/5 OR G.1/13 -- MS16/S4_A_Sk and/or MS16/S4-4c_A_Sk present

Item	Operation in AIS state	Reference	Status	Support
1	Reception: 3*new_point Transition to state: NORM Action: accept new offset	ETS 300 417-1-1 [1] annex B	m	
2	Reception: 3*AIS_ind Transition to state: AIS Action: offset undefined	ETS 300 417-1-1 [1] annex B	m	
3	Reception: 8*inv_point Transition to state: LOP Action: offset undefined	ETS 300 417-1-1 [1] annex B	m	
4	Reception: NDF_enable Transition to state: NDF Action: accept new offset	ETS 300 417-1-1 [1] annex B	m	

Table G.45: Pointer interpretation: complements

Prerequisite: G.1/5 OR G.1/13 -- MS16/S4_A_Sk and/or MS16/S4-4c_A_Sk present

Item	Pointer interpretation: complements	Reference	Status	Support
1	Non-consecutive invalid indications do not activate the transition to the LOP_state.	ETS 300 417-1-1 [1] annex B	m	
2	The pointer processor maintains its current phase on detection of an invalid pointer and searches in parallel for a new phase.	9.3.2, 9.3.4	m	
3	The reception of 3*new_point takes precedence over any other events.	ETS 300 417-1-1 [1] annex B	m	
4	The second and third offset value received in 3*new_point needs to be identical with the first.	ETS 300 417-1-1 [1] annex B	m	
5	The "consecutive new_point" counter is reset to zero on a change of state, except for transitions occurring among INC, DEC, NDF states and the NORM state.	ETS 300 417-1-1 [1] annex B	m	
6	The "consecutive inv_point counter" can be incremented in all states. The "consecutive inv_point" counter is not reset on a change of state.	ETS 300 417-1-1 [1] annex B	m	
7	The "consecutive AIS_ind" counter is not reset on a change of state.	ETS 300 417-1-1 [1] annex B	m	
8	The "consecutive NDF_enable" counter is reset to zero on a change of AIS to NDF state; otherwise the counter is not reset.	ETS 300 417-1-1 [1] annex B	m	

G.4.2.3.3 MS16 layer to S4 layer multiplexing and demultiplexing processes

Table G.46: Multiplexing

Prerequisite: G.1/4 -- MS16/S4_A_So present

Item	Multiplexing	Reference	Status	Support
1	Bytes allocated to the AU-4 pointer are multiplexed into MS16_AI at the AU tributary location indicated by MI_AUnum.	9.3.1	m	
2	The VC-4 is multiplexed into MS16_AI according to the pointer generation algorithm	9.3.1	m	

Table G.47: Demultiplexing

Prerequisite: G.1/5 -- MS16/S4_A_Sk present

Item	Demultiplexing	Reference	Status	Support
1	The AU-4 pointer is recovered from MS16_AI from the AU pointer location of the STM-16 stream indicated by MI_AUnum.	9.3.2	m	
2	The VC-4 is recovered from MS16_AI according to the pointer interpretation algorithm.	9.3.2	m	

G.4.2.4 MS16 layer to S4-4c layer adaptation functions: MS16/S4-4c_A_So and MS16/S4-4c_A_Sk

Table G.48: Adaptation process

Prerequisite: G.1/12 OR G.1/13 -- MS16/S4-4c_A_So and/or MS16/S4-4c_A_Sk present

Item	Adaptation process	Reference	Status	Support
1	The MS16/S4-4c_A_So function provides frequency justification and bitrate adaptation for a VC-4-4c signal, represented by a nominally $(1044 \times 9 \times 64) = 601\ 344$ kbit/s information stream and the related frame phase with a frequency accuracy within ±4,6 ppm.	9.3.3	c4801	
2	The MS16/S4-4c_A_So-N has access to a specific AU-4-4c of the MS16 access point. The AU-4-4c is defined by the parameter N with N=1, 5, 9 or 13.	9.3.3	c4801	
3	The MS16/S4-4c_A_Sk recovers the VC-4-4c data with frame phase information.	9.3.4	c4802	
4	The MS16S4-4c_A_Sk-N has access to a specific AU-4 of the MS16 access point. The AU-4 is defined by the parameter N with N=1, 5, 9 or 13.	9.3.4	c4802	

c4801: IF G.1/12 THEN m ELSE n/a -- MS16/S4-4c_A_So present
c4802: IF G.1/13 THEN m ELSE n/a -- MS16/S4-4c_A_Sk present

G.4.2.4.1 MS16 layer to S4-4c layer frequency justification and bitrate adaptation processes

Table G.49: Frequency justification and bitrate adaptation: principles

Prerequisite: G.1/12 -- MS16/S4-4c_A_So present

Item	Frequency justification and bitrate adaptation: principles	Reference	Status	Support
1	Frequency justification is performed by pointer adjustments.	9.3.3	m	

Table G.50: Frequency justification and bitrate adaptation: source direction

Prerequisite: G.1/12 -- MS16/S4-4c_A_So present

Item	Frequency justification and bitrate adaptation: source direction	Reference	Status	Support
1	The MS16/S4-4c_A_So function provides for an elastic store (buffer) process. The data and frame start signals are written into the store under control of the associated input clock. The data and frame start signals are read out of the store under control of the STM-16 clock, frame position and justification decision.	9.3.3	m	
2	Each justification decision results in a corresponding negative/positive justification action. Upon a positive justification action, the reading of 96 data bits are cancelled once and no data written at the twelve positions H3+1. Upon a negative justification action, an extra 96 data bits are read out once into the twelve positions H3.	9.3.3	m	
3	Consecutive pointer operations shall be separated by at least three frames (i.e. every fourth frame) in which the pointer value remains constant	9.3.3	m	

G.4.2.4.2 MS16 layer to S4-4c layer alignment process

Table G.51: Alignment process principles

Prerequisite: G.1/12 OR G.1/13 -- MS16/S4-4c_A_So and/or MS16/S4-4c_A_Sk present

Item	Alignment process principles	Reference	Status	Support
1	The alignment process is carried out by the processing of the AU-4-4c pointer which is aligned in the STM-16 payload in fixed position relative to the STM-16 frame.	G.707 [14] subclause 8.1	m	
2	The location of the first byte of the VC-4-4c with respect to the STM-16 is given by the related AU-4-4c pointer value.	G.707 [14] subclause 8.1.2	m	

Comments: The pointer value gives a measure of the phase offset between the VC-4-4c stream and the STM-16 frame.

Table G.52: AU-4-4c pointer and alignment byte location

Prerequisite: G.1/12 OR G.1/13 -- MS16/S4-4c_A_So and/or MS16/S4-4c_A_Sk present

Item	AU-4-4c pointer and alignment byte location	Reference	Status	Support
1	The 144 bytes at the beginning of row 4 in the STM-16 frame are allocated to the alignment process.	9.3.3, G.707 [14] subclauses 8.1 to 8.1.1	m	
2	The AU-4-4c pointer (associated to MS16/S4-4c_A_So-N and/or MS16/S4-4c_A_Sk-N) is located into bytes from (4,N) to (4,N+3) and from (4,N+48) to (4,N+51) of the STM-16 frame.	9.3.3, G.707 [14] subclauses 8.1 to 8.1.1	m	

Comments: The value of N can be 1, 5, 9 or 13.

Table G.53: AU-4-4c Pointer and alignment byte structure

Prerequisite: G.1/12 OR G.1/13-- MS16/S4-4c_A_So and/or MS16/S4-4c_A_Sk present

Item	AU-4-4c Pointer and alignment byte structure	Reference	Status	Support
1	Referring to the AU-4-4c pointer associated to MS16/S4-4c_A_So-N and/or MS16/S4-4c_A_Sk-N, the content of H1 (4,N) and H2 (4,N+48) bytes is viewed as one pointer word.	G.707 [14] subclause 8.1.2 and 8.1.7.1	m	
2	Bits 1 through 4 of the pointer word carry the New Data Flag (NDF).	G.707 [14] subclause 8.1.2 and 8.1.7.1	m	
3	Bits 5 and 6 of the pointer word, named ss bits, carry the AU-n type code. They are set to '10'.	9.3.3, G.707 [14] subclause 8.1.2 and 8.1.7.1	m	
4	Bits 7 through 16 (last ten bits) of the pointer word carry the pointer value.	G.707 [14] subclause 8.1.2 and 8.1.7.1	m	
5	The AU-4-4c pointer value is a binary number with a range of 0 to 782.	G.707 [14] subclause 8.1.2 and 8.1.7.1	m	
6	The pointer locations H1 (4,N+1) to (4,N+3) and H2 (4,N+49) to (4,N+51) carry the concatenation indicator, defined as 1001ss11 11111111, with ss being undefined bits.	9.3.3, G.707 [14] subclause 8.1.2 and 8.1.7.1	m	
7	Bytes from (4,17) to (4,48) contain the fixed stuff code Y = 1001 ss11. Bits ss are undefined.	9.3.3, G.707 [14] subclause 8.1.2 and 8.1.7.1	m	
8	Bytes from (4,65) to (4,96) contain the fixed stuff code '1' = 1111 1111.	9.3.3, G.707 [14] subclause 8.1.2 and 8.1.7.1	m	
9	Bytes H3 from (4,96+N) to (4,99+N), (4,112+N) to (4,115+N), (4,128+N) to (4,131+N) are the negative justification opportunity bytes.	G.707 [14] subclause 8.1.2 and 8.1.7.1	m	
10	Bits 7,9,11,13,15 of the pointer word (I bits) are the pointer incrementation indication bits.	G.707 [14] subclause 8.1.2 and 8.1.7.1	m	
11	Bits 8,10,12,14,16 of the pointer word (D bits) are the pointer decrementation indication bits.	G.707 [14] subclause 8.1.2 and 8.1.7.1	m	

Comments: The value of N can be 1, 5, 9 or 13.

G.4.2.4.2.1 Concatenation indicator recovery process

Table G.54: Concatenation indicator recovery process: principles

Prerequisite: G.1/13 -- MS16/S4-4c_A_Sk present

Item	Concatenation indicator recovery process: principles	Reference	Status	Support
1	The Concatenation Indicator recovery algorithm can be globally described by a state diagram as shown in ETS 300 417-1-1 [1] figure B.2. Three states are defined: - CONCatenated_state (CONC) - AIS_state (AISC) - LOP_state (LOPC)	ETS 300 417-1-1 [1] annex B	m	

Table G.55: Concatenation indicator recovery process events

Prerequisite: G.1/13 -- MS16/S4-4c_A_Sk present

Item	Concatenation indicator recovery events	Reference	Status	Support
1	The **conc_ind event** corresponds to a received word (in bytes [4,N+1] and [4,N+49], [4,N+2] and [4,N+50], [4,N+3] and [4,N+51]) with: NDF enabled AND dd 11 11111111. Bits indicated as 'dd' are undefined.	ETS 300 417-1-1 [1] annex B	m	
2	The **AIS_ind event** corresponds to a received word (in bytes [4,N+1] and [4,N+49], [4,N+2] and [4,N+50], [4,N+3] and [4,N+51]) with: 11111111 11111111.	ETS 300 417-1-1 [1] annex B	m	
3	The **inv_point event** corresponds to a received word (in bytes [4,N+1] and [4,N+49], [4,N+2] and [4,N+50], [4,N+3] and [4,N+51]) with: NOT conc_ind AND NOT AIS_ind.	ETS 300 417-1-1 [1] annex B	m	
4	The **3*AIS_ind** corresponds to three consecutive AIS_ind events.	ETS 300 417-1-1 [1] annex B	m	
5	The **8* inv_point** corresponds to eight consecutive inv_point events.	ETS 300 417-1-1 [1] annex B	m	
6	The **3*conc_ind** corresponds to three consecutive conc_ind events.	ETS 300 417-1-1 [1] annex B	m	

Comments: The value of N can be 1, 5, 9 or 13.

Table G.56: Operation in CONC state

Prerequisite: G.1/13 -- MS16/S4-4c_A_Sk present

Item	Operation in CONC state	Reference	Status	Support
1	Reception: 3*AIS_ind Transition to state: AISC.	ETS 300 417-1-1 [1] annex B	m	
2	Reception: 8*inv_ipoint Transition to state: LOPC.	ETS 300 417-1-1 [1] annex B	m	

Table G.57: Operation in LOPC state

Prerequisite: G.1/13 -- MS16/S4-4c_A_Sk present

Item	Operation in LOPC state	Reference	Status	Support
1	Reception: 3*conc_ind Transition to state: CONC.	ETS 300 417-1-1 [1] annex B	m	
2	Reception: 3*AIS_ind Transition to state: AISC.	ETS 300 417-1-1 [1] annex B	m	

Table G.58: Operation in AISC state

Prerequisite: G.1/13 -- MS16/S4-4c_A_Sk present

Item	Operation in AISC state	Reference	Status	Support
1	Reception: 3*conc_ind Transition to state: CONC.	ETS 300 417-1-1 [1] annex B	m	
2	Reception: 8*inv_point Transition to state: LOPC.	ETS 300 417-1-1 [1] annex B	m	

Table G.59: Pointer interpretation: complements

Prerequisite: G.1/13 -- MS16/S4-4c_A_Sk present

Item	Pointer interpretation: complements	Reference	Status	Support
1	Operation condition **AISX**: AIS#1 AND AISC#2 AND ... AND AISC#4.	ETS 300 417-1-1 [1] annex B	m	
2	Operation condition **NORMX**: NORM#1 AND CONC#2 AND ... AND CONC#4.	ETS 300 417-1-1 [1] annex B	m	
3	Operation condition **NDFX**: NDF#1 AND CONC#2 AND ... AND CONC#4.	ETS 300 417-1-1 [1] annex B	m	
4	Operation condition **INCX**: INC#1 AND CONC#2 AND ... AND CONC#4.	ETS 300 417-1-1 [1] annex B	m	
5	Operation condition **DECX**: DEC#1 AND CONC#2 AND ... AND CONC#4.	ETS 300 417-1-1 [1] annex B	m	
6	Operation condition **LOPX**: NOT AISX AND NOT NORMX AND NOT INCX AND NOT DECX AND NOT NDFX	ETS 300 417-1-1 [1] annex B	m	

NOTE: Some ambiguities about this functionality seem to appear in the base specification.

G.4.2.4.3 MS16 layer to S4-4c layer multiplexing and demultiplexing processes

Table G.60: Multiplexing

Prerequisite: G.1/12 -- MS16/S4-4c_A_So present

Item	Multiplexing	Reference	Status	Support
1	Bytes allocated to the AU-4-4c pointer are multiplexed into MS16_AI.	9.3.3	m	
2	The VC-4-4c is multiplexed into MS16_AI according to the pointer generation algorithm	9.3.3	m	

Table G.61: Demultiplexing

Prerequisite: G.1/13 -- MS16/S4-4c_A_Sk present

Item	Demultiplexing	Reference	Status	Support
1	The AU-4-4c pointer is recovered from MS16_AI.	9.3.4	m	
2	The VC-4-4c is recovered from MS16_AI according to the pointer interpretation algorithm.	9.3.4	m	

G.4.2.5 MS16 layer to DCC layer adaptation functions: MS16/DCC_A_So and MS16/DCC_A_Sk

G.4.2.5.1 MS16 layer to DCC layer multiplexing and demultiplexing processes

Table G.62: Multiplexing

Prerequisite: G.1/8 -- MS16/DCC_A_So present

Item	Multiplexing	Reference	Status	Support
1	The DCC_CI data (576 kbit/s) are multiplexed into D4(6,1), D5(6,49), D6(6,97), D7(7,1), D8(7,49), D9(7,97), D10(8,1), D11(8,49), D12(8,97) bytes of the STM-16 frame.	9.3.5	m	

Table G.63: Demultiplexing

Prerequisite: G.1/9 -- MS16/DCC_A_Sk present

Item	Demultiplexing	Reference	Status	Support
1	The DCC_CI data (576 kbit/s) are demultiplexed from byte locations D4 to D12.	9.3.6	m	

G.4.2.6 STM-16 Multiplex section layer to P0s layer adaptation functions: MS16/P0s_A_So and MS16/P0s_A_Sk

G.4.2.6.1 MS16 layer to P0s layer frequency justification and bitrate adaptation processes

Table G.64: Frequency justification and bitrate adaptation: principles

Prerequisite: G.1/10 -- MS16/P0s_A_So present

Item	Frequency justification and bitrate adaptation: principles	Reference	Status	Support
1	The MS16/ P0s _A_So function provides frequency justification and bitrate adaptation for a 64 kbit/s orderwire information stream. It takes P0s_CI as an unstructured bit-stream with a rate of 64 kbit/s ± 100 ppm and inserts it into the MSOH.	9.3.7	m	

Table G.65: Frequency justification and bitrate adaptation

Prerequisite: G.1/10 -- MS16/P0s_A_So present

Item	Frequency justification and bitrate adaptation	Reference	Status	Support
1	The MS16/P0s_A_So function provides for an elastic store (slip buffer) process. The data and frame start signals are written into the store under control of the associated input clock. The data and frame start signals are read out of the store under control of the STM-16 clock, frame position and justification decision.	9.3.7	m	
2	Each justification decision results in a corresponding negative/positive justification action. Upon a positive justification (slip) action, the reading of one 64 kbit/s octet (9 bits) is cancelled once. Upon a negative justification (slip) action, the same 64 kbit/s octet (9 bits) is read out a second time.	9.3.7	m	
3	The elastic store (slip buffer) size accommodates at least 18 µs of wander without introducing errors.is at least 2 octets.	9.3.7	m	

G.4.2.6.2 MS16 layer to P0s layer multiplexing and demultiplexing processes

Table G.66: Multiplexing

Prerequisite: G.1/10 -- MS16/P0s_A_So present

Item	Multiplexing	Reference	Status	Support
1	The P0s_CI data (64 kbit/s) are multiplexed into E2(9,97) byte of the STM-16 frame.	9.3.7	m	

Table G.67: Demultiplexing

Prerequisite: G.1/11 -- MS16/P0s_A_Sk present

Item	Demultiplexing	Reference	Status	Support
1	The P0s_ CI data (64 kbit/s) are demultiplexed from byte location E2.	9.3.8	m	

G.4.3 MS16 linear trail protection transmission tables

Table G.68: Protection operation

Prerequisite: G.1/14 OR G.1/15 -- STM-16 Linear Trail Protection supported

Item	Protection operation	Reference	Status	Support
1	The APS channel is a 13 bits channel carried into bits K1[1-8] and K2[1-5].	9.5.1.1, 9.5.1.2, A.1	c6801	
2	The signal switching procedure is started under Signal Fail (SF) or Signal Degrade (SD) conditions.	9.5.1.1, 9.5.1.2, A.1	m	
3	In revertive operation the available external commands are LO, FSw-#1, MSw-#1, CLR, EXER-#1.	9.5.1.1, 9.5.1.2, A.1	c6802	
4	In non-revertive operation the available external commands are LO or FSw, FSw-#i, MSw, MSw-#i, CLR, EXER-#i.	9.5.1.1, 9.5.1.2, A.1	c6803	
5	In revertive operation the available external commands are LO, FSw-#i, MSw-#i, CLR, EXER-#i.	9.5.1.1, 9.5.1.2, A.1	c6804	
6	Extra Traffic is supported	9.5.1.2, A.1	c6805	
7	The Wait-To-Restore (WTR) time is provisionable	9.5.1.1, 9.5.1.2	c6806	

c6801: IF (G.4/3 OR G.4/4 OR G.4/5)
THEN m ELSE o -- bi-directional switching supported
c6802: IF (G.4/1 OR G.4/3) THEN m ELSE n/a -- 1+1 revertive operation supported
c6803: IF (G.4/2 OR G.4/4) THEN m ELSE n/a -- 1+1 non-revertive operation supported
c6804: IF G.1/15 THEN m ELSE n/a -- 1:n protection architecture supported
c6805: IF G.1/15 THEN o ELSE n/a -- 1:n protection architecture supported
c6806: IF (G.4/1 OR G.4/3 OR G.4/5)
THEN m ELSE n/a -- revertive operation supported

Comments: The Linear Protection Switching Operation is generically described in annex A of ETS 300 417-3-1 [2].

Table G.69: Protection architecture characteristic parameters

Prerequisite: G.1/14 OR G.1/15 -- STM-16 Linear Trail Protection supported

Item	Protection architecture characteristic parameters	Reference	Status	Support	Values	
					Allowed	Supported
1	Working trails: n value.	9.5.1.2, A.1	c6901		$1 \leq n \leq 14$	
2	Wait-To-Restore (WTR) time: X value	9.5.1.1, 9.5.1.2, A.1	c6902		$0 \leq X \leq 12$ minutes	
3	Switching time: Y value	9.5.1.1, 9.5.1.2, A.1	m		$0 \leq Y \leq$ 50 ms	

c6901: IF G.1/15 THEN m ELSE n/a -- 1:n protection architecture supported
c6902: IF (G.4/1 OR G.4/3 OR G.4/5)
THEN m ELSE n/a -- revertive operation supported

Table G.70: APS channel bits structure

Prerequisite: G./1 -- APS channel supported

Item	APS channel bits structure	Reference	Status	Support
1	The request type is transported in K1[1-4] bits of the APS channel.	A.7.2, figure A.3	m	
2	The request signal number is transported in K1[4-8] bits of the APS channel.	A.7.2, figure A.3	m	
3	The local bridged signal number is transported in K2[1-4] bits of the APS channel.	A.7.2, figure A.3	m	
4	The architecture type is transported in K1[5] bit of the APS channel.	A.7.2, figure A.3	m	

Table G.71: APS signal fields

Prerequisite: G./1 -- APS channel supported

Item	APS signal fields	Reference	Status	Support
1	The content of the request type field conforms to table A.3 (subclause A.7.1) of annex A in ETS 300 417-3-1 [2].	A.7.1, table A.3	m	
2	The content of the request signal number field conforms to table A.4 (subclause A.7.1) of annex A in ETS 300 417-3-1 [2].	A.7.1, table A.4	m	
3	The content of local bridged signal number field conforms to table A.5 (subclause A.7.1) of annex A in ETS 300 417-3-1 [2].	A.7.1, table A.5	m	
4	The content of the architecture type field conforms to table A.6 (subclause A.7.1) of annex A in ETS 300 417-3-1 [2].	A.7.1, table A.6	m	

G.4.3.1 MS16 linear trail protection connection functions: MS16P1+1_C and MS16P1:n_C

Table G.72: Connectivity functionalities: generalities

Prerequisite: G.5/1-- MS Protection Connection function present

Item	Connectivity functionalities: generalities	Reference	Status	Support
1	The MS16P1+1_C connection function performs the STM-16 linear multiplex section protection process for 1+1 protection architectures.	9.5.1.1	c7201	
2	The MS16P1+1_C connection function performs the bridge and selector functionality.	9.5.1.1	c7201	
3	The MS16P1:n_C connection function performs the STM-16 linear multiplex section protection process for 1:n protection architectures.	9.5.1.2	c7202	
4	The MS16P1:n_C connection function performs the bridge and selector functionality.	9.5.1.2	c7202	
5	Provided no protection switching action is activated/required it is possible to change between switching types without disturbing the CI passing the connection.	9.5.1.1, 9.5.1.2	c7203	
6	Provided no protection switching action is activated/required it is possible to change between operation types without disturbing the CI passing the connection.	9.5.1.1, 9.5.1.2	c7204	
7	Provided no protection switching action is activated/required it is possible to change the WTR time without disturbing the CI passing the connection.	9.5.1.1, 9.5.1.2	c7205	
8	The priority associated to SD for both protection and working sections is fixed high.	9.5.1.1	c7201	
9	The priority associated to SF for both protection and working sections is fixed high.	9.5.1.1	c7201	
10	The switching type (uni- or bi-directional) is provisionable from the EMF	9.5.1.1	c7201	
11	The priority associated to SD (high or low) for each working section is provisionable from the EMF. The priority associated to SD for the protection section is fixed high.	9.5.1.2	c7202	
12	The priority associated to SF (high or low) for each working section is provisionable from the EMF. The priority associated to SF for the protection section is fixed high.	9.5.1.2	c7202	
13	The switching type (uni- or bi-directional) is provisionable from the EMF	9.5.1.2	c7203	
14	The operation type (revertive or non revertive) is provisionable from the EMF	9.5.1.1	c7204	
15	The use of extra traffic (true or false) is provisionable from the EMF	9.5.1.2	c7206	

Comment: item G.72/7 is relevant for all the implemented protection schemes.
c7201: IF G.1/14
THEN m ELSE n/a -- 1+1 protection architecture supported
c7202: IF G.1/15 THEN m ELSE n/a -- 1:n protection architecture supported
c7203: IF (G.4/1 OR G.4/2) AND (G.4/3 OR G.4/4)
THEN m ELSE n/a -- both unidirectional and bi-directional switching supported
c7204: IF (G.4/1 OR G.4/3) AND (G.4/2 OR G.4/4)
THEN m ELSE n/a -- both revertive and non- revertive operation supported
c7205: IF G.68/7 THEN m ELSE n/a -- WTR time programmable
c7206: IF G.68/6 THEN m ELSE n/a -- 1:n architecture with extra traffic supported

Table G.73: Connectivity functionalities: source direction

Prerequisite: G.5/1-- MS Protection Connection function present

Item	Connectivity functionalities: source direction	Reference	Status	Support
1	The working outputs are connected to the associated normal inputs for 1+1 protection.	9.5.1.1	c7301	
2	The protection output is connected to the normal #1 input.	9.5.1.1	c7301	
3	The working outputs are connected to the associated normal inputs for 1:n protection.	9.5.1.2	c7302	
4	The protection output is unsourced (no input connected), connected to the extra traffic input, or connected to any normal input.	9.5.1.2	c7302	

c7301: IF G.1/14 THEN m ELSE n/a -- 1+1 protection architecture supported
c7302: IF G.1/15 THEN m ELSE n/a -- 1:n protection architecture supported

Table G.74: Connectivity functionalities: sink direction

Prerequisite: G.5/1-- MS Protection Connection function present

Item	Connectivity functionalities: sink direction	Reference	Status	Support
1	The signal output at the normal #1 reference point can be the signal received via either the associated working #1 section or the protection section for 1+1 protection.	9.5.1.1	c7401	
2	The signal output at the normal #i reference point can be the signal received via either the associated working #i section or the protection section for 1:n protection.	9.5.1.2	c7402	

c7401: IF G.1/14 THEN m ELSE n/a -- 1+1 protection architecture supported
c7402: IF G.1/15 THEN m ELSE n/a -- 1:n protection architecture supported

G.4.3.2 MS16 linear protection trail termination functions: MS16P_TT_So and MS16P_TT_Sk

Table G.75: Trail termination process

Prerequisite: G.5/2 OR G. 5/3 -- MS16P_TT_So and/or MS16P_TT_Sk function present

Item	Trail termination process	Reference	Status	Support
1	The MS16_AI at the output of the MS16P_TT_So is identical to the MS16P_CI at its input.	9.5.2.1	c7501	
2	The MS16P_TT_Sk function reports the state of the protected MS16 trail.	9.5.2.2	c7502	
3	In case all connections are unavailable the MS16P_TT_Sk reports the signal fail condition of the protected trail.	9.5.2.2	c7502	

c7501: IF G. 5/2 THEN m ELSE n/a -- MS16P_TT_So function supported
c7502: IF G. 5/3 THEN m ELSE n/a -- MS16P_TT_Sk function supported

G.4.3.3 MS16 linear trail protection adaptation functions: MS16/MS16P_A_So and MS16/MS16P_A_Sk

G.4.3.3.1 MS16 layer to MS16 protection layer multiplexing and demultiplexing processes

Table G.76: Multiplexing

Prerequisite: G.5/4 -- MS16/MS16P_A_So present

Item	Multiplexing	Reference	Status	Support
1	The MS16/MS16P_A_So multiplexes the MS16 APS signal and MS16 data signal into the MS16_AI of the Protection Section.	9.5.3.1	m	

Table G.77: Demultiplexing

Prerequisite: G.5/5 -- MS16/MS16P_A_Sk present

Item	Demultiplexing	Reference	Status	Support
1	The MS16/MS16P_A_Sk extracts the MS16P_CI_D signal from the MS16_AI_D signal.	9.5.3.2	m	
2	The MS16/MS16P_A_Sk extracts the MS16 APS signal from the MS16_AI.	9.5.3.2	m	

Table G.78: APS channel processing: sink direction

Prerequisite: G.4/3 OR G.4/4 OR G.4/5 -- -- bi-directional switching supported

Item	APS channel processing: sink direction	Reference	Status	Support
1	A new value for the APS message is accepted when the value of the 13 APS bits is identical for three consecutive frames. This value is output via MS16P_CI_APS.	9.5.3.2	m	
2	The APS signal processing is performed only on the Protection Section.	9.5.3.2	m	

G.4.3.4 MS16 linear trail protection processes

G.4.3.4.1 Automatic Protection Switching (APS) externally initiated commands

Table G.79: Issuing of external switching commands

Prerequisite: G.1/14 OR G.1/15 -- STM-16 Linear Trail Protection supported

Item	Issuing of External Switching Commands	Reference	Status	Support
1	The external commands are received from the EMF.	ETS 300 746 [15] subclause 5.1.2.1	m	

Table G.80: Transmission of External Switching Requests

Prerequisite: G.79/1 -- External Switching Command issuing is supported

Item	Transmission of External Switching Requests	Reference	Status	Support
1	The external requests are issued via the APS bytes.	ETS 300 746 [15] subclause 5.1.2.1	c8001	
2	The external requests are issued via the EMF.	ETS 300 746 [15] subclause 5.1.2.1	c8001	

c8001: IF (G.4/3 OR G.4/4 OR G.4/5)
THEN o.8001 ELSE o -- bi-directional switching supported
o.8001: It is mandatory to support exactly one of these items -- Transmission of external bridge request is supported by one of the allowed ways.

Table G.81: External switching commands

Prerequisite: G.79/1 -- External Switching Command issuing is supported

Item	External switching commands	Reference	Status	Support
1	The external command Clear (CLR) conforms to the definition given in the whole point 1) clause A.2 of annex A in ETS 300 417-3-1 [2].	A.2	m	
2	The external command Lockout of Protection (LO) conforms to the definition given in the whole point 2) clause A.2 of annex A in ETS 300 417-3-1 [2].	A.2	m	
3	The external command Forced Switch #i (FSw-#i) conforms to the definition given in the whole point 3) of clause A.2 of annex A in ETS 300 417-3-1 [2].	A.2	m	
4	The external command Manual Switch #i (MSw-#i) conforms to the definition given in the whole point 4) clause A.2 of annex A in ETS 300 417-3-1 [2].	A.2	m	
5	The external command Exercise #i (EXER #i) conforms to the definition given in the whole point 5) clause A.2 of annex A in ETS 300 417-3-1 [2].	A.2	m	
6	The descending order of priority for external switching commands is: CLR, LO, FSw-#i, MSw-#i, EXER #i.	A.2	m	

G.4.3.4.2 Automatic Protection Switching (APS) automatically initiated commands

Table G.82: Automatic generation of requests

Prerequisite: G.1/14 OR G.1/15 -- STM-16 Linear Trail Protection supported

Item	Automatic Generation of Requests	Reference	Status	Support
1	The NE initiates the following automatic requests: Signal Failure (SF), Signal Degrade (SD).	ETS 300 746 [15] subclause 5.1.2.2	m	
2	The NE initiates the following automatic requests: Reverse Request (RR).	ETS 300 746 [15] subclause 5.1.2.2	c8201	
3	The NE initiates the following automatic requests: Wait To Restore (WTR).	ETS 300 746 [15] subclause 5.1.2.2	c8202	

c8201: IF (G.4/3 OR G.4/4 OR G.4/5) THEN m ELSE x -- dual-ended switching supported
c8202: IF (G.4/1 OR G.4/3 OR G.4/5) THEN m ELSE x -- revertive switching supported

Table G.83: Transmission of automatically generated requests

Prerequisite: G.1/14 OR G.1/15 -- STM-16 Linear Trail Protection supported

Item	Transmission of automatically generated requests	Reference	Status	Support
1	The automatically generated requests are issued via the APS bytes.	ETS 300 746 [15] subclause 5.1.2.2	c8301	

c8301: IF (G.4/3 OR G.4/4 OR G.4/5)
THEN m ELSE o -- bi-directional switching supported

Table G.84: Automatically generated requests

Prerequisite: G.1/14 OR G.1/15 -- STM-16 Linear Trail Protection supported

Item	Automatically generated requests	Reference	Status	Support
1	In the Wait-To-Restore (WTR) state the operation is such that in the revertive mode of operation, the normal signal will be restored when the working trail has recovered from the fault.	A.4	c8401	
2	An SF or SD condition will override the WTR.	A.4	c8401	
3	After the WTR period is completed, a No Request state will be entered.	A.4	c8401	
4	In the Reverse Request state the operation is such that for the case of bi-directional switching, a reverse request is returned for exerciser and for all other requests of higher priority.	A.4	c8402	
5	In unidirectional switching, Reverse Request is never indicated.	A.4	c8403	
6	In the Do not Revert state the operation is such that in the non-revertive mode of operation, assuming the normal signal is on protection when the working trail is repaired or a switch command is released, the tail end maintains the selection and issues Do not Revert for normal signal 1.	A.4	c8404	
7	For the case of bi-directional switching, the head end also maintains the selection and continues indicating reverse request.	A.4	c8405	
8	The Do not Revert is removed when pre-empted by a defect condition or an external request.	A.4	c8404	
9	In the No Request state none of the trail signal conditions is active, none of the external commands is active, and none of the states described above is active.	A.4	m	

c8401: IF (G.4/1 OR G.4/3 OR G.4/5) THEN m ELSE n/a -- revertive operation supported
c8402: IF (G.4/3 OR G.4/4 OR G.4/5) THEN m ELSE n/a -- bi-directional operation supported
c8403: IF (G.4/1 OR G.4/2) THEN m ELSE n/a -- unidirectional operation supported
c8404: IF (G.4/2 OR G.4/4) THEN m ELSE n/a -- non-revertive operation supported
c8405: IF G.4/4 THEN m ELSE n/a -- non-revertive and bi-directional operation supported

G.4.3.4.3 Automatic Protection Switching (APS) generalities

Table G.85: Allocation of extra traffic

Item	Allocation of extra traffic	Reference	Status	Support
1	Extra traffic is allocated to the protection trail when this one is not transporting a normal signal and the protection trail is not "locked out".	A.5	c8501	

c8501: IF G./6 THEN m ELSE n/a -- Extra traffic supported

Table G.86: Priority of request types

Prerequisite: G.1/14 OR G.1/15 -- STM-16 Linear Trail Protection supported

Item	Priority of request types	Reference	Status	Support
1	The priority of request types conforms to the priority order given in table A.2 (clause A.6) of annex A in ETS 300 417-3-1 [2].	A.6, table A.2	m	

G.4.3.4.4 Automatic Protection Switching (APS) switch performance

Table G.87: Switch completion time

Prerequisite: G.1/14 OR G.1/15 -- STM-16 Linear Trail Protection supported

Item	Switch completion time	Reference	Status	Support
1	The switch completion time is less than 50 ms .	A.8	m	

G.4.3.4.5 Automatic Protection Switching (APS) subprocesses

Table G.88: Signal request process

Prerequisite: G.1/14 OR G.1/15 -- STM-16 Linear Trail Protection supported

Item	Signal request processes	Reference	Status	Support
1	The SRSN is "0" (zero) for the protection trail and "i" ($1 \leq i \leq n$) for working trail #i.	A.9	m	
2	The SRT is generated based on the inputs SF, SD, SFpriority, SDpriority, as specified in the clause "Signal request (type & signal number) processes" in clause A.9 of annex A in ETS 300 417-3-1 [2].	A.9	m	

c8801: IF (G.4/3 OR G.4/4 OR G.4/5)
THEN m ELSE o -- bi-directional switching supported

Comments: The signal request process transfers the input SF and SD signals from a trail into a Signal Request Type (SRT) and Signal Request Signal Number (SRSN).

Table G.89: External request process

Prerequisite: G.1/14 OR G.1/15 -- STM-16 Linear Trail Protection supported

Item	External request processes	Reference	Status	Support
1	The ERSN is "0" (zero) if no normal signal is indicated, "i" ($1 \leq i \leq nmax$) for normal signal #i, and "nmax+1" for the extra traffic signal.	A.9	m	
2	The ERT/ERN is generated as specified in the clause "External request (type & signal number) processes" in clause A.9 of annex A in ETS 300 417-3-1 [2].	A.9	m	

c88901: IF (G.4/3 OR G.4/4 OR G.4/5)
THEN m ELSE o -- bi-directional switching supported

Comments: The external request process transfers the external commands (EXTCMD) into an External Request Type (ERT) and External Request Signal Number (ERSN).

Table G.90: Local request priority process

Prerequisite: G.1/14 OR G.1/15 -- STM-16 Linear Trail Protection supported

Item	Local request priority processes	Reference	Status	Support
1	The status of the protection and working input signals (SRT/SRSN #0 to SRT/SRSN #n), the external command (ERT/ERSN), and protection parameters OPERtype and EXTRAtraffic is evaluated by a three step priority logic as specified in the clause "Local request (type & signal number) priority processes" in clause A.9 of annex A in ETS 300 417-3-1 [2].	A.9	m	

c9001: IF (G.4/3 OR G.4/4 OR G.4/5)
THEN m ELSE o -- bi-directional switching supported

Comments: The local request priority process determines the highest priority local request.

Table G.91: Global request priority process

Prerequisite: G.1/14 OR G.1/15 -- STM-16 Linear Trail Protection supported

Item	Global request priority processes	Reference	Status	Support
1	The local request (LRT,LRSN) and the remote request (RRT,RRSN) are compared to decide which has priority, according to the descending order of priorities in table A.2 of annex A in ETS 300 417-3-1 [2].	A.9	c9101	
2	A received reverse request is not considered in the comparison.	A.9	c9101	
3	The Global Request Type (GRT) and Global Request Signal Number (GRSN) is determined as specified in the clause "Global request (type & signal number) priority processes" in clause A.9 of annex A in ETS 300 417-3-1 [2].	A.9	m	

c9101: IF (G.4/3 OR G.4/4 OR G.4/5)
THEN m ELSE n/a -- bi-directional switching supported

Comments: The global request priority process determines the Global Request Type (GRT) and Global Request Signal Number (GRSN).

Table G.92: Bridge control process

Prerequisite: G.1/14 OR G.1/15 -- STM-16 Linear Trail Protection supported

Item	Bridge control process	Reference	Status	Support
1	The bridge control process is performed as specified in the clause "Bridge control process" in clause A.9 of annex A in ETS 300 417-3-1 [2].	A.9	m	

Comments: The bridge control process controls which of the normal/extra traffic signals is bridged to the protection trail.

Table G.93: Control of the selector

Prerequisite: G.1/14 OR G.1/15 -- STM-16 Linear Trail Protection supported

Item	Control of the selector	Reference	Status	Support
1	The control of the selector is performed as specified in the clause "Control of the selector" in clause A.9 of annex A in ETS 300 417-3-1 [2].	A.9	m	

Comments: The control of the selector controls which of the normal/extra traffic signals is connected to/extracted from the protection trail.

G.4.3.4.6 Automatic Protection Switching (APS) signal generation

Table G.94: APS generation process

Prerequisite: G.1/14 OR G.1/15 -- STM-16 Linear Trail Protection supported

Item	APS generation process	Reference	Status	Support
1	The Global Request Type (GRT) is translated into the transmitted Request Type (TxRT) in accordance to table A.8 (clause A.9) of annex A in ETS 300 417-3-1 [2].	A.9	c9401	
2	The transmitted Request Signal Number (TxRSN) equals the Global Request Signal Number (GRSN).	A.9	c9401	
3	The transmitted Local Bridged Signal Number (TxLBSN) is set to '0' if the Remote Request Signal Number (RRSN) equals '0' else it is set to the Local Bridged Signal Number (LBSN) value.	A.9	c9401	
4	The transmitted (TxARCH) is set to "0" (zero) if the Architecture type (ARCHtype) is 1+1 else it is set to "1" (one).	A.9	c9401	

c9401: IF (G.4/3 OR G.4/4 OR G.4/5)
THEN m ELSE o -- bi-directional switching supported

Comments:. the APS generation process translates the signals Global Request Type (GRT), Global Request Channel Number (GRSN), Local Bridged Signal Number (LBSN) and local Architecture type (ARCHtype) into a transmitted APS signal

G.4.3.4.7 Automatic Protection Switching (APS) signal interpretation

Table G.95: APS interpretation process

Prerequisite: G.1/14 OR G.1/15 -- STM-16 Linear Trail Protection supported

Item	APS interpretation process	Reference	Status	Support
1	The accepted Request Type (AcRT) is translated into the Remote Request Type (RRT) in accordance to table A.7 (clause A.9) of annex A in ETS 300 417-3-1 [2].	A.9	c9501	
2	The Remote Request Signal Number (RRSN) equals the accepted Request Signal Number (AcRSN).	A.9	c9501	
3	The Remote Bridged Signal Number (RBSN) equals the accepted Local Bridged Signal Number (AcLBSN).	A.9	c9501	
4	The Remote Architecture type (RARCH) equals the accepted Architecture type (AcARCH).	A.9	c9501	

c9501: IF (G.4/3 OR G.4/4 OR G.4/5)
THEN m ELSE o -- bi-directional switching supported

Comments: The APS interpretation process translates the accepted APS signal into the signals Remote Request Type (RRT), Remote Request Signal Number (RRSN), Remote Bridged Signal Number (RBSN) and Remote Architecture type (RARCH).

Table G.96: Use of the accepted APS message

Prerequisite: G.1/14 OR G.1/15 -- STM-16 Linear Trail Protection supported

Item	Use of the accepted APS message	Reference	Status	Support
1	The accepted Request Type, Remote Request Signal Number, Remote Bridged Signal Number and Remote Architecture type are used for protection switching operation.	A.9	c9601	

c9601: IF (G.4/3 OR G.4/4 OR G.4/5)
THEN m ELSE x -- bi-directional switching supported

G.4.3.4.8 Automatic Protection Switching (APS) status report

Table G.97: APS reporting process

Prerequisite: G.1/14 OR G.1/15 -- STM-16 Linear Trail Protection supported

Item	APS reporting process	Reference	Status	Support
1	The active external request are reported to the Equipment Management Function (EMF).	A.9	m	
2	The active local request are reported to the Equipment Management Function (EMF).	A.9	m	
3	The active remote request are reported to the Equipment Management Function (EMF).	A.9	c9701	
4	The reason of denial of an external command are reported to the Equipment Management Function (EMF).	A.9	m	
5	The condition (SF,SD) of the working and protection trails are reported to the Equipment Management Function (EMF).	A.9	m	

c9701: IF (G.4/3 OR G.4/4 OR G.4/5)
THEN m ELSE o -- bi-directional switching supported

G.4.4 MS16 two-fibre shared protection ring transmission tables

Table G.98: Protection operation

Prerequisite: G.1/16 -- STM-16 two-fibre Shared Protection Ring supported

Item	Protection operation	Reference	Status	Support
1	The switching type is bi-directional.	TS 101 009 [16] subclause 6.2.2	m	
2	The operation type is revertive.	TS 101 009 [16] subclause 6.2.2	m	
3	The APS channel is a 16 bits channel carried into bytes K1 and K2.	ETS 300 746 [15] subclause 5.2.3	m	
4	The signal switching procedure is started under Signal Fail (SF) or Signal Degrade (SD) conditions.	ETS 300 746 [15] subclause 5.2.2.2	m	
5	The available external commands are LO, FS-R, MS-R, CLR, EXER-R.	ETS 300 746 [15] subclause 5.2.2.1	m	
6	Extra Traffic channels are present	9.6.1	o	
7	The WTR time value is provisionable from the EMF	9.6.1	m	

Table G.99: Protection architecture characteristic parameters

Prerequisite: G.1/16 -- STM-16 two-fibre Shared Protection Ring supported

Item	Protection architecture characteristic parameters	Reference	Status	Support	Values	
					Allowed	Supported
1	Wait-To-Restore (WTR) time: X value	A.1	m		$0 \leq X \leq 12$ minutes	
2	Switching time: Y value	A.1	m		$0 \leq Y \leq$ 50 ms	

Comments: The requirement for the switching time applies to a ring without secondary traffic or with secondary traffic and no previous switch request, and less than 1 200 km of fibre.

Table G.100: APS channel bits structure

Prerequisite: G.1/16 -- STM-16 two-fibre Shared Protection Ring supported

Item	APS channel bits structure	Reference	Status	Support
1	The Bridged Request Code is transported in K1[1-4] bits of the APS channel.	ETS 300 746 [15] subclause 5.2.3.1	m	
2	The Destination Node Identification is transported in K1[5-8] bits of the APS channel.	ETS 300 746 [15] subclause 5.2.3.1	m	
3	The Source Node Identification number is transported in K2[1-4] bits of the APS channel.	ETS 300 746 [15] subclause 5.2.3.2	m	
4	The Path Code (short/long) is transported in K2[5] bit of the APS channel.	ETS 300 746 [15] subclause 5.2.3.2	m	
5	The Status is transported in K2[6-8] bit of the APS channel.	ETS 300 746 [15] subclause 5.2.3.2	m	

Table G.101: APS signal fields

Prerequisite: G.1/16 -- STM-16 two-fibre Shared Protection Ring supported

Item	APS signal fields	Reference	Status	Support
1	The content of Bridged Request Code field conforms to table 5.5 (subclause 5.2.3.1) of ETS 300 746 [15].	ETS 300 746 [15] subclause 5.2.3.1	m	
2	The content of the Destination Node Identification field conforms to table 5.5 (subclause 5.2.3.1) of ETS 300 746 [15].	ETS 300 746 [15] subclause 5.2.3.1	m	
3	The content of the Source Node Identification number field conforms to table 5.6 (subclause 5.2.3.2) of ETS 300 746 [15].	ETS 300 746 [15] subclause 5.2.3.2	m	
4	The content of the Path Code field conforms to table 5.6 (subclause 5.2.3.2) of ETS 300 746 [15].	ETS 300 746 [15] subclause 5.2.3.2	m	
5	The content of the Status field conforms to table 5.6 (subclause 5.2.3.2) of ETS 300 746 [15].	ETS 300 746 [15] subclause 5.2.3.2	m	

G.4.4.1 MS16 two-fibre shared protection ring connection functions: MS16P2fsh_C

Table G.102: Connectivity functionalities: generalities

Prerequisite: G.1/16 -- STM-16 two-fibre Shared Protection Ring supported

Item	Connectivity functionalities: generalities	Reference	Status	Support
1	The MS16P2fsh_C connection function routes the Working and Protection group signals between its connection points (inputs/outputs).	9.6.1	m	
2	The MS16P2fsh_C connection function is able to perform the matrix connections indicated in table 87 (subclause 9.6.1) of ETS 300 417-3-1 [2].	9.6.1	m	
3	The ring map is provisionable from the EMF	9.6.1	m	
4	The ring node identifier is provisionable from the EMF	9.6.1	m	
5	The use of extra traffic (true or false) is provisionable from the EMF	9.6.1	c10201	

c10201: IF G.98/6 THEN m ELSE n/a -- extra traffic supported

Table G.103: Connectivity functionalities: source direction

Prerequisite: G.1/16 -- STM-16 two-fibre Shared Protection Ring supported

Item	Connectivity functionalities: source direction	Reference	Status	Support
1	Depending on the status of the ring (no failure, single point failure, nodal failure, multiple failure, ...) the working B, protection B and extra traffic B inputs are connected to the working A and protection A outputs as indicated in figures 114 to 117 in subclause 9.6.1 of ETS 300 417-3-1 [2].	9.6.1, figure 114, figure 115, figure 116, figure 117	m	
2	Depending on the status of the ring (no failure, single point failure, nodal failure, multiple failure, ...) the West APS incoming (outgoing) channel and the East APS outgoing (incoming) channel are connected as indicated in figures 114 to 117 in subclause 9.6.1 of ETS 300 417-3-1 [2].	9.6.1, figure 114, figure 115, figure 116, figure 117	m	
3	Protection A outputs source VC-4 unequipped signals when not connected to working or extra traffic B inputs.	9.6.1, figure 114, figure 115, figure 116, figure 117	m	

Comments: The working, protection and extra traffic inputs and outputs, both on A and B side of the MS16P2fsh connection function, are shown in figure 113 (subclause 9.6.1) of ETS 300 417-3-1 [2].
Item 2 deals both with the source and sink direction of the MS16P2fsh connection function.

Table G.104: Connectivity functionalities: sink direction

Prerequisite: G.1/16 -- STM-16 two-fibre Shared Protection Ring supported

Item	Connectivity functionalities: sink direction	Reference	Status	Support
1	Depending on the status of the ring (no failure, single point failure, nodal failure, multiple failure, ...) the working A and protection A inputs are connected to the working B, protection B and extra traffic B outputs as indicated in figures 114 to 117 in subclause 9.6.1 of ETS 300 417-3-1 [2].	9.6.1, figure 114, figure 115, figure 116, figure 117	m	

Comments: working, protection and extra traffic inputs and outputs, both on A and B side of the MS16P2fsh connection function, are shown in figure 113 (subclause 9.6.1) of ETS 300 417-3-1 [2].

G.4.4.2 MS16 two-fibre Shared Protection Ring trail termination functions: MS16P2fsh_TT_So and MS16P2fsh_TT_Sk

Table G.105: Trail termination process

Prerequisite: G.1/16 -- STM-16 two-fibre Shared Protection Ring supported

Item	Trail termination process	Reference	Status	Support
1	The MS16_AI at the output of the MS16P2fsh_TT_So is identical to the MS16P2fsh_CI at its input.	9.6.2.1	m	
2	The MS16P2fsh_TT_Sk function reports the state of the protected MS16 trail.	9.6.2.2	m	
3	When all connections are unavailable each MS16P2fsh_TT_Sk, belonging to the working capacity, reports the signal fail condition of the protected trail.	9.6.2.2	m	

G.4.4.3 MS16 to MS16 two-fibre Shared Protection Ring adaptation functions: MS16/MS16P2fsh_A_So and MS16/MS16P2fsh_A_Sk

G.4.3.3.1 MS16 to MS16 two-fibre Shared Protection Ring multiplexing and demultiplexing processes

Table G.106: Multiplexing

Prerequisite: G.1/16 -- STM-16 two-fibre Shared Protection Ring supported

Item	Multiplexing	Reference	Status	Support
1	The MS16/MS16P2fsh_A_So multiplexes two groups of signals (CI_D working, CI_D protection) into the MS16 payload (16 AU-4 timeslots).	9.6.3.1	m	
2	The MS16/MS16P2fsh_A_So multiplexes the working group signal into AU-4 timeslots 1 to 8 and the protection group signal into AU-4 timeslots 9 to 16.	9.6.3.1	m	
3	The MS16/MS16P2fsh_A_So maps the MS16 two-fibre shared protection ring APS signal into bytes K1 and K2.	9.6.3.1	m	

Table G.107: Demultiplexing

Prerequisite: G.1/16 -- STM-16 two-fibre Shared Protection Ring supported

Item	Demultiplexing	Reference	Status	Support
1	The MS16/MS16P2fsh _A_Sk splits the MS16 payload (i.e. 16 AU-4 timeslots) into two groups; the working group contains AU-4 timeslots 1 to 8 and the protection group contains AU-4 timeslots 9 to 16.	9.6.3.2	m	
2	The MS16/MS16P2fsh _A_Sk outputs the working group as the MS16P2fsh_CI_Dw and the protection group as the MS16P2fsh_CI_Dp.	9.6.3.2	m	
3	The MS16/MS16P2fsh _A_Sk extracts the 16 APS bits K1[1-8] and K2[1-8] from the MS16_AI_D signal.	9.6.3.2	m	

Table G.108: APS channel processing: sink direction

Prerequisite: G.1/16 -- STM-16 two-fibre Shared Protection Ring supported

Item	APS channel processing: sink direction	Reference	Status	Support
1	A new value for the APS message is accepted when the value of the 16 APS bits is identical for three consecutive frames. This value is output via MS16P2fsh_CI_APS.	9.6.3.2	m	

G.4.4.4 MS16 two-fibre shared protection ring processes

G.4.4.4.1 Automatic Protection Switching (APS) externally initiated commands

Table G.109: Issuing of external switching commands

Prerequisite: G.1/16 -- STM-16 two-fibre Shared Protection Ring supported

Item	Issuing of external switching commands	Reference	Status	Support
1	The external commands are received via the EMF.	ETS 300 746 [15] subclause 5.2.2.1	m	

Table G.110: Transmission of external switching requests

Prerequisite: G.1/16 -- STM-16 two-fibre shared protection ring supported

Item	Transmission of external switching requests	Reference	Status	Support
1	The external bridge requests are issued via the APS bytes.	ETS 300 746 [15] subclause 5.2.2.1	o.11001	
2	The external bridge requests are issued via the EMF.	ETS 300 746 [15] subclause 5.2.2.1	o.11001	

o.11001: It is mandatory to support exactly one of these items -- Transmission of external bridge request is supported by one of the allowed ways.

Table G.111: External Switching Commands

Prerequisite: G.1/16 -- STM-16 two-fibre Shared Protection Ring supported

Item	External Switching Commands	Reference	Status	Support
1	The external command CLEAR conforms to the definition given in subclause 5.2.2.1.1 of ETS 300 746 [15].	ETS 300 746 [15] subclause 5.2.2.1.1	m	
2	The external command LOCKOUT OF WORKING CHANNELS- RING SWITCH conforms to the definition given in subclause 5.2.2.1.1 of ETS 300 746 [15].	ETS 300 746 [15] subclause 5.2.2.1.1	m	
3	The external command FORCED SWITCH OF WORKING TO PROTECTION (FS-R) conforms to the definition given in subclause 5.2.2.1.2 of ETS 300 746 [15].	ETS 300 746 [15] subclause 5.2.2.1.2	m	
4	The external command MANUAL SWITCH OF WORKING TO PROTECTION - RING (MS-R) conforms to the definition given in subclause 5.2.2.1.2 of ETS 300 746 [15].	ETS 300 746 [15] subclause 5.2.2.1.2	m	
5	The external command EXERCISE - RING (EXER-R) conforms to the definition given in subclause 5.2.2.1.2 of ETS 300 746 [15].	ETS 300 746 [15] subclause 5.2.2.1.2	m	
6	The descending order of priority for external switching commands is: CLEAR, LOCK OUT of PROTECTION, FS-R, MS-R, EXER-R.	ETS 300 746 [15] subclause 5.2.3.1 table 5.5	m	

G.4.4.4.2 Automatic Protection Switching (APS) automatically initiated commands

Table G.112: Automatic generation of bridge requests

Prerequisite: G.1/16 -- STM-16 two-fibre Shared Protection Ring supported

Item	Automatic generation of bridge requests	Reference	Status	Support
1	The NE initiates the following automatic bridge requests: Signal Failure (SF), Signal Degrade (SD), Reverse Request (RR), Wait-To-Restore (WTR).	ETS 300 746 [15] subclause 5.2.2.2	m	

Table G.113: Transmission of Automatically Generated Bridge Requests

Prerequisite: G.1/16 -- STM-16 two-fibre Shared Protection Ring supported

Item	Transmission of Automatically Generated Bridge Requests	Reference	Status	Support
1	The automatically generated bridge requests are issued only via the APS bytes.	ETS 300 746 [15] subclause 5.2.2.2	m	

Table G.114: Automatically generated bridge requests

Prerequisite: G.1/16 -- STM-16 two-fibre Shared Protection Ring supported

Item	Automatically generated bridge requests	Reference	Status	Support
1	The Wait-To-Restore (WTR) command is issued when working channels meet the restoral threshold after, and only after, an SD or SF condition.	ETS 300 746 [15] subclause 5.2.2.2	m	
2	The Wait-To-Restore (WTR) command is used to maintain the state during the WTR period unless it is pre-empted by a higher priority bridge request.	ETS 300 746 [15] subclause 5.2.2.2	m	
3	The Reverse Request - Ring (RR-R) command is transmitted to the tail-end NE on the short path as an acknowledgement for receiving the short path ring bridge request.	ETS 300 746 [15] subclause 5.2.2.2	m	
4	In the No Request state none of the trail signal conditions is active, none of the external commands is active, and none of the states described above is active.	ETS 300 746 [15] subclause 5.2.2.2	m	
5	The Signal Fail (SF-R) command is used to request ring switching for signal failures.	ETS 300 746 [15] subclause 5.2.2.2	m	
6	The Signal Degrade (SD-R) command is used to request ring switching for signal degradation.	ETS 300 746 [15] subclause 5.2.2.2	m	

G.4.4.4.3 Ring node Automatic Protection Switching (APS) generalities

Table G.115: Allocation of the extra traffic signals

Prerequisite:G.98/6 -- Extra traffic channel(s) supported

Item	Allocation of the extra traffic signals	Reference	Status	Support
1	The extra traffic is allocated to the protection trails.	9.6.1	m	

Table G.116: Priority of request types

Prerequisite: G.1/16 -- STM-16 two-fibre Shared Protection Ring supported

Item	Priority of request types	Reference	Status	Support
1	The priority of request types conforms to the priority order given in table 5.5 (subclause 5.2.3.1) in ETS 300 746 [15].	ETS 300 746 [15] subclause 5.2.3.1 table 5.5	m	

G.4.4.4.4 Ring node Automatic Protection Switching (APS) states

Table G.117: Idle state rules

Prerequisite: G.1/16 -- STM-16 two-fibre Shared Protection Ring supported

Item	Idle state rules	Reference	Status	Support
1	Any node in the idle state sources the K1 and K2 bytes as given in table 5.7 (subclause 5.2.4.1.2) in ETS 300 746 [15].	ETS 300 746 [15] subclause 5.2.4.1.1	m	
2	Any node in the idle state terminates the K1 and K2 bytes in both directions.	ETS 300 746 [15] subclause 5.2.4.1.1	m	

Comments: a node is in the IDLE STATE when it is not generating, detecting, or passing through bridge request information.

Table G.118: Switching state rules

Prerequisite: G.1/16 -- STM-16 two-fibre Shared Protection Ring supported

Item	Switching state rules	Reference	Status	Support
1	Any node in the switching state sources the K1 and K2 bytes as given in table 5.8 (subclause 5.2.4.1.2) in ETS 300 746 [15].	ETS 300 746 [15] subclause 5.2.4.1.2	m	
2	Any node in the switching state sources a bridge request code on the short path and a bridge request code on the long path. Both bridge requests have the same priority (or one of them is a Reverse Request), and protect the same span.	ETS 300 746 [15] subclause 5.2.4.1.2	m	
3	Whenever a node in the switching state terminates a new short path K-byte bridge request from an adjacent node, of equal or higher priority than the bridge request it is currently executing, over the same span, it sources a bridge request of the same priority on the corresponding long path. This requirement takes precedence over the one given in the ICS item G.118/2 in case of multiple bridge requests at the same node.	ETS 300 746 [15] subclause 5.2.4.1.2	m	
4	Whenever a node receives ring bridge requests on both short paths from its adjacent nodes, indicating that both signals it is sending are failed (SF), the long path bridge request takes precedence over the short path Reverse Requests. This requirement takes precedence over the one given in the ICS item G.118/2 in case of multiple bridge requests at the same node.	ETS 300 746 [15] subclause 5.2.4.1.2	m	
5	Whenever a node detects an incoming failure on the working and on the protection channels, it always sources over the short path a short path ring bridge request , even in the case of multiple failures, as long as the ring bridge request is not pre-empted by a higher priority bridge request. This requirement takes precedence over those given in the ICS items G.118/3 and G.118/3.	ETS 300 746 [15] subclause 5.2.4.1.2	m	
6	Whenever a node receives in one direction a ring bridge request on the short path, (indicating that the signal it is sending has failed) and detects on the other side an incoming failure on the working and on the protection channels, it signals the detected failure over both the short and the long paths. This requirement takes precedence over those given in the ICS items G.118/3 and G.118/3.	ETS 300 746 [15] subclause 5.2.4.1.2	m	

(continued)

(concluded)

Item	Switching state rules	Reference	Status	Support
7	Any node in the switching state terminates K1 and K2 in both directions.	ETS 300 746 [15] subclause 5.2.4.1.2	m	
8	As soon as it receives a bridge request, the node to which it is addressed acknowledges the bridge request by changing K1 bits 1-4 to the Reverse Request code on the short path, and to the received bridge request priority on the long path.	ETS 300 746 [15] subclause 5.2.4.1.2	m	
9	The following switches are allowed to co-exist: - FS-R with FS-R; - SF-R with SF-R; - FS-R with SF-R.	ETS 300 746 [15] subclause 5.2.4.1.2	m	
10	When multiple equal priority bridge requests over different spans of SD-R, MS-R, or EXER-R exist at the same time, no bridge or switch is executed and existing switches and bridges is dropped.	ETS 300 746 [15] subclause 5.2.4.1.2	m	
11	If a node executing a ring bridge and switch no longer receives a valid bridge request on the long path, it drops its bridge and switch, and signals and acts on its highest priority input.	ETS 300 746 [15] subclause 5.2.4.1.2	m	

Comments: a node is in a SWITCHING STATE when it is either sourcing a bridge request (automatically or externally), or terminating a bridge request.

Table G.119: Pass-through state rules

Prerequisite: G.1/16 -- STM-16 two-fibre Shared Protection Ring supported

Item	Pass-through state rules	Reference	Status	Support
1	When a node is in full pass-through, it transmits on one side all the K1 and K2 bytes which it receives from the other side.	ETS 300 746 [15] subclause 5.2.4.1.3	m	
2	When a node that is in the full pass-through state receives a long path ring bridge request destined to itself, and another long path ring bridge request of the same priority destinated to another node, the node does not transit to another state.	ETS 300 746 [15] subclause 5.2.4.1.3	m	

Comments: a node is in the FULL PASS-THROUGH state when it transmits on one side, all the K1 and K2 bytes and the protection channels, which it receives on the other side. The full pass-through is bi-directional.

G.4.4.4.5 Ring node Automatic Protection Switching (APS) state transitions

Table G.120: Transitions between the idle and full pass-through state

Prerequisite: G.1/16 -- STM-16 two-fibre Shared Protection Ring supported

Item	Transitions between the idle and full pass-through state	Reference	Status	Support
1	The transition to the full pass-through state is triggered by a valid K-byte change, in any direction, from the No Request code to any other bridge request code, as long as the new bridge request is not destinated for the node itself.	ETS 300 746 [15] subclause 5.2.4.2.1	m	
2	For any ring bridge request, the intermediate nodes on the long path go from idle state into full pass-through state.	ETS 300 746 [15] subclause 5.2.4.2.1	m	
3	A node reverts from full pass-through state to the idle state when it detects No Request codes in K1 bits 1-4 and Idle codes in K2 bits 6-8, from both directions. Both directions revert simultaneously from the full pass-through state to the idle state.	ETS 300 746 [15] subclause 5.2.4.2.1	m	

Table G.121: Transitions between the idle and switching state

Prerequisite: G.1/16 -- STM-16 two-fibre Shared Protection Ring supported

Item	Transitions between the idle and switching state	Reference	Status	Support
1	Transition of an NE from the idle state to the switching state is triggered by one of the following conditions: - a valid K-byte change from the No Request (NR) code to any ring bridge request code received on either the long path or the short path and destinated to that NE; - an externally initiated command for that NE; - the detection of a failure at that NE.	ETS 300 746 [15] subclause 5.2.4.2.2	m	
2	A ring switch is put up or brought down only with long path bridge requests.	ETS 300 746 [15] subclause 5.2.4.2.2	m	

(continued)

(continued)

Item	Transitions between the idle and switching state	Reference	Status	Support
3	Actions taken at a switching NE upon receiving a valid bridge request are: - for FS-R bridge requests, the node checks if there is any need for squelching and squelches accordingly, execute a bridge and insert the Bridged code in K2 bits 6-8 in both directions (with MS-RDI and MS-AIS exceptions). Upon receiving a Bridged code in byte K2 bits 6-8 on the bridge request path, the NE executes a switch and update K2 bits 6-8 on both paths accordingly. - for SF-R bridge requests, the node checks if there is any need for squelching and squelches accordingly, execute a bridge and switch, and insert in byte K2 bits 6-8 the Bridged and Switched code on both the long and the short path (with MS-RDI and MS-AIS exceptions). - for SD-R and MS-R bridge requests the node executes a bridge and insert the Bridged code in byte K2 bits 6-8 in both directions (with MS-RDI and MS-AIS exceptions). Upon receiving a Bridged code in byte K2 bits 6-8 on the bridge request path, the NE executes a switch and update K2 bits 6-8 on both paths accordingly. - for EXER, the node signals as for any other bridge request, but does not execute the bridge or switch.	ETS 300 746 [15] subclause 5.2.4.2.2	m	
4	A node reverts from the switching state to the idle state when it detects NR codes in byte K1 bits 1-4 and idle codes in byte K2.	ETS 300 746 [15] subclause 5.2.4.2.2	m	

(continued)

(concluded)

Item	Transitions between the idle and switching state	Reference	Status	Support
5	In those cases in which no bridge or switch is to be dropped (e.g. for EXER, or switches that could not be executed due to other conditions on the ring). In these cases, the NE that initiated the request (i.e. tail-end) signals the No Request code. Upon reception of the No Request code, the head-end also sources the Idle code.	ETS 300 746 [15] subclause 5.2.4.2.2	m	
6	A node transmits the default APS code (i.e.: the transmitted K1 and K2 bytes have the source node ID equal to the destination node ID.) until it is capable of proper APS signalling in accordance with the current state of the ring. The default APS code is used to indicate that the node can not properly signal APS bytes, therefore cannot properly execute protection switching.	ETS 300 746 [15] subclause 5.2.4.2.2	m	
7	A ring switching node receiving the default APS code on the short path does not change its signalling or take any action associated with that path until proper APS codes are received. A ring switching node receiving default APS code on the long path drops its bridge and switch.	ETS 300 746 [15] subclause 5.2.4.2.2	m	
8	A node receiving long path ring bridge requests destinated to itself from both of its neighbours takes no action based on these bridge requests.	ETS 300 746 [15] subclause 5.2.4.2.2	m	
9	A node receiving the APS bytes which it is sourcing in both directions reverts to the idle state.	ETS 300 746 [15] subclause 5.2.4.2.2	m	
10	When a node receives a Reverse Request code over the span which it is protecting, and when that same node is sending a Reverse Request code, it drops its bridge and switch except for bridge requests of signal failure and signal degrade priority. For signal failure and signal degrade, the node drops the switch and the bridge after the expiration of the WTR time according.	ETS 300 746 [15] subclause 5.2.4.2.2	m	

Table G.122: Transitions between switching states

Prerequisite: G.1/16 -- STM-16 two-fibre Shared Protection Ring supported

Item	Transitions between switching states	Reference	Status	Support
1	When an NE that is currently executing an SF-R switch receives another SF-R bridge request over the long path or an FS-R bridge request over the long path, not destinated to that NE, the NE checks if there is any need for squelching and squelches accordingly. The NE stops squelching when the bridge and switch are dropped.	ETS 300 746 [15] subclause 5.2.4.2.3	m	
2	When an NE that is currently executing an FS-R switch receives another FS-R bridge request over the long path or an SF-R bridge request over the long path, not destinated to that NE, the NE checks if there is any need for squelching and squelches accordingly. The NE stops squelching when the bridge and switch are dropped.	ETS 300 746 [15] subclause 5.2.4.2.3	m	
3	When an NE that is currently executing any ring switch receives a higher priority ring bridge request (due to a locally detected failure, an externally initiated command or a ring bridge request destinated to it) for the same span, it upgrades the priority of the ring switch it is executing to the priority of the received ring bridge request.	ETS 300 746 [15] subclause 5.2.4.2.3	m	
4	When a NE that is currently executing a ring switch receives a ring bridge request (due to a locally detected failure, an externally initiated command or a ring bridge request destinated to it) of greater priority for an adjacent span that the ring switch it is executing, it: - drops the ring bridge and switches immediately - executes the higher priority ring bridge request.	ETS 300 746 [15] subclause 5.2.4.2.3	m	
5	When a failure condition affecting only one span clears at a node, the node enters Wait-To-Restore and remain in Wait-To-Restore for the appropriate time-out interval, unless (1) a different bridge request of higher priority than WTR is received, or (2) another failure is detected, or (3) an externally initiated command becomes active. The node sends out a WTR code on both the long and short paths.	ETS 300 746 [15] subclause 5.2.4.2.3	m	

(continued)

(concluded)

Item	Transitions between switching states	Reference	Status	Support
6	As soon as a node which was requested to bridge, but did not actually detect the failure, receives a Wait-To-Restore code (unidirectional failure case), it continues to send out Reverse Request on the short path, and it sends out WTR on the long path.	ETS 300 746 [15] subclause 5.2.4.2.3	m	
7	A node receiving long path ring bridge requests destinated to itself from both of its neighbours drops its bridge and switches.	ETS 300 746 [15] subclause 5.2.4.2.3	m	

Table G.123: Transitions between switching and full pass-through state

Prerequisite: G.1/16 -- STM-16 two-fibre Shared Protection Ring supported

Item	Transitions between switching and full pass-through state	Reference	Status	Support
1	When a node that is currently executing a ring switch receives a long path ring bridge request for a non adjacent span of greater priority than the ring switch it is executing, it drops its bridge and switches immediately, then enters full pass-through state.	ETS 300 746 [15] subclause 5.2.4.2.4		
2	When a node that is currently executing a ring switch has as its highest priority input long path ring bridge requests not destinated to itself from both directions, it drops its bridge and switches immediately, then enters full pass-through state.	ETS 300 746 [15] subclause 5.2.4.2.4		
3	The transition of a node from full pass-through to switching state is triggered by: - an equal, higher priority or allowed coexisting externally initiated command, - the detection of an equal, higher priority or allowed coexisting failure, - the receipt of an equal, higher priority or allowed coexisting bridge request destinated to that NE.	ETS 300 746 [15] subclause 5.2.4.2.4		
4	If a node that was in the pass-through state due to a SF-R or FS-R request on the ring is now sourcing a SF-R or FS-R bridge request the node: - determines if there is any need for squelching and squelch accordingly, - executes the ring bridge and switches.	ETS 300 746 [15] subclause 5.2.4.2.4		

G.4.5 MS16 layer defect, fault and performance monitoring tables

G.4.5.1 Port status management

Table G.124: Trail termination point mode process

Prerequisite: G.1/3 -- MS16_TT_Sk function present

Item	Trail Termination point mode process	Reference	Status	Support
1	The Trail Termination Point Mode supports "not monitored" (NMON) status	ETS 300 417-1-1 [1] subclause 8.5	m	
2	The Trail Termination Point Mode supports "monitored" (MON) status	ETS 300 417-1-1 [1] subclause 8.5	m	
3	The Trail Termination Point Mode status is provisionable by the EMF.	9.2.2	m	

G.4.5.2 Defect detection and clearance criteria

Table G.125: MS16 Alarm Indication Signal defect (MS16 dAIS)

Prerequisite: G.1/3 -- MS16_TT_Sk function present

Item	MS16 Alarm Indication Signal defect (MS16 dAIS)	Reference	Status	Support
1	The MS16 dAIS is detected if at least *x* consecutive frames contain the '111' pattern in bits 6, 7 and 8 of the K2 byte.	9.2.2	m	
2	The MS16 dAIS is cleared if in at least *x* consecutive frames any pattern other than '111' is detected in bits 6, 7 and 8 of the K2 byte.	9.2.2	m	

Table G.126: MS16 dAIS parameters value

Prerequisite: G.1/3 -- MS16_TT_Sk function present

Item	MS16 dAIS parameters value	Reference	Status	Support	Values	
					Allowed	Supported
1	MS16 dAIS threshold: *x* parameter	9.2.2	m		$3 \leq x \leq 5$	

Table G.127: Remote Defect Indication (RDI) defect (dRDI)

Prerequisite: G.1/3 -- MS16_TT_Sk function present

Item	Remote Defect Indication (RDI) defect (dRDI)	Reference	Status	Support
1	The MS16 RDI defect is detected if *5* consecutive frames contain the '110' pattern in bits 6, 7 and 8 of the K2 byte.	ETS 300 417-1-1 [1] subclause 8.2.1.5	m	
2	The MS16 RDI defect is cleared if in *5* consecutive frames any pattern other than '110' is detected in bits 6, 7 and 8 of the K2 byte.	ETS 300 417-1-1 [1] subclause 8.2.1.5	m	
3	The MS16 RDI defect is cleared during reception of an RS16 aSSF	ETS 300 417-1-1 [1] subclause 8.2.1.5	m	

Table G.128: Trail performance monitoring

Prerequisite: G.1/3 -- MS16_TT_Sk function present

Item	Trail performance monitoring	Reference	Status	Support
1	An MS16 near-end block is errored if one or more EDC Violations (EDCV) - BIP-24 parity - are detected.	9.2.2	m	
2	The EDCV process assumse "zero" EDCVs in the incoming all "1s" (AIS) signal during reception of Server Signal Fail (aSSF) from the server layer.	9.2.2	m	
3	Every second the number of MS16 Near-end Errored Block (MS16 N_Bs) within that second is counted as the MS16 Near-end Error Block Count (MS16 pN_EBC).	9.2.2	m	

Table G.129: Degraded defect (dDEG)

Prerequisite: G.1/3 -- MS16_TT_Sk function present

Item	Degraded defect (dDEG)	Reference	Status	Support
1	Once every second, MS16 pNEBC is compared with DEGTHR	9.2.2	m	
2	If MS16 pNEBC>=DEGTHR the corresponding second is declared BAD, otherwise it is declared GOOD	9.2.2	m	
3	The MS16 dDEG is detected if M consecutive BAD seconds have occurred.	9.2.2	m	
4	The MS16 dDEG is cleared if M consecutive GOOD seconds have occurred.	9.2.2	m	
5	The MS16 dDEG is cleared during reception of an RS1 aSSF	9.2.2	m	
6	The DEGTHR parameter is provisionable by the EMF	9.2.2	m	
7	The DEGM parameter is provisionable by the EMF	9.2.2	m	

Table G.130: DEG defect parameters value

Prerequisite: G.1/3 -- MS16_TT_Sk function present

Item	DEG defect parameters	Reference	Status	Support	Values	
					Allowed	Supported
1	MS16 dDEG DEGTHR parameter	9.2.2	c13001		0< DEGTHR ≤ 128 000	
2	MS16 dDEG M parameter	9.2.2	c13002		2 ≤ M ≤ 10	

c13001: IF G.129/6 THEN m ELSE n/a -- DEGTHR programmable
c13002: IF G.129/7 THEN m ELSE n/a -- DEGM programmable

Table G.131: AU-4 Alarm Indication Signal defect (AU4 dAIS)

Prerequisite: G.1/5 -- MS16/S4_A_Sk function present

Item	AU-4 Alarm Indication Signal defect (AU4 dAIS)	Reference	Status	Support
1	The AU4 dAIS is detected if the pointer interpreter enters the AIS_state	9.3.2	m	
2	The AU4 dAIS is cleared if the pointer interpreter exits the AIS_state	9.3.2	m	

Table G.132: AU-4-4c Alarm Indication Signal defect (AU4-4c dAIS)

Prerequisite: G.1/13 -- MS16/S4-4c_A_Sk function present

Item	AU-4-4c Alarm Indication Signal defect (AU4-4c dAIS)	Reference	Status	Support
1	The AU4-4c dAIS is detected if the pointer interpreter enters the AISX_state	9.3.4	m	
2	The AU4-4c dAIS is cleared if the pointer interpreter exits the AISX_state	9.3.4	m	

Table G.133: Loss of AU-4 Pointer defect (AU-4 dLOP)

Prerequisite: G.1/5 -- MS16/S4_A_Sk function present

Item	Loss of AU-4 Pointer defect (AU-4 dLOP)	Reference	Status	Support
1	The High Order Path dLOP (related to an AU-4 pointer) is detected if the pointer interpreter enters the LOP_state.	9.3.2	m	
2	The High Order Path dLOP (related to an AU-4 pointer) is cleared if the pointer interpreter exits the LOP_state.	9.3.2	m	

Table G.134: Loss of AU-4-4c Pointer defect (AU-4-4c dLOP)

Prerequisite: G.1/13 -- MS16/S4-4c_A_Sk function present

Item	Loss of AU-4-4c Pointer defect (AU-4-4c dLOP)	Reference	Status	Support
1	The High Order Path dLOP (related to an AU-4-4c pointer) is detected if the pointer interpreter enters the LOPX_state.	9.3.4	m	
2	The High Order Path dLOP (related to an AU-4-4c pointer) is cleared if the pointer interpreter exits the LOPX_state.	9.3.4	m	

G.4.5.3 Consequent action activation and clearance criteria

Table G.135: Alarm Indication Signal action (aAIS)

Item	Alarm Indication Signal action (aAIS)	Reference	Status	Support
1	The MS16_TT_Sk outputs an all "1s" signal within 250 µs upon MS16 dAIS detection	9.2.2	c13501	
2	The MS16_TT_Sk outputs normal data within 250 µs when there is (are) no more defect(s) active.	9.2.2	c13501	
3	The MS16/S4_A_So outputs an all "1s" signal within 250 µs upon CI_SSF reception.	9.3.1	c13502	
4	The MS16/S4_A_So outputs normal data within 250 µs when there is (are) no more defect(s) active.	9.3.1	c13502	
5	The MS16/S4-4c_A_So outputs an all "1s" signal within 250 µs upon CI_SSF reception.	9.3.3	c13503	
6	The MS16/S4-4c_A_So outputs normal data within 250 µs when there is (are) no more defect(s) active.	9.3.3	c13503	
7	The MS16/S4_A_Sk outputs an all "1s" signal within 250 µs upon AU4 dAIS detection.	9.3.2	c13504	
8	The MS16/S4_A_Sk outputs an all "1s" signal within 250 µs upon HO dLOP detection.	9.3.2	c13504	
9	The MS16/S4_A_Sk outputs normal data within 250 µs when there is (are) no more defect(s) active.	9.3.2	c13504	
10	The MS16/S4-4c_A_Sk outputs an all "1s" signal within 250 µs upon AU4-4c dAIS detection.	9.3.4	c13505	
11	The MS16/S4-4c_A_Sk outputs an all "1s" signal within 250 µs upon HO dLOP detection.	9.3.4	c13505	
12	The MS16/S4-4c_A_Sk outputs normal data within 250 µs when there is (are) no more defect(s) active.	9.3.4	c13505	
13	The MS16/P0s_A_Sk outputs an all "1s" signal within 1 ms upon AI_TSF reception.	9.3.8	c13506	
14	The MS16/P0s_A_Sk outputs normal data within 1 ms when there is (are) no more defect(s) active.	9.3.8	c13506	

c13501: IF G.1/3 THEN m ELSE n/a -- MS16_TT_Sk present
c13502: IF G.1/4 THEN m ELSE n/a -- MS16/S4_A_So present
c13503: IF G.1/12 THEN m ELSE n/a -- MS16/S4-4c_A_So present
c13504: IF G.1/5 THEN m ELSE n/a -- MS16/S4_A_Sk present
c13505: IF G.1/13 THEN m ELSE n/a -- MS16/S4-4c_A_Sk present
c13506: IF G.1/11 THEN m ELSE n/a -- MS16/P0s_A_Sk present

Table G.136: Remote Defect Indication (RDI) defect action (aRDI)

Prerequisite: G.1/2 AND G.1/3 -- MS16_TT_So and MS16_TT_Sk function present

Item	Remote Defect Indication (RDI) defect action (aRDI)	Reference	Status	Support
1	The MS16_TT_Sk outputs an RDI request generation (RI_RDI) on MS16 dAIS detection.	9.2.2	m	
2	The MS16_TT_Sk clears the RDI request when there is (are) no more defect(s) active.	9.2.2	m	
3	The MS16_TT_So inserts the RDI code within 250 µs upon RI_RDI reception.	9.2.1	m	
4	The MS16_TT_So outputs normal data within 250 µs upon RI_RDI clearing.	9.2.1	m	

Table G.137: Remote Error Indication (REI) action (aREI)

Prerequisite: G.1/2 AND G.1/3 -- MS16_TT_So and MS16_TT_Sk function present

Item	Remote Error Indication (REI) action (aREI)	Reference	Status	Support
1	The MS16_TT_So inserts the REI value in the next REI bits.	9.2.1	m	

Table G.138: Server Signal Fail action (aSSF)

Prerequisite: G.1/5 OR G.1/13 OR G.1/9 -- MS16/S4_A_Sk and /or MS16/S4-4c_A_Sk and /or MS16/DCC_A_Sk function present

Item	Server Signal Fail action (aSSF)	Reference	Status	Support
1	The MS16/S4_A_Sk sets CI_SSF to TRUE on AU4 dAIS detection.	9.3.2	c13801	
2	The MS16/S4_A_Sk sets CI_SSF to TRUE on HO dLOP detection.	9.3.2	c13801	
3	The MS16/S4_A_Sk sets CI_SSF to FALSE when there is (are) no more defect(s) active.	9.3.2	c13801	
4	The MS16/S4-4c_A_Sk sets CI_SSF to TRUE on AU4-4c dAIS detection.	9.3.4	c13802	
5	The MS16/S4-4c_A_Sk sets CI_SSF to TRUE on HO dLOP detection.	9.3.4	c13802	
6	The MS16/S4-4c_A_Sk sets CI_SSF to FALSE when there is (are) no more defect(s) active.	9.3.4	c13802	
7	The MS16/DCC_A_Sk sets CI_SSF to TRUE on AI_TSF reception.	9.3.6	c13803	
8	The MS16/ DCC _A_Sk sets CI_SSF to FALSE when there is (are) no more defect(s) active.	9.3.6	c13803	
9	The MS16/P0s_A_Sk sets CI_SSF to TRUE on AI_TSF reception.	9.3.8	c13804	
10	The MS416P0s _A_Sk sets CI_SSF to FALSE when there is (are) no more defect(s) active.	9.3.8	c13804	

c13801: IF G.1/5 THEN m ELSE n/a -- MS16/S4_A_Sk present
c13802: IF G.1/13 THEN m ELSE n/a -- MS16/S4-4c_A_Sk present
c13803: IF G.1/9 THEN m ELSE n/a -- MS16/DCC_A_Sk present
c13804: IF G.1/11 THEN m ELSE n/a -- MS16/P0s_A_Sk present

Table G.139: Trail Signal Fail action (aTSF)

Prerequisite: G.1/3 -- MS16_TT_Sk function present

Item	Trail Signal Fail action (aTSF)	Reference	Status	Support
1	The MS16_TT_Sk sets AI_TSF to TRUE on MS16 dAIS detection.	9.2.2	m	
2	The MS16_TT_Sk sets AI_TSF to FALSE when there is (are) no more defect(s) active.	9.2.2	m	

Table G.140: Trail Signal Degrade action (aTSD)

Prerequisite: G.1/3 -- MS16_TT_Sk function present

Item	Trail Signal Degrade action (aTSD)	Reference	Status	Support
1	If the dDEG is detected in the trail termination sink the aTSD is performed.	ETS 300 417-1-1 [1] subclause 8.2.2.6	m	
2	It ceases aTSD insertion after the dDEG defect is cleared.	ETS 300 417-1-1 [1] subclause 8.2.2.6	m	
3	The aTSD is equivalent to send the Signal Degrade (SD) signal as defined in the Automatic Protection Switching (APS).	ETS 300 417-1-1 [1] subclause 8.2.2.6	m	

G.4.5.4 Defect correlation

Table G.141: Defect correlation

Prerequisite: G.7/5 -- Defect correlation process supported

Item	Defect correlation	Reference	Status	Support
1	Under MS16 dAIS detection the MS16_TT_Sk generates a MS16 cAIS report if the port is in the monitoring state (MON) and no CI_SSF is received from the server layer.	9.2.2	c14101	
2	The MS16 cAIS is reported only if selected MS16 AIS_reported is set to TRUE by the NEM. By default MS16 AIS_reported is set to FALSE.	9.2.2	c14101	
3	Under MS16 dAIS detection the MS16_TT_Sk generates a MS16 cSSF report if the port is in the monitoring state (MON).	9.2.2	c14101	
4	The MS16 cSSF is reported only if selected MS16 SSF_reported is set to TRUE by the NEM. By default MS16 SSF_reported is set to FALSE.	9.2.2	c14101	
5	Under MS16 dRDI detection the MS16_TT_Sk generates a MS16 cRDI report if the port is in the monitoring state (MON).	9.2.2	c14101	
6	The MS16 cRDI is reported only if MS16 RDI_reported is set to TRUE by the NEM. By default MS16 RDI_reported is set to FALSE.	9.2.2	c14101	
7	Under MS16 dDEG detection the MS16_TT_Sk generates a MS16 cDEG report if the port is in the monitoring state (MON).	9.2.2	c14101	
8	Under AU4 dAIS detection the MS16/S4_A_Sk generates a AU4 cAIS report if the port is in the monitoring state (MON) and no AI_TSF is received from the MS16_TT_Sk.	9.3.2	c14102	
9	The AU4 cAIS is reported only if AU4 AIS _reported is set to TRUE by the NEM. By default AU4 cAIS_reported is set to FALSE.	9.3.2	c14102	
10	Under HO dLOP detection the MS16/S4_A_Sk generates a HO cLOP report.	9.3.2	c14102	
11	Under AU4-4c dAIS detection the MS16/S4-4c_A_Sk generates a AU4 cAIS report if the port is in the monitoring state (MON) and no AI_TSF is received from the MS16_TT_Sk.	9.3.4	c14103	
12	The AU4-4c cAIS is reported only if AU4-4c AIS _reported is set to TRUE by the NEM. By default AU4-4c cAIS_reported is set to FALSE.	9.3.4	c14103	
13	Under HO dLOP detection the MS16/S4-4c_A_Sk generates a HO cLOP report.	9.3.4	c14103	
14	All the generated fault cause (cXXX) are reported to the EMF.	ETS 300 417-1-1 [1] subclause 8.1, figure 36	m	

c14101: IF G.1/3 THEN m ELSE n/a -- MS16_TT_Sk present
c14102: IF G. 1/5 THEN m ELSE n/a -- MS16/S4_A_Sk present
c14103: IF G. 1/13 THEN m ELSE n/a -- MS16/S4-4c_A_Sk present

G.4.5.5 Performance monitoring

G.4.5.5.1 Near end performance monitoring

Table G.142: pN_DS performance parameter

Prerequisite: G.7/1 -- Near-end performance monitoring process supported

Item	pN_DS performance parameter	Reference	Status	Support
1	The MS16_TT_Sk indicates a MS16 pN_DS every second with at least one occurrence of MS16 aTSF or an equipment defect (dEQ) and reports it to the EMF.	9.2.2	m	

Table G.143: pN_EBC performance parameter

Prerequisite: G.7/1 -- Near-end performance monitoring process supported

Item	pN_EBC performance parameter	Reference	Status	Support
1	Every second the MS16_TT_Sk counts the number of MS16 Near-end Errored Block (MS16 N_Bs) within that second as the MS16 pN_EBC (MS16 Near-end Error Block Count) and reports it to the EMF.	9.2.2	m	

Comments: A "Near-end Block" (N_B) is errored if one or more BIP-24 violations are detected.

G.4.5.5.2 Far end performance monitoring

Table G.144: pF_DS performance parameter

Prerequisite: G.7/2 -- Far-end performance monitoring process supported

Item	pF_DS performance parameter	Reference	Status	Support
1	The MS16_TT_Sk indicates a MS16 pF_DS every second with at least one occurrence of MS16 dRDI and reports it to the EMF.	9.2.2	m	

Table G.145: pF_EBC performance parameter

Prerequisite: G.7/2 -- Far-end performance monitoring process supported

Item	pF_EBC performance parameter	Reference	Status	Support
1	Every second the MS16_TT_Sk counts the number of MS16 Far-end Errored Block (MS16 F_Bs) within that second as the MS16 pF_EBC (MS16 Far-end Error Block Count) and reports it to the EMF.	9.2.2	m	

Comments: A "Far-end Block" (F_B) is errored if the REI count indicates one or more errors.

G.4.5.5.3 Pointer performance monitoring

Table G.146: PJE performance parameter

Prerequisite: G.7/3 -- Pointer performance monitoring process supported

Item	PJE performance parameter	Reference	Status	Support
1	Every second the number of generated AU-4 pointer increments is counted as the HO pPJE+ and reported to the EMF.	9.3.1	c14601	
2	Every second the number of generated AU-4-4c pointer increments is counted as the HO pPJE+ and reported to the EMF.	9.3.3	c14602	
3	Every second the number of generated AU-4 pointer decrements within that second is counted as the HO pPJE- and reported to the EMF.	9.3.1	c14601	
4	Every second the number of generated AU-4-4c pointer decrements within that second is counted as the HO pPJE- and reported to the EMF.	9.3.3	c14602	

c14601: IF G.1/4 THEN m ELSE n/a -- MS16/S4_A_So present
c14602: IF G.1/12 THEN m ELSE n/a -- MS16/S4-4c_A_So present

G.4.6 MS16 linear trail protection defect, fault and performance monitoring tables

G.4.6.1 Defect detection and clearance criteria

Table G.147: Protection Architecture Mismatch defect (dPAM)

Prerequisite: G.4/3 OR G.4/4 OR G.4/5 -- bi-directional switching supported

Item	Protection Architecture Mismatch defect (dPAM)	Reference	Status	Support
1	The MS16P dPAM is detected if the received APS Architecture (RARCH) value differs from the local architecture type (ARCHtype) for a period of 50 ms.	A.9	**m**	
2	The MS16P dPAM is cleared when the there is again a match between the received APS Architecture (RARCH) value and the local architecture type (ARCHtype).	A.9	m	

Comments: This defect concerns the APS interpretation process.

Table G.148: Invalid Command defect (dINV)

Prerequisite: G.4/3 OR G.4/4 OR G.4/5 -- bi-directional switching supported

Item	Invalid Command defect (dINV)	Reference	Status	Support
1	The MS16P dINV is detected if the request type bits (RT) in the APS signal indicate an invalid request code, or the RSN or LBSC indicate a non-existing trail signal number for Y ms.	A.9	m	
2	The MS16P dINV is cleared when the RT indicates a valid code and the RSN or LBSN indicate an existing signal number.	A.9	m	

Comments: This defect concerns the APS interpretation process.

Table G.149: INV defect parameters value

Prerequisite: G.4/3 OR G.4/4 OR G.4/5 -- bi-directional switching supported

Item	INV defect parameters value	Reference	Status	Support	Values	
1					Allowed	Supported
1	MS16P dINV parameter (Y)	A.9	m		TBD	

Table G.150: Acknowledge Timeout defect (dTMOUT)

Prerequisite: G.4/3 OR G.4/4 OR G.4/5 -- bi-directional switching supported

Item	Acknowledge Timeout defect (dTMOUT)	Reference	Status	Support
1	The MS16P dTMOUT is detected if a head end response on a tail end request does not comply to the protocol within a period of 50 ms.	A.9	m	
2	The MS16P dTMOUT is cleared when the head-end response complies again.	A.9	m	
3	The MS16P dTMOUT is cleared if the protection trail is in SF condition.	A.9	m	

Comments: This defect concerns the global request priority process.

Table G.151: Selector Control Mismatch defect (dSCM)

Prerequisite: G.4/3 OR G.4/4 OR G.4/5 -- bi-directional switching supported

Item	Selector Control Mismatch defect (dSCM)	Reference	Status	Support
1	The MS16P dSCM is detected if a mismatch between RRSN and GRSN persists for Y ms.	A.9	m	
2	The MS16P dSCM is cleared when RRSN is identical to GRSN.	A.9	m	
3	The MS16P dSCM is cleared if the protection trail is in SF condition.	A.9	m	

Comments: This defect concerns the selector control.

Table G.152: SCM defect parameters value

Prerequisite: G.4/3 OR G.4/4 OR G.4/5 -- bi-directional switching supported

Item	INV defect parameters value	Reference	Status	Support	Values	
					Allowed	Supported
1	MS16P dSCM parameter (Y)	A.9	m		TBD	

G.4.6.2 Consequent action activation and clearance criteria

Table G.153: Null signal insertion

Prerequisite: G.1/15 -- 1:n MS Linear Trail Protection supported

Item	Null signal insertion	Reference	Status	Support
1	If neither the extra traffic nor a normal signal input is to be connected to the protection section output, the null signal is connected to the protection output.	9.5.1.2	m	
2	If the extra traffic output (if applicable) is disconnected from the protection input it is set to all-ONEs signal (AIS).	9.5.1.2	c15301	

c15301: IF /6 THEN m ELSE n/a -- Extra traffic channel supported

Table G.154: Server Signal Fail action (aSSF)

Prerequisite: G.1/15 -- 1:n MS Linear Trail Protection supported

Item	Server Signal Fail action (aSSF)	Reference	Status	Support
1	The MS16P1:n_C sets the CI_SSF to TRUE on the extra traffic connection point if the extra traffic output (if applicable) is disconnected from the protection input.	9.5.1.2	c15401	
2	The MS16/MS16P_A_Sk sets CI_SSF to TRUE on AI_TSF reception.	9.5.3.2	c15402	
3	The MS16/MS16P_A_Sk sets CI_SSF to FALSE when there is (are) no more defect(s) active.	9.5.3.2	c15402	

c15401: IF (G.1/15 AND G.68/6) THEN m ELSE n/a -- 1:n MS Linear Trail Protection and extra traffic channel present

c15402: IF G.5/5 THEN m ELSE n/a -- MS16/MS16P_A_Sk present

Table G.155: Trail Signal Fail action (aTSF)

Prerequisite: G.5/3 -- MS16P_TT_Sk present

Item	Trail Signal Fail action (aTSF)	Reference	Status	Support
1	The MS16P_TT_Sk sets AI_TSF to TRUE on CI_SSF reception.	9.5.2.2	m	
2	The MS16P_TT_Sk sets AI_TSF to FALSE when there is (are) no more defect(s) active.	9.5.2.2	m	

Table G.156: Server Signal Degrade action (aSSD)

Prerequisite: G.5/5 -- MS16/MS16P_A_Sk present

Item	Server Signal Degrade action (aSSD)	Reference	Status	Support
1	The MS16/MS16P_A_Sk sets CI_SSD to TRUE on AI_TSD reception.	9.5.3.2	m	
2	The MS16/MS16P_A_Sk sets CI_SSD to FALSE when there is (are) no more defect(s) active.	9.5.3.2	m	

Table G.157: Selector release

Prerequisite: G.4/3 OR G.4/4 OR G.4/5 -- -- bi-directional switching supported

Item	Selector release	Reference	Status	Support
1	The selector is released if one or more of the four defects dPAM, dSCM, dTMOUT, dINV is active.	A.9	m	

Comments: This consequent action concerns the selector control.

G.4.6.3 Defect correlation

Table G.158: Defect correlation

Prerequisite: G.7/5 AND (G.1/14 OR G.1/15) -- Fault management process supported and STM-16 Linear Trail Protection supported

Item	Defect correlation	Reference	Status	Support
1	Under MS16P dSCM detection a MS16P cFOP (Failure Of Protocol) report is generated.	A.9	c15801	
2	Under MS16P dPAM detection a MS16P cFOP (Failure Of Protocol) report is generated.	A.9	c15801	
3	Under MS16P dTMOUT detection a MS16P cFOP (Failure Of Protocol) report is generated.	A.9	c15801	
4	Under MS16P dINV detection a MS16P cFOP (Failure Of Protocol) report is generated.	A.9	c15801	
5	Under MS16P CI_SSF reception a MS16P cSSF report is generated.	9.5.2.2	c15802	
6	The MS16P cSSF is reported only if selected MS16P SSF_reported is set to TRUE by the NEM. By default MS16P SSF_reported is set to FALSE.	9.5.2.2	c15802	
7	All the generated fault cause (cXXX) are reported to the EMF.	ETS 300 417-1-1 [1] subclause 8.1, figure 36	m	

c15801: IF (G.4/3 OR G.4/4 OR G.4/5) THEN m ELSE n/a -- bi-directional switching supported
c15802: IF G.5/3 THEN m ELSE n/a -- MS16P_TT_Sk present

G.4.6.4 Performance monitoring

Table G.159: pPSC performance parameter

Prerequisite: G.7/4 AND (G.1/14 OR G.1/15) -- Protection performance monitoring process supported and STM-16 Linear Trail Protection supported

Item	pPSC performance parameter	Reference	Status	Support
1	Every second the MS16P1+1_C indicates as MS16P pPSC (Protection Switching Count) the number of Protection Switching actions within that second and reports it to the EMF.	A.9	c15901	
2	Every second the MS16P1:n_C indicates as MS16P pPSC (Protection Switching Count) the number of Protection Switching actions within that second and reports it to the EMF.	A.9	c15902	

c15901: IF G.1/14 THEN m ELSE n/a -- 1+1 MS Linear Trail Protection supported
c15902: IF G.1/15 THEN m ELSE n/a -- 1:n MS Linear Trail Protection supported

Table G.160: pPSD performance parameter

Prerequisite: G.4/3 AND (G.4/1 OR G.4/3 OR G.4/5) -- Protection performance monitoring process supported and revertive protection supported

Item	pPSD performance parameter	Reference	Status	Support
1	Every second that the normal signal #i is not selected from the Working trail #i is reported as a pPSD/i (i≥1) to the EMF.	A.9	m	
2	Every second that the normal signal is selected from the Protection trail is reported as a pPSD/0 to the EMF.	A.9	m	

G.4.7 MS16 two-fibre shared protection ring defect, fault and performance monitoring tables

G.4.7.1 Defect detection and clearance criteria

NOTE: Currently none of the two-fibre Shared Protection Ring functions has to detect defects. The MS16P2fsh_C has to detect some defects which are for further study.

G.4.7.2 Consequent action activation and clearance criteria

Table G.161: Server Signal Fail action (aSSF)

Prerequisite: G.6/5 -- MS16/MS16P2fsh_A_Sk present

Item	Server Signal Fail action (aSSF)	Reference	Status	Support
1	The MS16/MS16P2fsh_A_Sk sets CI_SSF to TRUE on AI_TSF reception.	9.6.3.2	m	
2	The MS16/MS16P2sh_A_Sk sets CI_SSF to FALSE when there is (are) no more defect(s) active.	9.6.3.2	m	

Table G.162: Trail Signal Fail action (aTSF)

Prerequisite: G.6/3 -- MS16P2fsh_TT_Sk present

Item	Trail Signal Fail action (aTSF)	Reference	Status	Support
1	The MS16P2fsh_TT_Sk sets AI_TSF to TRUE on CI_SSF reception.	9.6.2.2	m	
2	The MS16P2fsh_TT_Sk sets AI_TSF to FALSE when there is (are) no more defect(s) active.	9.6.2.2	m	

Table G.163: Server Signal Degrade action (aSSD)

Prerequisite: G.6/5 -- MS16/MS16P2fsh_A_Sk present

Item	Server Signal Degrade action (aSSD)	Reference	Status	Support
1	The MS16/MS16P2fsh_A_Sk sets CI_SSD to TRUE on AI_TSD reception.	9.6.3.2	m	
2	The MS16/MS16P2fsh_A_Sk sets CI_SSD to FALSE when there is (are) no more defect(s) active.	9.6.3.2	m	

Table G.164: Insertion of unequipped signals

Prerequisite: G.6/1 -- MS16P2fsh_C present

Item	Trail Signal Fail action (aTSF)	Reference	Status	Support
1	The MS16P2fsh_C function generates a VC-4 [VC-4-Xc] unequipped signal (plus valid AU-4 [AU-4-Xc] pointer) for each protection timeslot when this protection timeslot is not in use.	9.6.1	m	

Table G.165: Insertion of all-ONEs signals (AIS), squelching

Prerequisite: G.6/1 -- MS16P2fsh_C present

Item	Trail Signal Fail action (aTSF)	Reference	Status	Support
1	The MS16P2fsh_C function inserts all-ONEs signal (AIS) for an AU-4 [AU-4-xc] within protection timeslots that would otherwise be misconnected.	9.6.1	m	

G.4.7.3 Defect correlation

Table G.166: Defect correlation

Prerequisite: G.7/4 AND G.6/3 -- Fault management process supported and MS16P2fsh_TT_Sk present

Item	Defect correlation	Reference	Status	Support
1	Under MS16P2fsh CI_SSF reception a MS16P2fsh cSSF report is generated.	9.6.2.2	m	
2	The MS16P2fsh cSSF is reported only if selected MS16P2fsh SSF_reported is set to TRUE by the NEM. By default MS16P2fsh SSF_reported is set to FALSE.	9.6.2.2	m	
3	All the generated fault cause (cXXX) are reported to the EMF.	ETS 300 417-1-1 [1] subclause 8.1, figure 36	m	

NOTE: Currently for the MS16P2fsh_C fault management processes are for further study.

G.4.7.4 Performance monitoring

NOTE: Currently none of the two-fibre Shared Protection Ring functions has to monitor any performance parameter, with the exception of the MS16P2fsh_C, for which the performance monitoring processes are for further study.

History

Document history			
August 1996	Public Enquiry	PE 112:	1996-08-19 to 1996-12-13
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