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Foreword

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

This second edition of ETS 300 147 (1995) supersedes the first edition of ETS 300 147 (1992).

This ETS provides inter-vendor and inter-operator compatibility and is based on ITU-T Recommendations G.707 [1], G.708 [2] and G.709 [3].

Transposition dates	
Date of latest announcement of this ETS (doa):	30 April 1995
Date of latest publication of new National Standard or endorsement of this ETS (dop/e):	31 October 1995
Date of withdrawal of any conflicting National Standard (dow):	31 October 1995

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1 Scope

This European Telecommunication Standard (ETS) specifies the hierarchical bit rates, the multiplexing structure and the mapping schemes to be used in the transmission networks based on Synchronous Digital Hierarchy (SDH).

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]   ITU-T Recommendation G.707 (1993): "Synchronous digital hierarchy bit rates".

[2]   ITU-T Recommendation G.708 (1993): "Network node interface for the synchronous digital hierarchy".

[3]   ITU-T Recommendation G.709 (1993): "Synchronous multiplexing structure".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of this ETS, the definitions given in ITU-T Recommendation G.708 [2] apply.

3.2 Abbreviations

For the purposes of this ETS the following abbreviations apply.

ATM	Asynchronous Transfer Mode
AU-n	Administrative Unit-n
AUG	Administrative Unit Group
N	Normative
N/R	Not Relevant
POH	Path Overhead
SDH	Synchronous Digital Hierarchy
SOH	Section Overhead
STM-N	Synchronous Transport Module-N
TU-n	Tributary Unit-n
TUG(-n)	Tributary Unit Group (-n)
VC-n	Virtual Container-n

4 Hierarchical bit rates

The hierarchical bit rates used in the SDH transmission network shall be according to ITU-T Recommendation G.707 [1].

5 Basic multiplexing structure

The basic SDH multiplexing structure shall be as described in figure 1.

> NOTE 1: This SDH multiplexing structure is a subset of the SDH multiplexing structure defined in ITU-T Recommendation G.709 [3].

> NOTE 2: The order of transmission of information in all diagrams in ITU-T Recommendation G.709 [3] is first from left to right and then from top to bottom. Within each byte, the most significant bit is transmitted first. The most significant bit (bit 1) is illustrated at the left in all diagrams.

6 Multiplexing method and mapping

The multiplexing method and mapping are given in ITU-T Recommendation G.709 [3] together with the following statements and modifications.

As ITU-T Recommendation G.709 [3] was written as a recommendation, table 1 also gives indication of the status of each requirement (i.e. Normative or Not Relevant).

Definitions:

Normative (N): requirements with which it is necessary to comply in order to be able to claim compliance with this ETS.

Not Relevant (N/R): section/subsection is not relevant to this ETS.

This ETS is not an equipment specification. The fact that a requirement is defined as normative does not imply that the associated function has to be implemented but means that, if implemented, the function shall be implemented in accordance with this requirement.

Table 1: Modifications and statements to ITU-T Recommendation G.709 [3]

1	General	
1.1	Abbreviations	N
1.2	Basic multiplexing structure (see Clause 5 of this ETS)	N/R
2	Multiplexing Method	
2.1	Multiplexing of Administrative Units into STM-N	
2.1.1	Multiplexing of Administrative Unit Groups (AUGs) into STM-N	N
2.1.2	Multiplexing of AU-4s via AUG	N
2.1.3	Multiplexing of AU-3s via AUG	N/R
2.2	Multiplexing of Tributary Units into VC-4 and VC-3	
2.2.1	Multiplexing of Tributary Unit Group-3s (TUG-3s) into a VC-4	N
2.2.2	Multiplexing of TU-3s via TUG-3	N
2.2.3	Multiplexing of TUG-2s via TUG-3	N
2.2.4	Multiplexing of TUG-2s into a VC-3	N/R
2.2.5	Multiplexing of TU-2s via TUG-2s	N
2.2.6	Multiplexing of TU-1s via TUG-2s	N
	In this subsection, reference to TU-11 is N/R	
2.3	Maintenance signals	
2.3.1	Section maintenance signals	N
2.3.2	Path maintenance signals	N
	In this section 2.3.2, reference to AU-3 is N/R	
2.4	Timing recovery	N
3	Pointers	
3.1	AU pointer	N
	In this section 3.1, all the references to AU-3 are N/R	
3.1.1	AU pointer location	N
3.1.2	AU pointer value	N
3.1.3	Frequency justification	N
3.1.4	New Data Flag	N
3.1.5	Pointer generation	N
3.1.6	Pointer interpretation	N
3.1.7	AU-4 concatenation	N
3.1.7.1	Pointer generation	N
3.1.7.2	Pointer interpretation	N
3.2	TU-3 pointer	N
3.2.1	TU-3 pointer location	N
3.2.2	TU-3 pointer value	N
3.2.3	Frequency justification	N
3.2.4	New Data Flag	N
3.2.5	Pointer generation	N
3.2.6	Pointer interpretation	N
3.3	TU-1/TU-2 pointer	N
	In this section 3.3, all the references to TU-11 are N/R	
3.3.1	TU-1/TU-2 pointer location	N
3.3.2	TU-1/TU-2 pointer value	N
3.3.3	TU-1/TU-2 multiframe indication byte	N
	In this section 3.3, references to VC-3 are N/R	

(continued)

Table 1 (concluded): Modifications and statements to ITU-T Recommendation G.709 [3]

3.3.4	TU-1/TU-2 frequency justification	N
3.3.5	TU-1/TU-2 sizes	N
3.3.6	New Data Flag	N
3.3.7	TU Concatenation	N
3.3.7.1	Concatenation of Contiguous TU-2s in the Higher Order VC-3	N/R
3.3.7.2	Sequential Concatenation of TU-2s in the Higher Order VC-4	N/R
3.3.7.3	Virtual Concatenation of TU-2s in the Higher Order VC-4	N
3.3.8	TU pointer generation and interpretation In this subsection, item 4 dealing with concatenation Indication is N/R	N
4	Path Overhead description	
4.1	VC-3/VC-4/VC-4-Xc POH In this section, note 3 dealing with C2 byte mapping code is N/R	N
4.2	VC-1/VC-2 POH	N
4.3	CRC-7 polynomial algorithm	
4.3.1	Multiplication/division process	N
4.3.2	Encoding procedure	N
4.3.3	Decoding procedure	N
5	Mapping of tributaries into VCs In Figure 5.1/G.709, the reference to TU-11 is N/R	N
5.1	Mapping of tributaries into VC-4	
5.1.1	Asynchronous mapping of 139 264 kbit/s	N
5.2	Mapping of tributaries into VC-3	
5.2.1	Asynchronous mapping of 44 736 kbit/s	N
5.2.2	Asynchronous mapping of 34 368 kbit/s	N
5.3	Mapping of tributaries into the VC-2	
5.3.1	Byte synchronous mapping of 8 448 kbit/s	N/R
5.3.2	Asynchronous mapping of 6 312 kbit/s	N/R
5.3.3	Bit synchronous mapping of 6 312 kbit/s	N/R
5.3.4	Byte synchronous mapping of 6 312 kbit/s	N/R
5.4	Mapping of tributaries into VC-12	
5.4.1	Asynchronous mapping of 2 048 kbit/s	N
5.4.2	Bit synchronous mapping of 2 048 kbit/s	N/R
5.4.3	Byte synchronous mapping of 2 048 kbit/s (note)	N
5.5	Mapping of tributaries into VC-11	
5.5.1	Asynchronous mapping of 1 544 kbit/s	N
5.5.2	Bit synchronous mapping of 1 544 kbit/s	N
5.5.3	Byte synchronous mapping of 1 544 kbit/s	N
5.6	VC-11 to VC-12 conversion for transport by a TU-12	N
5.7	Floating and locked mode conversion	N/R
5.8	Mapping of ATM cells	N
5.8.1	Mapping of ATM cells into VC-4	N
5.8.2	Mapping of ATM cells into the VC-4-Xc	N
5.8.3	Mapping of ATM cells into other VCs	N
NOTE:	The byte synchronous mapping shall be used for the support of CCITT Recommendation G.704 2 048 kbit/s signals which are, under normal conditions, traceable to a CCITT Recommendation G.811 clock, when visibility of the 64 kbit/s structure is required.	

For abbreviations used in table 1, see subclause 3.2.

7   Section Overhead (SOH) bytes

For the purposes of this ETS the SOH bytes location and description given in ITU-T Recommendation G.708 [2] § 5.2 apply.

8   Conformance testing

A SDH based interface can contain any one of a very large number of multiplexing possibilities depending upon the signals being transported over the interface. Recognising this variety and the fact that the interface terminates on network elements, SDH equipment function standards are based on the identification of atomic functions which are then rigorously specified in terms of information flows into and out of the atomic functions.

Conformance testing is concerned with testing the functional blocks contained within a network element. Conformance testing is performed using a SDH interface(s) to exercise the functional block. Conformance testing principles will, therefore, be associated with the relevant equipment function standards.

Figure 1: Multiplexing structure
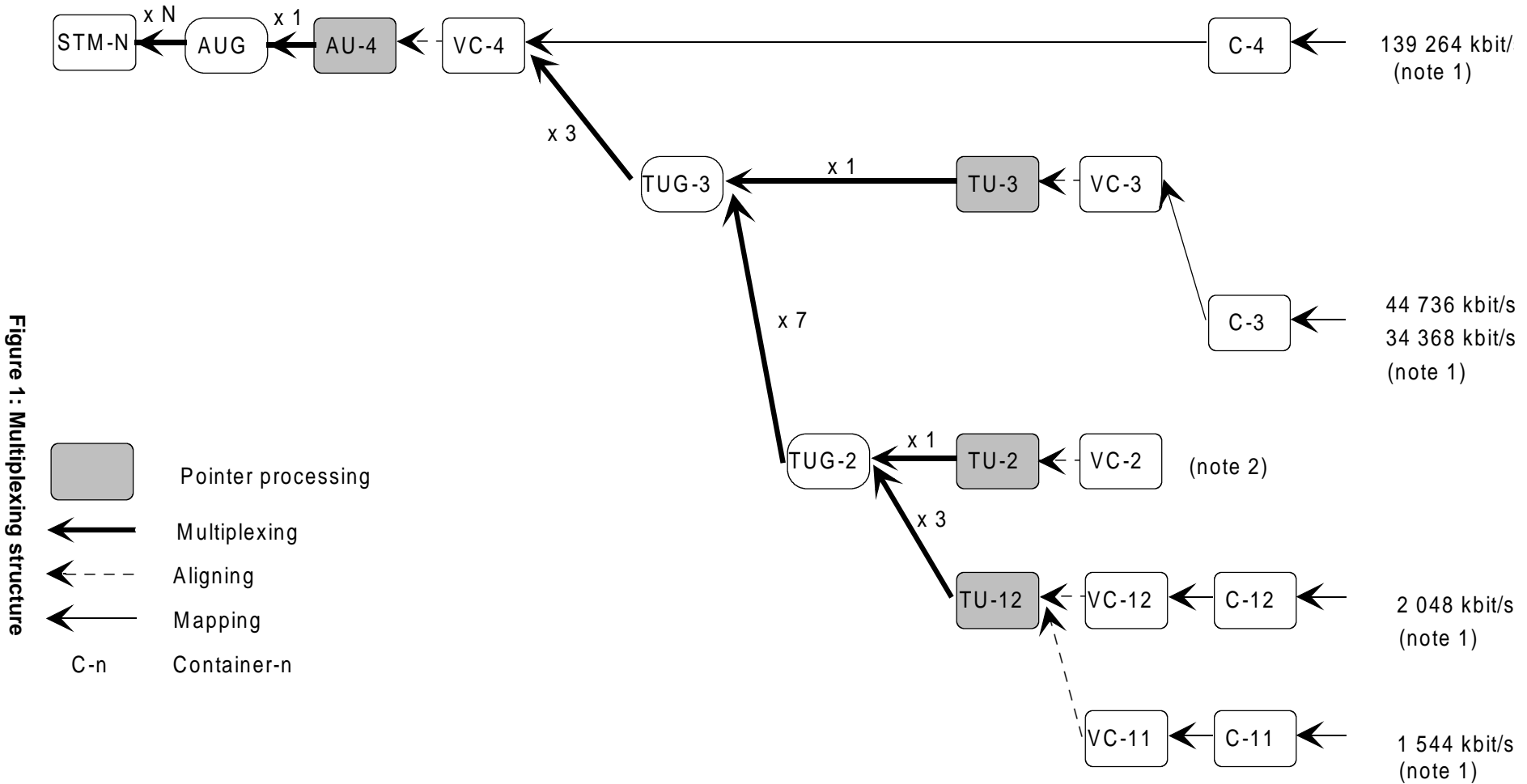
NOTE 1:   CCITT Recommendation G.702 tributaries associated with containers C-x are shown.
Other signals, e.g. ATM, can also be accomodated.

NOTE 2:   Virtual concatenation of VC-2 could be used for the transport of new services of
non-hierarchical bit rates.

Annex A (informative): Bibliography

The following references are given for information.

1)   CCITT Recommendation G.702: "Digital hierarchy bit rates".

2)   CCITT Recommendation G.704: "Synchronous frame structures used at primary and secondary hierarchical levels".

3)   CCITT Recommendation G.811: "Timing requirements at the outputs of primary reference clocks suitable for plesiochronous operation of international digital links".

History

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