



EUROPEAN
TELECOMMUNICATION
STANDARD

ETS 300 167

August 1993

Source: ETSI TC-TM

Reference: DE/TM-3006

ICS: 33.020, 33.040.40

Key words: Transmission, multiplexing, interfaces

**Transmission and Multiplexing (TM);
Functional characteristics
of 2 048 kbit/s interfaces**

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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 ETS aims at providing inter-vendor and inter-operator compatibility for synchronous frame structures based on CCITT Recommendations G.704 [1] used at primary hierarchical levels and G.706 [2] on frame alignment and Cyclic Redundancy Check (CRC) procedures relating to basic frame structures defined in CCITT Recommendation G.704 [1].

The conformance testing requirements corresponding to the specifications contained in this ETS are to be specified in a different ETS.

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1 Scope

This ETS describes the synchronous frame structures and the frame alignment and Cyclic Redundancy Check (CRC) procedures relevant to 2 048 kbit/s interfaces based on CCITT Recommendations G.704 [1] and G.706 [2].

2 Normative references

This ETS incorporates by dated or 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] CCITT Recommendation G.704 (1990): "Synchronous frame structures used at primary and secondary hierarchical levels CCITT blue book III.4 modified according to COM XVIII - R 33 report".
- [2] CCITT Recommendation G.706 (1990): "Frame alignment and cyclic redundancy check (CRC) procedures relating to basic frame structures defined in Recommendation G.704 CCITT blue book III.4 modified according to COM XVIII - R 33 report".

3 Definitions

For the purposes of this ETS, there are no terms needing a specific definition.

4 Abbreviations

For the purposes of this ETS, the following abbreviation applies:

CRC Cyclic Redundancy Check

5 Requirements

As CCITT Recommendations G.704 [1] and G.706 [2] were written as recommendations, for the purpose of compliance with this ETS the statements given in tables 1 and 2 provide indications on the status of the requirements (i.e. normative, informative or not relevant).

Definitions:

N = normative: requirements with which it shall be necessary to comply in order to be able to claim compliance with this ETS. Therefore, functions and features in Clauses/subclauses of CCITT Recommendations G.704 [1] and G.706 [2], stated as being normative in this ETS, shall be implemented and followed even if the text is given as a recommendation or as an example.

I = informative: the text of this Clause/subclause is provided for information only. Titles for Clauses and subclauses are marked as informative when the requirements are given in further subclauses.

N/R = not relevant: this Clause/subclause is not relevant to this ETS.

Table 1: Modifications and statements to CCITT Recommendation G.704 [1]

Clause/subclause	Title	Statement
1	General	N
2.1	Basic frame structure at 1 544 kbit/s	N/R
2.2	Basic frame structure at 6 312 kbit/s	N/R
2.3	Basic frame structure at 2 048 kbit/s	I
2.3.1	Frame length	N
2.3.2	Allocation of bits number 1 to 8 of the frame	N
2.3.3	Description of the CRC-4 procedure in bit 1 of the frame	N
2.4	Basic frame structure at 8 448 kbit/s	N/R
3	Characteristics of frame structures carrying channels at various bit rates in 1 544 kbit/s	N/R
4	Characteristics of frame structures carrying channels at various bit rates in 6 312 kbit/s	N/R
5	Characteristics of frame structures carrying channels at various bit rates in 2 048 kbit/s interfaces	N
5.1	Interface at 2 048 kbit/s carrying 64 kbit/s channels	I
5.1.1	Frame structure	N
5.1.2	Use of other 64 kbit/s channel time slots	N
5.1.3	Signalling	N
5.2	Interface at 2 048 kbit/s carrying n x 64 kbit/s	N
5.2.1	One n x 64 kbit/s signal on the tributary side of a multiplex equipment	N (NOTE)
5.2.2	One or more n x 64 kbit/s signals on the multiplexed signal side of a multiplexing equipment	N (NOTE)
6	Characteristics of frame structures carrying channels at various bit rates in 8 448 kbit/s interface	N/R
Annex A	Examples of CRC implementations using shift registers	
A.1	CRC-6 procedure for interface at 1 544 kbit/s	N/R
A.2	CRC-5 procedure for interface at 6 312 kbit/s	N/R
A.3	CRC-4 procedure for interface at 2 048 kbit/s	I
NOTE: Inside the network of a network operator the time slots composing an n x 64 kbit/s signal need not be contiguous.		

Table 2: Modifications and statements to CCITT Recommendation G.706 [2]

Clause/subclause	Title	Statement
1	General	I
2	Frame alignment and CRC procedures at 1 544 kbit/s interface	N/R
3	Frame alignment and CRC procedures at 6 312 kbit/s interface	N/R
4	Frame alignment and CRC procedures at 2 048 kbit/s interface	I
4.1	Loss and recovery of frame alignment	I
4.1.1	Loss of frame alignment	N
4.1.2	Strategy for frame alignment recovery	N
4.2	CRC multiframe alignment using information in bit 1 of the basic frame	N
4.3	CRC bit monitoring	N
4.3.1	Monitoring procedure	N
4.3.2	Monitoring for false frame alignment	N
4.3.3	Error performance monitoring using CRC-4	N
5	Frame alignment and CRC procedures at 8 448 kbit/s interface	N/R
Annex A	Background information on the use of CRC procedures.	
A.1	Reasons for application of CRC	I
A.1.1	Protection against false frame alignment	I
A.1.2	Bit error monitoring	I
A.2	Limitations of CRC procedures	I
A.2.1	Probability of undetected bit errors	I
A.2.2	Limitation of application to error ratio measurement	I
Annex B	Modified CRC multiframe alignment algorithm to allow automatic interworking between equipment with and without CRC-4 capability	N
Annex C	CRC-4 checksum updating procedure at intermediate path points in a message-based data-link application	N

History

Document history	
August 1993	First Edition
January 1996	Converted into Adobe Acrobat Portable Document Format (PDF)