INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

G.707/Y.1322
Amendment 1
(11/2001)

SERIES G: TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS

Digital terminal equipments – General

SERIES Y: GLOBAL INFORMATION INFRASTRUCTURE AND INTERNET PROTOCOL ASPECTS

Internet protocol aspects – Transport

Network node interface for the synchronous digital hierarchy (SDH)
Amendment 1

ITU-T Recommendation G.707/Y.1322 (2000) – Amendment 1

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TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS

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ITU-T Recommendation G.707/Y.1322

Network node interface for the synchronous digital hierarchy (SDH)

AMENDMENT 1

Summary

This document contains the Amendment 1 to ITU-T Rec. G.707/Y.1322 (10/2000).

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, ITU had received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

CONTENTS

ITU-T Recommendation G.707/Y.1322

Network node interface for the synchronous digital hierarchy (SDH)

AMENDMENT 1

This amendment contains editorial and technical additions to the 2000 version of ITU-T Rec. G.707.

1)   Clause 2, References

Insert the following references:

–   ITU-T Recommendation G.7041/Y.1303 (2001), *Generic framing procedure* (*GFP*).

–   ITU-T Recommendation G.7042/Y.1305 (2001), *Link Capacity Adjustment Scheme (LCAS) for virtual concatenated signals*.

2)   Clause 4, Acronyms and abbreviations – for LCAS

Insert the following abbreviations:

CRC   Cyclic Redundancy Check

CTRL   Control word sent from source to sink

DNU   Do Not Use

EOS   End of Sequence

GID   Group Identification

LCAS   Link Capacity Adjustment Scheme

MFI   Multiframe Indicator

MST   Member Status

NORM   Normal Operating Mode

RS-Ack   Re-sequence Acknowledge

SQ   Sequence Indicator

VCG   Virtual Concatenation Group

3)   Clause 9.3.1.3, Signal label: C2 – additional codes

Insert the following two rows to Table 9-11:

0 0 0 1	1 1 0 0	1C	Mapping of 10 Gbit/s Fibre Channel frames (Note 8)

1 1 0 1	0 0 0 0	D0	Reserved for proprietary use
…	…	…	
1 1 0 1	1 1 1 1	DF	

4) New clause 10.6, Mapping of GFP frames

Add the following clause:

10.6 Mapping of GFP frames

The GFP frame stream is mapped into a Container-n (n = 11, 12, 2, 3, 4, 4-Xc, 11/12/2/3/4-Xv) with its byte boundaries aligned with the byte boundaries of the Container-n (see Figure 10-26). The Container-n is then mapped into the VC-n respectively, together with the associated POH as specified in 9.3. The GFP frame boundaries are thus aligned with the VC-n byte boundaries. Since the Container-n capacity is not an integer multiple of the variable length GFP frame, a GFP frame may cross a Container-n frame boundary.
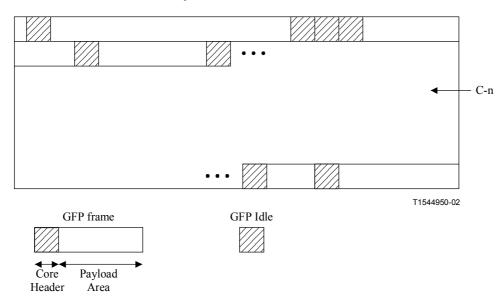

Figure 10-26/G.707/Y.1322 – Mapping of GFP frames into C-n

A GFP frame consists of a GFP core header and a GFP payload area. GFP frames arrive as a continuous byte stream with a capacity that is identical to the VC payload, due to the insertion of GFP Idles at the GFP adaptation stage. See also ITU-T Rec. G.7041/Y.1303.

NOTE – There is no rate adaptation or scrambling required at the mapping stage. The GFP adaptation process performs these functions.

5) New clause 11.2.1, Higher order LCAS for VC-n-Xv (n = 3, 4)

11.2.1 Higher order LCAS for VC-n-Xv (n = 3, 4)

Table 11-1a depicts the modified VC-3, VC-4 H4 HO virtual concatenation 1st multiframe, as defined in 11.2, indicating the control codes used for the support of HO LCAS. See also ITU-T Rec. G.7042/Y.1305.

– Frame indicator: A combination of the 1st multiframe and the 2nd multiframe counter [0-4095].

– Sequence indicator: Number to identify each member in the VCG [0-255].

– CTRL: LCAS Control word, see Table 1/G.7042/Y.1305.

– GID: Group Identification bit.

–   Member status: The status report of the individual members uses a multiframe as shown in Table 11-1b. The status of all members (256) is transferred in 64 ms.

–   RS-Ack: Re-Sequence Acknowledge bit.

–   CRC: Eight-bit CRC check for fast acceptance of Virtual Concatenation OH. With this CRC-8 the probability of an undetected error is better than 1.52×10^{-16}. The CRC generator polynomial is $x^8 + x^2 + x + 1$.

Table 11-1a/G.707/Y.1322 – VC-n-Xv sequence and multiframe indicator H4 coding

H4 byte								1st multi-frame number	2nd multi-frame number
Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7	Bit 8		
				1st multiframe indicator MFI1 (bits 1-4)					
Sequence indicator MSBs (bits 1-4)				1	1	1	0	14	n–1
Sequence indicator LSBs (bits 5-8)				1	1	1	1	15	
2nd multiframe indicator MFI2 MSBs (bits 1-4)				0	0	0	0	0	
2nd multiframe indicator MFI2 LSBs (bits 5-8)				0	0	0	1	1	
CTRL				0	0	1	0	2	
GID ("000x")				0	0	1	1	3	
Reserved ("0000")				0	1	0	0	4	
Reserved ("0000")				0	1	0	1	5	
CRC-8				0	1	1	0	6	
CRC-8				0	1	1	1	7	n
Member status MST				1	0	0	0	8	
Member status MST				1	0	0	1	9	
RS-Ack ("000x")				1	0	1	0	10	
Reserved ("0000")				1	0	1	1	11	
Reserved ("0000")				1	1	0	0	12	
Reserved ("0000")				1	1	0	1	13	
Sequence indicator SQ MSBs (bits 1-4)				1	1	1	0	14	
Sequence indicator SQ LSBs (bits 5-8)				1	1	1	1	15	
2nd multiframe indicator MFI2 MSBs (bits 1-4)				0	0	0	0	0	
2nd multiframe indicator MFI2 LSBs (bits 5-8)				0	0	0	1	1	
CTRL				0	0	1	0	2	
GID ("000x")				0	0	1	1	3	N+1
Reserved ("0000")				0	1	0	0	4	
Reserved ("0000")				0	1	0	1	5	
CRC-8				0	1	1	0	6	
CRC-8				0	1	1	1	7	
Member status MST				1	0	0	0	8	

Table 11-1b/G.707/Y.1322 – H4 VC-n-Xv member status

2nd multiframe frame number	Member number				
0, 32, 64, 96, 128, 160, 192, 224	0	1	2	3	
	4	5	6	7	
1, 33, 65, 97, 129, 161, 193, 225	8	9	10	11	
	12	13	14	15	
. . .	. . .	. . .	. . .	. . .	Member status multiframe
30, 62, 94, 126, 158, 190, 222, 254	240	241	242	243	
	244	245	246	247	
31, 63, 95, 127, 159, 191, 223, 255	248	249	250	251	
	252	253	254	255	

NOTE 1 – There are 8 member statuses reported per VC-n-Xv frame. The 256 members require 32 frames at a frame rate of 2 ms each. This therefore results in the member status being refreshed every 64 ms if there is only one return channel.

NOTE 2 – The interpretation of the member status bits according to this table is based on the 2nd multiframe value at the moment the member status word is received. In the case of VC-3/4 this means that first the 2nd multiframe value is read from H4[1-4][0] and H4[1-4][1] – a value between 0 and 255 – and consequently this value is used (modulo 32) as an index for this table to identify the members of which the status is received in the H4[1-4][8] and H4[1-4][9] nibbles immediately after. This is still within the same 1st multiframe, but just in the next control packet.

11.2.1.1   High order control packet

The high order control packet consists of:

*   MST (Member status) field (two nibbles 1st multiframe #8 and #9);
*   RS-Ack (Re-Sequence Acknowledge) bit (bit 4 of nibble 1st multiframe #10);
*   SQ (Sequence Indicator) field (two nibbles 1st multiframe #14 and #15);
*   MFI2 (2nd Multiframe Indicator) (two nibbles 1st multiframe #0 and #1);
*   CTRL (Control word) field (one nibble 1st multiframe #2);
*   GID (Group Identification) bit (bit 4 of nibble 1st multiframe #3);
*   CRC-8 field (two nibbles 1st multiframe #6 and #7);
*   All other 1st multiframe nibbles (#11, #12, #13, #4 and #5) are reserved and should be set to "0000".

The high order control packet starts at 1st multiframe #8 and end at 1st multiframe #7 in the next multiframe as shown between the heavy lines in Table 11-1a.

6)   New clause 11.4.1, Lower order LCAS, VC-m-Xv (m = 11, 12, 2)

Add the following:

11.4.1   Lower order LCAS, VC-m-Xv (m = 11, 12, 2)

Figure 11-10 depicts the modified K4[2] LO virtual concatenation multiframe, as defined in 11.4, indicating the control codes used for the support of LO LCAS. See also ITU-T Rec. G.7042/Y.1305.

– Frame count: The multiframe counter [0-31].

– Sequence indicator: Number to identify each member in the VCG [0-63].

– CTRL: LCAS Control word, see Table 1/G.7042/Y.1305.

– GID: Group Identification bit.

– Member status: The status report of the individual members uses a multiframe as shown in Table 11-12. The status of all members (64) is transferred in 128 ms.

– RS-Ack: Re-Sequence Acknowledge bit.

– CRC: Three-bit CRC check for fast acceptance of Virtual Concatenation overhead. With this CRC-3 the probability of an undetected error in a signal with an average BER of 5.32×10^{-9}, is 4×10^{-30}. The CRC generator polynomial is $x^3 + x + 1$.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Frame Count					Sequence Indicator						CTRL				GID	Spare				RS-Ack	Member Status								CRC-3		

Figure 11-10/G.707/Y.1322 – K4[2] VC-m-Xv supporting LCAS coding

Table 11-12/G.707/Y.1322 – LO LCAS VC-m-Xv Frame-to-Member number relation

Frame number	Member number								
0, 8, 16, 24	0	1	2	3	4	5	6	7	Member status multiframe
1, 9, 17, 25	8	9	10	11	12	13	14	15	
2, 10, 18, 26	16	17	18	19	20	21	22	23	
3, 11, 19, 27	24	25	26	27	28	29	30	31	
4, 12, 20, 28	32	33	34	35	36	37	38	39	
5, 13, 21, 29	40	41	42	43	44	45	46	47	
6, 14, 22, 30	48	49	50	51	52	53	54	55	
7, 15, 23, 31	56	57	58	59	60	61	62	NA	
NOTE – There are eight member statuses reported per VC-m-Xv frame. The 63 members require eight frames at a frame rate of 16 ms each. This thus results in the member status being refreshed every 128 ms if there is only one return channel.									

11.4.1.1 Low order control packet

The low order control packet consists of:

- Frame Indicator (MFI) (five bits: 1 to 5);
- Sequence Indicator (SQ) field (six bits: 6 to 11);
- CTRL (control) field (four bits: 12 to 15);
- GID (Group Identification) bit (one bit: 16);
- RS-Ack (Re-Sequence Acknowledge) bit (one bit: 21);
- Member status (MST) field (eight bits: 22 to 29);
- CRC-3 field (three bits: 30 to 32);
- All other bits (#17, #18, #19 and #20) are reserved and should be set to '0'.

The control packet for low order LCAS starts and stops at the same frames as the original multiframe (see Figure 11-10).

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