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G.993.2

Corrigendum 3

(06/2009)

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

Digital sections and digital line system – Access networks

Very high speed digital subscriber line transceivers 2 (VDSL2)

Corrigendum 3

Recommendation ITU-T G.993.2 (2006) – Corrigendum 3

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ITU-T G-SERIES RECOMMENDATIONS

TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS

INTERNATIONAL TELEPHONE CONNECTIONS AND CIRCUITS	G.100–G.199
GENERAL CHARACTERISTICS COMMON TO ALL ANALOGUE CARRIER-TRANSMISSION SYSTEMS	G.200–G.299
INDIVIDUAL CHARACTERISTICS OF INTERNATIONAL CARRIER TELEPHONE SYSTEMS ON METALLIC LINES	G.300–G.399
GENERAL CHARACTERISTICS OF INTERNATIONAL CARRIER TELEPHONE SYSTEMS ON RADIO-RELAY OR SATELLITE LINKS AND INTERCONNECTION WITH METALLIC LINES	G.400–G.449
COORDINATION OF RADIOTELEPHONY AND LINE TELEPHONY	G.450–G.499
TRANSMISSION MEDIA AND OPTICAL SYSTEMS CHARACTERISTICS	G.600–G.699
DIGITAL TERMINAL EQUIPMENTS	G.700–G.799
DIGITAL NETWORKS	G.800–G.899
DIGITAL SECTIONS AND DIGITAL LINE SYSTEM	G.900–G.999
General	G.900–G.909
Parameters for optical fibre cable systems	G.910–G.919
Digital sections at hierarchical bit rates based on a bit rate of 2048 kbit/s	G.920–G.929
Digital line transmission systems on cable at non-hierarchical bit rates	G.930–G.939
Digital line systems provided by FDM transmission bearers	G.940–G.949
Digital line systems	G.950–G.959
Digital section and digital transmission systems for customer access to ISDN	G.960–G.969
Optical fibre submarine cable systems	G.970–G.979
Optical line systems for local and access networks	G.980–G.989
Access networks	**G.990–G.999**
MULTIMEDIA QUALITY OF SERVICE AND PERFORMANCE – GENERIC AND USER-RELATED ASPECTS	G.1000–G.1999
TRANSMISSION MEDIA CHARACTERISTICS	G.6000–G.6999
DATA OVER TRANSPORT – GENERIC ASPECTS	G.7000–G.7999
PACKET OVER TRANSPORT ASPECTS	G.8000–G.8999
ACCESS NETWORKS	G.9000–G.9999

For further details, please refer to the list of ITU-T Recommendations.

Recommendation ITU-T G.993.2

Very high speed digital subscriber line transceivers 2 (VDSL2)

Corrigendum 3

Summary

Corrigendum 3 to Recommendation ITU-T G.993.2 includes:

- Corrections to framing parameters for ROC (clauses 9.5.4, 12.3.5.2.1.1 and 12.3.5.2.1.3)
- Corrections to the delay constraint of the ROC in clause 9.7
- Corrections to SNR accuracy sample variance requirement in clause 11.4.1.1.3
- Correction to activation symbol for SOS in clause 13.3
- Corrections to interpretation of SOS-NTONES in clause 13.4.3.1.2

Source

Corrigendum 3 to Recommendation ITU-T G.993.2 (2006) was approved on 29 June 2009 by ITU-T Study Group 15 (2009-2012) under Recommendation ITU-T A.8 procedures.

FOREWORD

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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.

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CONTENTS

Recommendation ITU-T G.993.2

Very high speed digital subscriber line transceivers 2 (VDSL2)

Corrigendum 3

1) Clause 9.5.4

Revise the definition of the parameter, msg_p, in Table 9-6 in clause 9.5.4 as follows:

Table 9-6 – Framing parameters for latency path *p*

Parameter	Definition
Primary framing parameters	
...	
Derived framing parameters	
...	
msg_p	The message overhead data rate (for OH frame Type 1 only): $msg_p = OR_p \times \frac{SEQ_p - 6}{SEQ_p}$ kbit/s. The settings of framing parameters shall provide $msg_{min} < msg_p < msg_{max}$. The settings for msg_{min} and msg_{max} shall comply with the following conditions: 16 kbit/s ≤ msg_{min} ≤ ~~<248~~236 kbit/s; msg_{max} = 256 kbit/s.
...	

2) Clause 9.7

Revise clause 9.7 "Delay" as follows:

9.7 Delay

When the interleaver is disabled (interleaver depth = 1), the one-way delay between the α and β interfaces shall not exceed 2 ms.

The actual delay in milliseconds introduced by the interleaver to latency path *p* shall be computed as:

$$delay_p = \frac{S_p \times (D_p - 1)}{q_p \times f_s} \times \left(1 - \frac{q_p}{N_{FECp}}\right) \text{ ms},$$

where D_p is the interleaving depth set for the latency path *p*, S_p is the parameter defined in Table 9-6, q_p is the number of interleaver blocks in an FEC codeword for latency path *p*, N_{FECp} is the FEC codeword size for latency path *p*, and f_s is the data symbol rate in ksymbols/s.

The interleaver delay in milliseconds for the specific bearer channel *n* is constrained by the value of $delay\_max_n$ defined in the CO MIB.

For single latency with ROC mode, the value $delay_p$ for latency path #0 (the ROC) shall comply with:

$$delay_0 \leq 8 \text{ ms}.$$

Additionally, the framing parameters of the latency path #0 (the ROC) shall be chosen such that the ROC is robust to repetitive impulse noise at a frequency of 120 Hz. This may be achieved by selecting the framing parameters such that:

$$\frac{8 \times N_{FEC0} \times D_0}{L_0} \leq \left\lfloor \frac{f_s}{120\,\text{Hz}} \right\rfloor - 1.$$

3) Clause 11.4.1.1.3

Revise the text in clause 11.4.1.1.3 "Accuracy of signal-to-noise ratio per sub-carrier group (SNR-ps)" as follows:

11.4.1.1.3 Accuracy of signal-to-noise ratio per sub-carrier group (SNR-ps)

…

For each downstream sub-carrier group where the SNR($k \times G \times \Delta f$) accuracy requirement applies, the sample variance of SNR($k \times G \times \Delta f$) measurements (expressed in dB and all samples taken within a 10-minute time interval, without line re-initialization in this time interval, and under the same loop, noise, temperature, and configuration settings) shall be equal to or smaller than 0.5 ~~dB.~~, calculated as follows:

$$SNRps\_\text{variance} \leq 0.5$$

where

$$SNRps\_\text{variance} = \frac{1}{\text{N}}\left(\sum_{i=1}^{N} (SNRps(i) - SNRps\_avg)^2 \right)$$

$$SNRps\_avg = \frac{1}{\text{N}}\left(\sum_{i=1}^{N} SNRps(i) \right)$$

If the line does not re-initialize over a time period T1 to T2, the following requirements shall be met for upstream sub-carrier groups where the SNR($k \times G \times \Delta f$) accuracy requirement applies:

$$| (\text{SNRps\_T2}(k \times G \times \Delta f) - \frac{1}{G} \sum_{i=kG}^{(k+1)G-1} \text{gi\_T2}(i)) - (\text{SNRps\_T1}(k \times G \times \Delta f) -$$

$$\frac{1}{G} \sum_{i=kG}^{(k+1)G-1} \text{gi\_T1}(i)) - \Delta\text{SNRps\_reference\_us}(k \times G \times \Delta f)| \leq 0.8\text{dB}.$$

Accuracy requirements for upstream sub-carrier groups where (SNRps_T1 – gi_T1) or (SNRps_T2 – gi_T2) is greater than 40 dB, are for further study.

For each upstream sub-carrier group where the SNR($k \times G \times \Delta f$) accuracy requirement applies, the sample variance of SNR($k \times G \times \Delta f$) measurements (expressed in dB and all samples taken within a 10-minute interval, without line re-initialization in this time interval, and under the same loop, noise, temperature, and configuration settings) shall be equal to or smaller than 0.5 ~~dB.~~, calculated as follows:

$$SNRps\_\text{variance} \leq 0.5$$

where

$$SNRps\_\text{variance} = \frac{1}{\text{N}}\left(\sum_{i=1}^{N}(SNRps(i) - SNRps\_avg)^2\right)$$

$$SNRps\_avg = \frac{1}{\text{N}}\left(\sum_{i=1}^{N} SNRps(i)\right)$$

NOTE – In verification tests, noise changes should be applied gradually over time, and not simultaneously at the U-O2 and U-R2 reference points, as not to force a re-initialization of the line.

4) Clause 12.3.5.2.1.1

Revise the text in clause 12.3.5.2.1.1 "O-MSG 1" as follows:

12.3.5.2.1.1 O-MSG 1

…

Field #23 contains the value of INPMIN-ROCds as specified in the MIB. The parameter is defined as the required INP_no_erasure value for the ROC (see clause 9.6). INPMIN-ROC is an integer in the range from 0 to 8~~16~~.

…

5) Clause 12.3.5.2.1.3, Table 12-47.1

Revise Table 12-47.1 in clause 12.3.5.2.1.3 "O-PMS" as follows:

Table 12-47.1 – ROC descriptor

Octet	Field	Format	Description
1	T	1 byte	The number of MDFs in an OH sub-frame of the ROC. ~~The value of *T* shall be 1.~~ $T = k \times M$, where k is an integer. The value of T shall not exceed 64.
2	G	1 byte	The total number of overhead octets in an OH sub-frame of the ROC; The valid values of G are $1 \leq G \leq 32$.
3	F	1 byte	Number of OH frames in the OH superframe for the ROC. The value of F shall be 1.
4	M	1 byte	The number of MDFs in an RS codeword for the ROC. The valid values of M are 1, ~~and~~ 2, 4, 8 and 16.
5 and 6	L	2 bytes	Contains the value of L for the ROC. The valid values of L are from 8 to 128 in multiples of 8.
7	R	1 byte	Contains the value of R for the ROC. The value of R shall be 16.
8	I	1 byte	Contains the value of I for the ROC. I shall be set to $I=M \times (G/T)+R$. The valid values of I are $32 \leq I \leq 66$.
9 and 10	D	2 bytes	Interleaver depth D for the ROC. The valid values of D are $1 \leq D \leq 20$.

6) Clause 13.3

Revise the text in clause 13.3 "Timing of changes in sub-carrier configuration" (second paragraph after Figure 13-1) as follows:

13.3 Timing of changes in sub-carrier configuration

…

For OLR Type 4 (SOS), the change in L_p values and b_i values shall take effect starting from the ~~10~~66th symbol that follows the Syncflag, i.e., the symbol with symbol count ~~9~~ 65 in the DMT superframe following the Syncflag, where the first symbol in the DMT superframe is the symbol at symbol count 0.

…

7) Clause 13.4.3.1.2

Revise clause 13.4.3.1.2 "Minimum percentage of degraded tones (SOS-NTONES)" as follows:

13.4.3.1.2 Minimum percentage of degraded tones (SOS-NTONES)

SOS-NTONES is the minimum percentage of loaded tones (i.e., tones with b_i>0)~~in the MEDLEY set~~ that must be persistently degraded throughout the time window SOS-TIME, in order to arm the first sub-condition of the standard SOS triggering criteria (see clause 13.4.3.2).

A degraded tone is a tone that has been identified as needing a reduction in bit loading because, with its current bit loading, it contributes substantially to the increase of the BER above the nominal value. The degraded tones ~~do not need to be~~are not necessarily contiguous.

The SOS-NTONES defined for the downstream and upstream are denoted as SOS-NTONES-ds and SOS-NTONES-us, respectively.

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Series A	Organization of the work of ITU-T
Series D	General tariff principles
Series E	Overall network operation, telephone service, service operation and human factors
Series F	Non-telephone telecommunication services
Series G	**Transmission systems and media, digital systems and networks**
Series H	Audiovisual and multimedia systems
Series I	Integrated services digital network
Series J	Cable networks and transmission of television, sound programme and other multimedia signals
Series K	Protection against interference
Series L	Construction, installation and protection of cables and other elements of outside plant
Series M	Telecommunication management, including TMN and network maintenance
Series N	Maintenance: international sound programme and television transmission circuits
Series O	Specifications of measuring equipment
Series P	Terminals and subjective and objective assessment methods
Series Q	Switching and signalling
Series R	Telegraph transmission
Series S	Telegraph services terminal equipment
Series T	Terminals for telematic services
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