INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

G.992.5

Amendment 2

(06/2004)

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Digital sections and digital line system – Access networks

Asymmetric Digital Subscriber Line (ADSL) transceivers – Extended bandwidth ADSL2 (ADSL2+)

Amendment 2

ITU-T Recommendation G.992.5 (2003) – Amendment 2

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ITU-T Recommendation G.992.5

Asymmetric Digital Subscriber Line (ADSL) transceivers – Extended bandwidth ADSL2 (ADSL2+)

Amendment 2

Summary

This Amendment 2 to ITU-T Rec. G.992.5 contains changes relevant to clause 8.9 and Annex K.

Source

Amendment 2 to ITU-T Recommendation G.992.5 (2003) was approved on 13 June 2004 by ITU-T Study Group 15 (2001-2004) under the ITU-T Recommendation A.8 procedure.

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.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure e.g. interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

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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.

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ITU-T Recommendation G.992.5

Asymmetric Digital Subscriber Line (ADSL) transceivers – Extended bandwidth ADSL2 (ADSL2+)

Amendment 2

1) Clause 8.9 Transmitter dynamic range

Add text as follows:

See 8.9/G.992.3.

Due to the non-flat PSD used for the downstream transmitted signals, the MTPR requirements at the ATU-C are for further study.

2) Figure 8-14 Loop diagnostics timing diagram (part 1)

In this figure, the duration of loop diagnostics state R-QUIET5 shall be shortened from 16464 to 16464 – 80 = 16384 symbols (to match ATU-C state durations).

3) Table 8-26

Correct the title of this table as follows:

Table 8-26/G.992.5 – Format of the SNR(i) R-MSG9~~x~~-LD message

4) Addition to Annex K TPS-TC functional descriptions

Modify text in Annex K as follows:

See Annex K/G.992.3, with the following changes:

1) The G.994.1 codepoints shall represent the data rate divided by 8000 bit/s. The last row of Table K.6/G.992.3 shall show "8000 bit/s" instead of "4000 bit/s".

2) The ATU shall support a net data rate of at least 16 Mbit/s. Net_min_n, Net_max_n and $Net\_reserve_n$ entry in Tables K.4/G.992.3, K.11/G.992.3 and K.20/G.992.3 shall show "16 Mbit/s" instead of "8 Mbit/s".

3) *Add Tables K.3a and K.3b as follows:*

Table K.3a/G.992.5 – INP_min and delay_max related Downstream Net Data rates limits (in kbit/s)

		INP_min						
		0	**½**	**1**	**2**	**4**	**8**	**16**
delay_max [ms]	**1 (Note)**	24432	0	0	0	0	0	0
	2	24432	7104	3008	960	0	0	0
	4	24432	15232	7104	3008	960	0	0
	8	24432	22896	15232	7104	3008	960	0
	16	24432	22896	15232	7552	3520	1472	448
	32	24432	22896	15232	7552	3712	1728	704
	63	24432	22896	15232	7552	3712	1728	704
NOTE – In ITU-T Rec. G.997.1, a 1 ms delay is reserved to mean that $S_p \leq 1$ and $D_p = 1$.								

Table K.3b/G.992.5 – INP_min and delay_max related Upstream Net Data rates limits (in kbit/s)

		INP_min						
		0	**½**	**1**	**2**	**4**	**8**	**16**
delay_max [ms]	**1 (Note)**	3520	0	0	0	0	0	0
	2	3520	3072	1472	448	0	0	0
	4	3520	3264	1728	704	192	0	0
	8	3520	3264	1792	832	320	64	0
	16	3520	3264	1792	832	384	128	0
	32	3520	3264	1792	832	384	128	0
	63	3520	3264	1792	832	384	128	0
NOTE – In ITU-T Rec. G.997.1, a 1 ms delay is reserved to mean that $S_p \leq 1$ and $D_p = 1$.								

Appendix VI

Constraints on delay, impulse noise protection, overhead rate, and net data rate when bonding

This appendix considers the case when multiple transceivers form a bonding group and the differential delay among members of the group is controlled through the *delay_min* parameter derived from ITU-T Rec. G.994.1. This appendix outlines a set of simple rules that allow the construction of a valid set of configuration parameters involving the minimum delay *(delay_min)*, the minimum impulse noise protection *(INP_min),* the minimum overhead message rate *(MSGmin)*, the minimum net data rate *(net_min)* and the data rate granularity. These rules restrict the framing parameters and may lead to a reduction in the attainable data rates.

The rules are as follows:

- Set *delay_min* = *delay_max*. In either the upstream or downstream direction, all transceivers in a bonding group should use the same delay. In the downstream direction, a value for delay can be selected from either Table VI.1 or Table VI.2. When using delays from Table VI.2, since the internal representation of *delay_min* and *delay_max* are restricted to be integers, *delay_min* should be set to floor *(delay_min)* and *delay_max* should be set to ceil *(delay_max)* where floor (·) and ceil (·) are the 'greatest integer less than' and 'smallest integer greater than' respectively. In the upstream direction, *delay_min* and *delay_max* should be selected from Table VI.3.
- Set the minimum net data rate below the values shown in Table VI.1 or Table VI.2 and Table VI.3 for downstream and upstream respectively. Depending on the downstream PSD mask and value of BIMAX, the actual maximum net data rate might be lower than those shown in these tables.
- Depending on the delay, the valid range of MSGmin and the corresponding data rate granularity (minimum value of *net_max* – *net_min*) are listed in Tables VI.4 and Table VI.5.

Table VI.1/G.992.5 – Maximum downstream net data rate (kbit/s) for various values of *delay_min* = *delay_max* and *INP_min*

		INP_min (Note 2)						
		0	**½**	**1**	**2**	**4**	**8**	**16**
delay_min delay_max (ms)	**1 (Note 1)**	24432	0	0	0	0	0	0
	2	16256	7104	3008	960	0	0	0
	4	16256	15232	7104	3008	960	0	0
	8	16256	15232	15232	7104	3008	960	0
	16	8064	7552	7552	7552	3520	1472	448
	32	3968	3712	3712	3712	3712	1728	704

NOTE 1 – In ITU-T Rec. G.997.1, a 1 ms delay is reserved to mean that $S_p \leq 1$ and $D_p = 1$.

NOTE 2 – Values of *INP_min* in gray are optional.

Table VI.2/G.992.5 – Maximum downstream net data rate (kbit/s) for various values of *delay_min* = *delay_max* and *INP_min*

		INP_min (Note 2)						
		0	**½**	**1**	**2**	**4**	**8**	**16**
delay_min delay_max (ms)	**1.33 (Note 1)**	24432	6576	2448	432	0	0	0
	2.67 (Note 1)	24432	14736	6576	2448	432	0	0
	5.33 (Note 1)	24432	22896	14736	6576	2448	432	0

NOTE 1 – Set *delay_max* = ceil *(delay)* and *delay_min* = floor *(delay)*.

NOTE 2 – Values of *INP_min* in gray are optional.

Table VI.3/G.992.5 – Maximum upstream net data rate (kbit/s) for various values of *delay_min* = *delay_max* and *INP_min*

		INP_min (Note 2)						
		0	**½**	**1**	**2**	**4**	**8**	**16**
delay_min = delay_max (ms)	**1 (Note 1)**	3520	0	0	0	0	0	0
	2	3520	3072	1472	448	0	0	0
	4	3520	3264	1728	704	192	0	0
	8	1920	1792	1792	832	320	64	0
	16	896	832	832	832	384	128	0
	32	0	0	0	0	0	0	0

NOTE 1 – In ITU-T Rec. G.997.1, a 1 ms delay is reserved to mean that $S_p \leq 1$ and $D_p = 1$.

NOTE 2 –Values of *INP_min* in gray are optional.

Table VI.4/G.992.5 – Range of MSGmin and minimum data rate granularity *(net_max – net_min)* when delay is selected from Tables VI.1 or VI.3

MSGmin (kbit/s)	Data rate granularity (kbit/s)
60-64	not supported
29-60	64
14-28	32
6-13	16
4-5	8

Table VI.5/G.992.5 – Range of MSGmin and minimum data rate granularity *(net_max – net_min)* when delay is selected from Table VI.2

MSGmin (kbit/s)	Data rate granularity (kbit/s)
45-64	not supported
21-44	48
9-20	24
4-8	12

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