Technical Report
TR-026

T1.413 Issue 2 ATM based ADSL ICS

September 9, 1999

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1. Revision History

Date (M/D/Y)	Version	Major Changes.
12/1/98	1	Creation, First draft.
3/1/99	2	Swap body and annex, 3 annexes
3/24/99	3	Include contributions 99-014,99-004
5/26/99	4	Prepare for first straw ballot
9/1/1999, 9/9/99	5	Comments from 99-179,99-233 as agreed at Hawaii meeting. Minor edits (spaces, table of contents, *etc.*)

2. Introduction

The ADSL Forum Testing & Interoperability Working Group has developed this ADSL ICS (ADSL Implementation Conformance Statement).

The ADSL ICS can be used for several purposes:
1. As a starting document used by two equipment vendors to determine their respective implementations and their degree of interoperability.
2. As a guide for selection of the appropriate test cases to build a test suite.
3. For self-verification or certification of compliance to a specific standard, when comparing to an ADSL ICS filled out with the requirements of this standard.

When this proforma list is filled out by both parties and a match is obtained, then interoperability should be possible. Having a match for interoperability does not imply that the systems are [ANSI] compliant.

3. Scope

This Technical Report presents an ADSL ICS list targeting an [ANSI] compliant system. This ADSL ICS contains an ICS for an ATM based implementation.
An STM based ICS is for further study.

Three types of ICS exist:

1. Electrical ICS,
2. Physical Layer ICS, and
3. Protocol ICS (also called PICS).

The format of the ADSL ICS is according to the guidelines specified in [ETR212]. [ETR212] also references [ISO9646].

ANNEX A contains the Conformance statement.
ANNEX B contains the Physical layer ADSL ICS.
ANNEX C contains the electrical ADSL ICS.Each ANNEX can be used as a proforma.
The Protocol ICS is for further study.

4. A guide to the use of the ADSL ICS proforma

4.1 Abbreviations and conventions

The information in this document is comprised of information in tabular form in accordance with the guidelines of [ETR212] and [ISO9646]. A detailed description of how to create or fill out the ICS can be found in these documents.

The item column contains a number which identifies the item in the table. The item description column describes in free text each respective item (e.g., parameters, timers). It implicitly means "is <item description> supported by the implementation?".

Status column

The following notations, defined in [ISO9646], are used for the status column:

m	mandatory - the capability is required to be supported.
o	optional - the capability may be supported or not.
n/a	not applicable - in the given context, it is impossible to use the capability.
x	prohibited (excluded) - there is a requirement not to use this capability in the given context.
o.i	qualified optional - for mutually exclusive or selectable options from a set. "i" is an integer which identifies an unique group of related optional items and the logic of their selection which is defined immediately following the table.

NOTE: In the case where items of the group do not always belong to the same table, all o.i shall be defined in the last sub-clause of the ICS proforma.

c.i.	conditional - the requirement on the capability ("m", "o", "x" or "n/a") depends on the support of other optional or conditional items. "i" is an integer identifying an unique conditional status expression which is defined immediately following the table.

Reference column

The reference column makes references to [ANSI], except where explicitly stated otherwise.

Support column

The support column shall be filled in by the supplier of the implementation. The following common notations, defined in [ISO9646], are used for the support column:

Y or y	supported by the implementation
N or n	not supported by the implementation
N/A, n/a or -	no answer required (allowed only if the status is n/a, directly or after evaluation of a conditional status)

Values allowed column

The values allowed column contains the type, the list, the range, or the length of values allowed. The following notations are used:

- range of values: <min value> .. <max value>
  example: 5 .. 20

- list of values: <value1>, <value2>, ..., <valueN>
  example: 2 ,4 ,6 ,8, 9
  example: ’1101’B, ’1011’B,
  example: ’0A’H, ’34’H, ’2F’H

- list of named values: <name1>(<val1>), <name2>(<val2>), ..., <nameN>(<valN>)
  example: reject(1), accept(2)

- length: size (<min size> .. <max size>)
  example: size (1 .. 8)

- comment: one can give additional useful information an item in the form Ò- <comment>Ó
  For example in case of a list of values, a unit of measurement can be added
  example: 1..63 -- dB

Values supported column

The values supported column shall be filled in by the supplier of the implementation. In this column, the values or the ranges of values supported by the implementation shall be indicated.

References to items

For each possible item answer (answer in the support column) within the ICS proforma, a unique reference exists, used, for example, in the conditional expressions.
It is defined as the table identifier, followed by a slash character "/", followed by the item number in the table. If there is more than one support column in a table, the columns are discriminated by letters (a, b, *etc.*), respectively.

EXAMPLE 1: A.5/4 is the reference to the answer of item 4 in table A.5.
EXAMPLE 2: A.6/3b is the reference to the second answer (i.e. in the second support column) of item 3 in table A.6.

4.2 Instructions for completing the ICS proforma

The supplier of the implementation shall complete the ICS proforma in each of the spaces provided. In particular, an explicit answer shall be entered, in each of the support or supported column boxes provided, using the notation described in Section 4.1.

If necessary, the supplier may provide additional comments in space at the bottom of the tables, or separately on sheets of paper. More detailed instructions are given at the beginning of the different sub-clauses of the ICS proforma.

Roles: the supplier should only fill in the items depending on the role of his implementation.
E.g., The ATU-R vendor should fill out the tables marked ATU-R. The ATU-C vendor should fill out the tables marked ATU-C.
When a table contains both roles, then only the appropriate role should be filled out.

4.3 Examples

Following is an example of an optional item. The answer can be ÔyesÕ or ÔnoÕ Both are allowed and compliant.

Table X.1: ATU-C send C-tone

Item	Signal	Reference	Status	Support
1	C-tone	9.2.1.3	o	*y*

Following is an example of a mandatory item. The answer can be ÔyesÕ or ÔnoÕ The answer must be ÔyesÕ to be compliant.

Table X.2: ATU-R receive C-Tone

Item	Signal	Reference	Status	Support
1	C-tone	9.2.1.3	m	*y*

Following is an example of a mandatory item including a range of values. The answer can be ÔyesÕ or ÔnoÕ The answer must be ÔyesÕ to be compliant. Supported values must be the complete range or a subset of the range to be compliant.
In the case of table X.3 the full range is needed to be compliant.
In the case of table X.4 a subset of the range is sufficient to be compliant.
Refer to the indicated reference to determine if the full range or subset is required.

Table X.3: ATU-C detection & response to R-ACT-REQ

Item	Signal	Reference	Status	Support	Values	
					Allowed	Supported
1	R-ACT-REQ	9.2.1.1	m	y	-32..48	*-32..48*

Table X.4: ATU-C C-SEGUE used tones

Item	Signal	Reference	Status	Support	Values	
					Allowed	Supported
1	C-SEGUE1	9.6.1	m	y	5..255	*48.255*
2	C-SEGUE2	9.8.2	m	y	5..255	*48.255*

Following is an example of a qualified optional item.
The qualifier is mentioned below the table.

Table X.5: ATU-R response to C-ACTx

Item	Signal	Reference	Status	Support
1	R-ACK1	9.3.3	o.2	*n*
2	R-ACK2	9.3.3	o.2	*y*
3	R-ACK3	9.3.3	n/a	-

o.2 : the ATU-R shall transmit only one of these signals

Following is an example of a conditional item. The answer depends on the response to the question put under the table.
E.g., If in table A.23 item 2 OR in table A.23 item 3 have been answered ÔyesÕ then this item is mandatory, ELSE it is prohibited.

Table X.6: Downstream sub-channel support

Item	Sub-channel	Reference	Status	Support	
				ATU-C	*ATU-R*
1	AS0	5.2	m	*y*	*y*
2	AS1	5.2	c2401	*n*	*n*

c2401: IF Table B.23/2 OR Table B.23/3 THEN m ELSE x

5. References

[ANSI] ANSI T1.413-1998, Network and Customer Installation Interfaces — Asymmetric Digital Subscriber Line (ADSL) Metallic Interface.

[ETR212] ETSI TC-MTS: Methods for testing and Specification (MTS). Implementation Conformance Statement proforma style guide. ETR 212 December 1995 (DTR/MTS-00004)

[ISO9646] ISO/IEC 9646-1 (1994): Information technology - open systems interconnection - conformance testing methodology and framework- Part 1: General Concepts

[Annex D] [ANSI], annex D

ANNEX A: Conformance Statement

A.1 Identification of the implementation

Identification of the Implementation Under Test (IUT) and the system in which it resides (the System Under Test - SUT) should be filled out so as to provide as much detail as possible regarding version numbers and configuration options.

The product supplier information and client information should both be filled in if they are different.

A person who can answer queries regarding information supplied in the ICS should be named as the contact person.

A.2 Date of the statement

……
……

A.3 Implementation Under Test (IUT) identification

IUT name:

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IUT version:

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A.4 System Under Test (SUT) identification

SUT name:
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Hardware configuration:

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Operating system/SW version:

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A.5 Product supplier Name

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Address:

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Telephone number:

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……

Facsimile number:

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E-mail address:

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Additional information:

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A.6 Client (if different from product supplier) Name

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Address:

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Telephone number:

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Facsimile number:

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E-mail address:

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A.7 Identification of the reference standard

This ICS proforma applies to the following standard:

[ANSI] T1.413-1998 -- ATM based implementation

A.8 Global statement of conformance

Are all mandatory capabilities implemented ? (Yes/No) .....

NOTE: Answering "No" to this question indicates non-conformance to the [ANSI] specification. Non-supported mandatory capabilities are to be identified in the ICS, with an explanation of why the implementation is non-conforming, on pages attached to the ICS proforma.

ANNEX B: Physical Layer ADSL ICS

B.1 Initialization sequence

B.1.1 Activation and acknowledgment

The table below shows the activation and acknowledgment tones sent by the ATU-C and the ATU-R. In response to these tones, PILOT or QUIET signals are sent.

Table B.1: ATU-C send C-tone

Item	Signal	Reference	Status	Support
1	C-tone	9.2.1.3	o	

Table B.2: ATU-R receive C-Tone

Item	Signal	Reference	Status	Support
1	C-tone	9.2.1.3	m	

Depending on the loop, the ATU-C may detect the higher or lower transmit power of R-ACT-REQ, and can thus respond before the end of R-ACT-REQ. The timing is expressed in number of symbols relative to the end of R-ACT-REQ.

Table B.3: ATU-C detection & response to R-ACT-REQ

Item	Signal	Reference	Status	Support	Values	
					Allowed	Supported
1	R-ACT-REQ	9.2.1.1	m		-32..48	

Depending on the loop, the ATU-R may detect the higher or lower transmit power of C-ACT, and can thus respond before the end of C-ACT. The timing is expressed in number of symbols relative to the end of C-ACT.

Table B.4: ATU-R detection & response to C-ACT

Item	Signal	Reference	Status	Support	Values	
					Allowed	Supported
1	C-ACT	9.3.1	m		-32..48	

The type of C-ACTx determines the signal to be sent during R-QUIET3/R-PILOT1 and determines the type of loop timing.

Table B.5: ATU-C support of C-ACTx

Item	Signal	Reference	Status	Support
1	C-ACT1	9.2.2	o.1	
2	C-ACT2	9.2.2	o.1	
3	C-ACT3	9.2.2	o.1	
4	C-ACT4	9.2.2	o.1	

o.1: the ATU-C shall transmit only one of these signals

Table B.6: ATU-R support of C-ACTx

Item	Signal	Reference	Status	Support

1	C-ACT1	9.2.2	m	
2	C-ACT2	9.2.2	m	
3	C-ACT3	9.2.2	o	
4	C-ACT4	9.2.2	o	

Depending on the loop, the ATU-C may detect the higher or lower transmit power of R-ACK, but shall always maintain the full duration of C-QUIET2.

Table B.7: C-QUIET2 duration

Item	Signal	Reference	Status	Value	Support
1	C-QUIET2	9.2.3	m	*128*	

Depending on the C-ACT signal and loop timing requirements, a different R-ACK signal can be sent, requesting the ATU-C to send specific signals during C-QUIET3/4/5.

Table B.8: ATU-R response to C-ACTx

Item	Signal	Reference	Status	Support
1	R-ACK1	9.3.3	o.2	
2	R-ACK2	9.3.3	o.2	
3	R-ACK3	9.3.3	n/a	

o.2: the ATU-R shall transmit only one of these signals

Table B.9: ATU-C support of R-ACKx

Item	Signal	Reference	Status	Support
1	R-ACK1	9.3.3	m	
2	R-ACK2	9.3.3	m	
3	R-ACK3	9.3.3	n/a	

B.2 Transceiver Training

B.2.1 Method of loop timing acquisition

[ANSI] allows the ATU-R to send an R-QUIET2 of short length (less than 256 symbols) without loop-timing acquisition during R-REVERB1 or long length (at least 1024 symbols) with loop-timing acquisition during R-QUIET2. The ATU-R may extend the timing (up to 4000 symbols) to improve synchronization stability.

Table B.10: ATU-R R-QUIET duration (first initialization)

Item	Signal	Reference	Status	Support	Values	
					Allowed	Supported
1	R-QUIET2	9.5.1	o.3		128..256	
2	R-QUIET2	9.5.1	o.3		257..1024	
3	R-QUIET2	9.5.1	o.3		1025..4000	

o.3: The ATU-R shall use one of these options

A second initialization caused by time-out on detection of C-REVEILLE uses a different timing of R-QUIET2. This happens when the remote modem is issue 1.

Table B.11: ATU-R R-QUIET duration (second initialization)

Item	Signal	Reference	Status	Support	Values	
					Allowed	Supported
1	C-QUIET2	9.5.1	m		128..256	

B.2.2 Tones used in REVERB

Table B.12: ATU-C C-REVERB used tones

Item	signal	Reference	Status	Support	Values	
					Allowed	Supported
1	C-REVERB1	9.4.6	m		5..255	
2	C-REVERB2	9.4.10	m		5..255	
3	C-REVERB3	9.4.13	m		5..255	
4	C-REVERB4	9.7.9	m		5..255	
5	C-REVERB5	9.8.15	m		5..255	
6	C-REVERB-RA	9.8.7	m		5..255	

Table B.13: ATU-R R-REVERB used tones

Item	Signal	Reference	Status	Support	Values	
					Allowed	Supported
1	R-REVERB1	9.5.2	m		5..31	
2	R-REVERB2	9.5.6	m		5..31	
3	R-REVERB3	9.7.2	m		5..31	
4	R-REVERB4	9.7.9	m		5..31	
5	R-REVERB5	9.9.12	m		5..31	
6	R-REVERB6	9.9.16	m		5..31	
7	R-REVERB-RA	9.9.6	m		5..31	

B.2.3 Used tones during SEGUE

Table B.14: ATU-C C-SEGUE used tones

Item	Signal	Reference	Status	Support	Values	
					Allowed	Supported
1	C-SEGUE1	9.6.1	m		5..255	
2	C-SEGUE2	9.8.2	m		5..255	
3	C-SEGUE3	9.8.16	m		5..255	
4	C-SEGUE-RA	9.8.8	m		5..255	

Table B.15: ATU-R R-SEGUE used tones

Item	Signal	Reference	Status	Support	Values	
					Allowed	Supported
1	R-SEGUE1	9.7.1	m		5..31	
2	R-SEGUE2	9.8.2	m		5..31	
3	R-SEGUE3	9.8.16	m		5..31	
4	R-SEGUE4	9.9.13	m		5..31	
5	R-SEGUE5	9.9.17	m		5..31	
6	R-SEGUE-RA	9.9.7	m		5..31	

B.2.4 ECT Signal

During x-ECT, a vendor defined signal can be sent. The remote side must ignore any signal being received during this period.

Table B.16: ATU-R support of C-ECT

Item	Signal	Reference	Status	Support
1	C-ECT	9.4.9	m	

Table B.17: ATU-C support of R-ECT

Item	Signal	Reference	Status	Support
1	R-ECT	9.5.5	m	

B.2.5 R-QUIET3/R-REVERB2 symbol alignment

[ANSI] allows the ATU-R to shorten the last symbol of R-PILOT1 or R-QUIET3 by an integer multiple of 4 samples to obtain frame alignment between transmitter and receiver.

Table B.18: Shortened R-PILOT1/R-QUIET3

Item	Signal	Reference	Status	Support	
				ATU-C	*ATU-R*
1	R-PILOT1	9.5.4	o		
2	R-QUIET3	9.5.4	o		

The ATU-R can lengthen R-REVERB2 such that C-SEGUE1 and R-SEGUE1 can start at the same time.

Table B.19: ATU-R R-REVERB2 duration

Item	Signal	Reference	Status	Support	Values	
					Allowed	Supported
1	R-REVERB2	9.5.6	m		1024..1056	

B.3 Channel analysis

B.3.1 MSG1 messages

These messages should be compared to the capabilities of the other side modem

Table B.20: C-MSG1 configuration

Item	Bits	Name	Ref.	Status	Support	Values	
						Allowed	Supported
1	47-44	Minimum required noise margin	9.6.4.1	m		0..15 -- dB	
2	43-28	Vendor identification	9.6.4.2	m		[Annex D]	
3	27-26	Reserved	9.6.4	m		0	
4	25-23	T1.413 revision number	9.6.4.3	m		1	
5	22-18	Vendor revision number	9.6.4.4	m		0..31	
6	17	Trellis coding	9.6.4.5	m		0,1	
7	16	Echo cancellation	9.6.4.6	m		0,1	
8	15	Expanded Exchange Sequence	9.6.4.7	m		1	
9	14	Reserved	9.6.4	m		0	
10	13-12	Max transmit PSD	9.6.4	m		0	
11	11	Network Timing Reference	9.6.4.8	m		0,1	
12	10-9	Framing Structure	9.6.4.9	m		0..3	
13	8-6	Transmit PSD during initialization	9.6.4.10	m		1..7	
14	5-4	Reserved	9.6.4	m		0	
15	3-0	Max #bits per sub-carrier	9.6.4.11	m		2..15	

Table B.21: R-MSG1 configuration

Item	Bits	Name	Ref.	Status	Support	Values	
						Allowed	Supported
1	47-44	Reserved	9.7.6	m		0	
2	43-28	Vendor identification	9.7.6.1	m		[Annex D]	
3	27-26	Reserved	9.7.6	m		0	
4	25-23	T1.413 revision number	9.7.6.2	m		1	
5	22-18	Vendor revision number	9.7.6.3	m		0..31	
6	17	Trellis coding	9.7.6.4	m		0,1	
7	16	Echo cancellation	9.7.6.5	m		0,1	
8	15	Expanded exchange sequence	9.7.6.6	m		1	
9	14	Support of higher bit rates	9.7.6.7	m		0,1	
10	13	Support of dual latency downstream	9.7.6.8	m		0,1	
11	12	Support of dual latency upstream	9.7.6.9	m		0,1	
12	11	Network Timing Reference	9.7.6.10	m		0,1	
13	10-9	Framing structure	9.7.6.11	m		0..3	
14	8-4	Reserved	9.1.6	m		0	
15	3-0	Max #bits per sub-carrier	9.6.4.11, 6.8.1	m		2..15	

B.3.2 RATES1 messages

The rates messages contains a proposed allocation of the data bytes and the Reed Solomon parameters. Framing structure will depend on the transport type.

Table B.22: Transport type

Item	Type	Reference	Status	Support	
				ATU-C	*ATU-R*
1	STM	4.2.1, 4.3.1	o.4		
2	ATM	4.2.2, 4.3.2	o.4		

o.4: the ADSL system shall support one of these options

Table B.23: ATM latency support

Item	Latency	Reference	Status	Support	
				ATU-C	*ATU-R*
1	SINGLE down/up	5.2	m		
2	DUAL down, SINGLE up	5.2	o		
3	DUAL down/up	5.2	o		
4	Different down/up	5.2	o		

Table B.24: Downstream sub-channel support

Item	Sub-channel	Reference	Status	Support	
				ATU-C	*ATU-R*
1	AS0	5.2	m		
2	AS1	5.2	c2401		

c2401: IF Table B.23/2 OR Table B.23/3 THEN m ELSE x

Table B.25: Upstream sub-channel support

Item	Sub-channel	Reference	Status	Support	
				ATU-C	*ATU-R*
1	LS0	5.2	m		
2	LS1	5.2	c2501		

c2501: IF Table B.23/2 OR Table B.23/3 THEN m ELSE x

Bit rate is allocated in a ônx32kbitõfashion.

Table B.26: ATU-C ATM bit rate support

Item	Sub-channel	Reference	Status	Support	Values of ĜQ 32 kbps	
	down				Allowed	Supported
1	AS0	5.2	m		1..192	
2	AS0	5.2	o		> 192	
3	AS1	5.2	o		1..144	
4	AS1	5.2	o		> 144	
	up					
5	LS0	5.2	m		1..20	
6	LS0	5.2	o		>20	
7	LS1	5.2	o		1..20	
8	LS1	5.2	o		>20	

Table B.27: ATU-R ATM bit rate support

Item	Sub-channel	Reference	Status	Support	Values of ĜQ 32 kbps	
	down				Allowed	Supported
1	AS0	5.2	m		1..192	
2	AS0	5.2	o		> 192	
3	AS1	5.2	o		1..144	
4	AS1	5.2	o		> 144	
	up					
5	LS0	5.2	m		1..20	
6	LS0	5.2	o		>20	
7	LS1	5.2	o		1..20	
8	LS1	5.2	o		>20	

The ATU-C shall support any combination of RS FEC coding as indicated in Table B.28.

Table B.28: ATU-C FEC coding support

Item	Parameter	Reference	Status	Support	Values	
					Allowed	Supported
	down					
1	RF	6.6	m		0,2,4,6,8,10, 12,14,16	
2	RI	6.6	m		0,2,4,6,8,10, 12,14,16	
3	SF	6.6	m		1	
4	SI	6.6	m		1,2,4,8,16	
5	D	6.6	m		1,2,4,8,16,32,6 4	
	up					
6	RF	7.6	m		0,2,4,6,8,10, 12,14,16	
7	RI	7.6	m		0,2,4,6,8,10, 12,14,16	
8	SF	7.6	m		1	
9	SI	7.6	m		1,2,4,8,16	
10	D	7.6	m		1,2,4,8	

RF: parity bytes per Reed-Solomon codeword, fast
RI: parity bytes per Reed-Solomon codeword, interleaved
SF: DMT symbols per Reed-Solomon codeword, fast
SI: DMT symbols per Reed-Solomon codeword, interleaved
D: interleave depth

Table B.29: ATU-R FEC coding support

Item	Parameter	Reference	Status	Support	Values	
					Allowed	Supported
	down					
1	RF	6.6	m		0,2,4,6,8,10, 12,14,16	
2	RI	6.6	m		0,2,4,6,8,10, 12,14,16	
3	SF	6.6	m		1	
4	SI	6.6	m		1,2,4,8,16	
5	D	6.6	m		1,2,4,8,16,32,6 4	
	up					
6	RF	7.6	m		0,2,4,6,8,10, 12,14,16	
7	RI	7.6	m		0,2,4,6,8,10, 12,14,16	
8	S (F)	7.6	m		1	
9	S (I)	7.6	m		1,2,4,8,16	
10	D	7.6	m		1,2,4,8	

RF: parity bytes per Reed-Solomon codeword, fast
RI: parity bytes per Reed-Solomon codeword, interleaved
SF: DMT symbols per Reed-Solomon codeword, fast
SI: DMT symbols per Reed-Solomon codeword, interleaved
D: interleave depth

Since at this time it is not known what the T1.413 version is of the ATU-R, C-RATES1 can only contain options assuming framing structure 1.

B.3.3 Tones used in MEDLEY

Table B.30: ATU-C C-Medley used tones

Item	Signal	Reference	Status	Support	Values	
					Allowed	Supported
1	C-MEDLEY	9.6.6	m		5..255	

Table B.31: ATU-R R-Medley used tones

Item	Signal	Reference	Status	Support	Values	
					Allowed	Supported
1	R-MEDLEY	9.6.8	m		5..31	

B.4 Exchange

The exchange modulation of one byte per symbol is using the two sets of tones.

Table B.32: ATU-C exchange tones

Item	Tones	Reference	Status	Support	Values	
					Allowed	Supported
1	nominal set	9.8.9	m		43..46	
2	backup set 1	9.8.9	c3301		37..40	
3	backup set 2	9.8.9	c3302		91..94	

c3301: IF Table B.21/4 =0 THEN m ELSE x
c3302: IF Table B.21/4 =1 THEN m ELSE x

Table B.33: ATU-R exchange tones

Item	Tones	Reference	Status	Support	Values	
					Allowed	Supported
1	nominal set	9.9.8	m		10..13	
2	backup set1	9.9.8	c3401		6..9	
3	backup set2	9.9.8	c3402		20..23	

c3401: IF Table B.20/4 =0 THEN m ELSE x
c3402: IF Table B.20/4 =1 THEN m ELSE x

B.4.1 MSG-RA messages

If both modems indicate they support the expanded exchange sequence in C-MSG1 and R-MSG1, then the following messages should be checked for support by the other side.

Table B.34: C-MSG-RA configuration

Item	Bits	Name	Ref.	Status	Support	Values	
						Allowed	Supported
1	47-44	New minimum noise margin	9.8.5	m		0..15 --dB	
2	43-0	reserved	9.8.5	m		0	

Table B.35: R-MSG-RA configuration

Item	Bits	Name	Ref.	Status	Support	Values	
						Allowed	Supported
1	79-56	Reserved	9.9.2	m		0	
2	55-49	# RS overhead bytes (R)	9.9.2	m		0..127	
3	48-40	# RS payload bytes (K)	9.9.2	m		0..511	
4	39-32	# Tones carrying data	9.9.2	m		0..255	
5	31-25	Estimated average loop attenuation (downstream)	9.9.2	m		0..127 --_ dB	
6	24-21	Coding gain	9.9.2	m		0..15 --_ dB	
7	20-16	Performance margin with selected rate option	9.9.2	m		0..31 --dB	
8	15-14	Reserved	9.9.2	m		0	
9	13-12	Max interleaving depth	9.9.2	m		0..3	
10	11-0	Max # bits per symbol	9.9.2	m		0..4095	

B.4.2 RATES-RA messages

The content of the RA message is determined by the line quality.
If a fixed startup rate is used, then the ATU-C C-RATES-RA message content could be identical to the C-RATES1 message content.

Table B.36: Expanded exchange rates support

Item	Signal	Reference	Status	Support	
				ATU-C	*ATU-R*
1	C-RATES-RA	9.8.3	m		
2	R-RATES-RA	9.9.4	m		

B.4.3 MSG2 messages

C-message2 is a 32 bit message and contains the total number of bits per symbol supported, the estimated upstream loop attenuation, and the performance margin with the selected rate option.

Table B.37: C-MSG2 configuration

Item	Bits	Name	Ref.	Status	Support	Values	
						Allowed	Supported
1	31-26	Estimated average loop attenuation (upstream)	9.9.2	m		0..63 -- _dB	
2	25-21	Reserved	9.9.2	m		0	
3	20-16	Performance margin with selected rate option	9.9.2	m		0..31 --dB	
4	15-9	Reserved	9.9.2	m		0	
5	8-0	Max # bits per symbol	9.9.2	m		0..511	

R-message2 is a 32 bit message and contains the total number of bits per symbol supported, the estimated downstream loop attenuation, and the performance margin with the selected rate option.

Table B.38: R-MSG2 configuration

Item	Bits	Name	Ref.	Status	Support	Values	
						Allowed	Supported
1	31-25	Estimated average loop attenuation (downstream)	9.9.8	m		0..127 --_dB	
2	24-21	Reserved	9.9.8	m		0	
3	20-16	Performance margin with selected rate option	9.9.8	m		0.31 --dB	
4	15-12	Reserved	9.9.8	m		0	
5	11-0	Max # bits per symbol	9.9.8	m		0..4095	

B.4.4 RATES2 messages

In R-RATES2, the ATU-R sends the selected downstream option.

Table B.39: R-RATES2 configuration

Item	Bits	Name	Ref.	Status	Support	Values	
						Allowed	Supported
1	7..0	Selected downstream option	9.9.10	m		11,22,44,8800 --hex	

In C-RATES2, the ATU-C sends the selected upstream option, combined with the downstream option as selected by the ATU-R in R-RATES2.

Table B.40: C-RATES2 configuration

Item	Bits	Name	Ref.	Status	Support	Values	
						Allowed	Supported
1	7..0	Selected down & up options	9.8.1 1	m		11,12,14,18 21,22,24,28 41,42,44,48 81,82,84,88 00 --hex	

B.4.5 B&G tables

The ATU-C sends the upstream B&G table in C-B&G.

Table B.41: Bits and Gains message support

Item	Message	Reference	Status	Support	
				ATU-C	*ATU-R*
1	C-B&G	9.8.13	m		
2	R-B&G	9.9.4	m		

Table B.42: ATU-C C-B&G support

Item	Name	Ref.	Status	Support	Values	
					Allowed	Supported
1	Bi tone 16	9.8.13	m		0	
2	Gi tone 16	9.8.13	m		1	
3	Bi unused tones	9.8.13	m		0	
4	Gi unused tones	9.8.13	m		0	
5	Bi monitored tones	9.8.13	m		0	
6	Gi monitored tones	9.8.13	m		0.75..1.33	
7	Bi used tones	9.8.13	m		0..Nupmax	
8	Gi used tones	6.10	m		0.75..1.33	

Nupmax: value indicated in Table B.20/15

The ATU-R sends the downstream B&G table in R-B&G.

Table B.43: ATU-R R-B&G support

Item	Name	Ref.	Status	Support	Values	
					Allowed	Supported
1	Bi tone 64	9.9.14	m		0	
2	Gi tone 64	9.9.14	m		1	
3	Bi unused tones	9.9.14	m		0	
4	Gi unused tones	9.9.14	m		0	
5	Bi monitored tones	9.9.14	m		0	
6	Gi monitored tones	9.9.14	m		0.75..1.33	
7	Bi used tones	9.9.14	m		0..Ndownmax	
8	Gi used tones	7.10	m		0.75..1.33	

Ndownmax: value indicated in Table B.21/15

B.5 Showtime

B.5.1 Steady state PSD

Table B.44: ATU-C steady state PSD

Item	Mask	Reference	Status	Support
1	TX-PSD	6.14	m	

Table B.45: ATU-R steady state PSD

Item	Mask	Reference	Status	Support
1	TX-PSD	7.14	m	

B.5.2 Framing

Four different framing structures exist.

Table B.46: Framing structure support

Item	Framing structure	Reference	Status	Support	
				ATU-C	*ATU-R*
1	0: full overhead sync	6.4, 7.4	m		
2	1: full overhead, no sync	6.4, 7.4	c4701		
3	2: reduced overhead, separate fast & sync	6.4, 7.4	o.5		
4	3: reduced overhead, merged fast & sync	6.4, 7.4	o.5		

c4701: IF Table B.22/1 THEN o.5 ELSE m
o.5: If this framing structure is supported than also all lower numbered framing structures shall be supported.

Table B.47: ATU-C Network timing reference support

Item		Reference	Status	Support
1	NTR	6.1.5, 6.2.4	c4801	

c4801: IF Table B.22/1 THEN o ELSE m

Table B.48: ATU-R Network timing reference support

Item		Reference	Status	Support
1	NTR	7.1.4, 7.2.3	o	

STM and ATM based modems could have a different behavior on the bit/byte alignment of the data

Table B.49: ATU-R byte boundary preservation between T-R and U-R interface

Item	Byte boundary preservation	Reference	Status	Support
1	Framing structure 0	6.1.5, 6.2.4	C5001	
2	Framing structure 1	6.1.5, 6.2.4	C5001	
3	Framing structure 2	6.1.5, 6.2.4	C5001	
4	Framing structure 3	6.1.5, 6.2.4	C5001	

C5001: IF Table B.22/1 THEN o ELSE m

Table B.50: ATU-R byte boundary preservation between V-C and U-C interface

Item	Byte boundary preservation	Reference	Status	Support
1	Framing structure 0	7.1.4, 7.2.3	c5101	
2	Framing structure 1	7.1.4, 7.2.3	c5101	
3	Framing structure 2	7.1.4, 7.2.3	c5101	
4	Framing structure 3	7.1.4, 7.2.3	c5101	

c5101: IF Table B.22/1 THEN o ELSE m

B.5.3 Embedded Operations Channel (EOC)

The EOC channel is used for communication between the ATU-C and ATU-R for maintenance and status information.

Table B.51: EOC support (bi-directional messages)

Item	Message	Reference	Status	Support	
				ATU-C	*ATU-R*
1	HOLD	8.1.3.1	m		
2	RTN	8.1.3.1	m		
3	SLFTST	8.1.3.1	m		
4	REQCOR	8.1.3.1	m		
5	REQEND	8.1.3.1	m		
6	NOTCOR	8.1.3.1	m		
7	EOD	8.1.3.1, 8.1.3.3	m		
8	REQTPU	8.1.3.1	m		
9	WRITE[1]	8.1.3.1, 8.1.5.3.2	m		
10	READ[1]	8.1.3.1, 8.1.5.3.1	m		

Table B.52: EOC support (ATU-C to ATU-R)

Item	Message	Reference	Status	Support	
				ATU-C	*ATU-R*
1	NEXT	8.1.3.2	m		

Table B.53: EOC support (ATU-R to ATU-C)

Item	Message	Reference	Status	Support	
				ATU-C	*ATU-R*
1	UTC	8.1.3.3	m		
2	DGASP	8.1.3.3, 8.1.5.4	m		

Table B.54: ATU-R register support

Item	Register	Reference	Status	Support
1	Vendor Id	8.1.4	m	
2	Revision number	8.1.4	m	
3	Serial number	8.1.4	m	
4	Self test results [2]	8.1.4	m	
5	Vendor discretionary [3]	8.1.4	m	
6	Vendor discretionary [3]	8.1.4	m	
7	Line attenuation	8.1.4	m	
8	SNR margin	8.1.4	m	
9	ATU-R configuration	8.1.4	m	
10-15	Reserved	8.1.4	m	

When the ATU-R does not support a message or does not support the requested function it shall reply with the unable-to-comply (UTC) (8.1.5.2).

B.5.4 ADSL Overhead Channel (AOC)

The AOC channel is used for online adaptation and reconfiguration of the number of bits and gain assigned per sub-carrier.

Table B.55: AOC message support

Item	Message	Reference	Status	Support	
				ATU-C	*ATU-R*
1	Reconfiguration	10.1.1	m		
2	Vendor specific	10.1.1	m		
3	Unable to comply	10.1.1	m		
4	Extended bit swap request	10.1.1	m		
5	Bit swap request	10.1.1	m		
6	Bit swap acknowledge	10.1.1	m		

Table B.56: Bit swap request message support

Item	Message	Reference	Status	Support	
				ATU-C	*ATU-R*
1	Do nothing	10.2.3	m		
2	Increase #bits by one	10.2.3	m		
3	Decrease #bits by one	10.2.3	m		
4	Increase power by 1 dB	10.2.3	m		
5	Increase power by 2 dB	10.2.3	m		
7	Increase power by 3 dB	10.2.3	m		
8	Decrease power by 1 dB	10.2.3	m		
9	Decrease power by 2 dB	10.2.3	m		
10	Vendor commands	10.2.3	m		

B.6 OAM

[2] Only the first byte is defined in this register. The length and syntax of the remainder is vendor discretionary.

[3] . The length and syntax of these registers are vendor discretionary. ATU-C has to know of the nature and length of these registers when reading or writing to them

B.6.1 Indicator bits, ADSL line related

Table B.57: ADSL line related near-end anomalies

Item	Primitive	Reference	Status	Support	
				ATU-C	*ATU-R*
1	fec-I	8.2.1.1	m		
2	fec-F	8.2.1.1	m		
3	crc-I	8.2.1.1	m		
4	crc-F	8.2.1.1	m		

Table B.58: ADSL line related far-end anomalies

Item	Primitive	Reference	Status	Support	
				ATU-C	*ATU-R*
1	ffec-I	8.2.1.2	m		
2	ffec-F	8.2.1.2	m		
3	febe-I	8.2.1.2	m		
4	febe-F	8.2.1.2	m		

Table B.59: ADSL line related near-end defects

Item	Primitive	Reference	Status	Support	
				ATU-C	*ATU-R*
1	los	8.2.1.3	m		
2	sef	8.2.1.3	m		

Table B.60: ADSL line related far-end defects

Item	Primitive	Reference	Status	Support	
				ATU-C	*ATU-R*
1	flos	8.2.1.4	m		
2	frdi	8.2.1.4	m		

B.6.2 Indicator bits, ATM data path related

Table B.61: ATM data path near-end anomalies

Item	Primitive	Reference	Status	Support	
				ATU-C	*ATU-R*
1	ncd-I	8.2.3.1	m		
2	ncd-F	8.2.3.1	m		
3	ocd-I	8.2.3.1	m		
4	ocd-F	8.2.3.1	m		
5	hec-I	8.2.3.1	m		
6	hec-F	8.2.3.1	m		

Table B.62: ATM data path far-end anomalies

Item	Primitive	Reference	Status	Support	
				ATU-C	*ATU-R*
1	fncd-I	8.2.3.2	m		
2	fncd-F	8.2.3.2	m		
3	focd-I	8.2.3.2	m		
4	focd-F	8.2.3.2	m		
5	fhec-I	8.2.3.2	m		
6	fhec-F	8.2.3.2	m		

Table B.63: ATM data path near-end defects

Item	Primitive	Reference	Status	Support	
				ATU-C	*ATU-R*
1	lcd-I	8.2.3.3	m		
2	lcd-I	8.2.3.3	m		

Table B.64: ATM data path far-end defects

Item	Primitive	Reference	Status	Support	
				ATU-C	*ATU-R*
1	flcd-I	8.2.3.4	m		
2	flcd-F	8.2.3.4	m		

Table B.65: Other

Item	Primitive	Reference	Status	Support	
				ATU-C	*ATU-R*
1	lpr	8.2.4	m		
2	flpr	8.2.4	m		

B.6.3 ADSL line related failures and counters

Table B.66: ADSL line related near-end failures

Item	Failure	Reference	Status	Support	
				ATU-C	*ATU-R*
1	LOS	8.2.5.1	m		
2	LOF	8.2.5.1	m		
3	LPR	8.2.5.1	m		

Table B.67: ATU-C ADSL line related near-end failure counters

Item	Failure Counter	Reference	Status	Support
1	LOS	8.2.5.1, 8.2.4.3	m	
2	LOF	8.2.5.1, 8.2.4.3	m	
3	LPR	8.2.5.1, 8.2.4.3	m	

Table B.68: ATU-R ADSL line related near-end failure counters

Item	Failure Counter	Reference	Status	Support
1	LOS	8.2.5.1, 8.2.4.3	o	
2	LOF	8.2.5.1, 8.2.4.3	o	
3	LPR	8.2.5.1, 8.2.4.3	o	

Table B.69: ATU-C ADSL line related far-end failures

Item	Failure	Reference	Status	Support
1	FLOS	8.2.5.2	m	
2	FRFI	8.2.5.2	m	
3	FLPR	8.2.5.2	m	

Table B.70: ATU-C ADSL line related far-end failure counters

Item	Failure Counter	Reference	Status	Support
1	FLOS	8.2.5.2, 8.2.4.3	m	
2	FRFI	8.2.5.2, 8.2.4.3	m	
3	FLPR	8.2.5.2, 8.2.4.3	m	

Table B.71: ATU-R ADSL line related far-end failures

Item	Failure	Reference	Status	Support
1	FLOS	8.2.5.2	o	
2	FRFI	8.2.5.2	o	
3	FLPR	8.2.5.2	o	

Table B.72: ATU-R ADSL line related far-end failure counters

Item	Failure counter	Reference	Status	Support
1	FLOS	8.2.5.2, 8.2.4.3	o	
2	FRFI	8.2.5.2, 8.2.4.3	o	
3	FLPR	8.2.5.2, 8.2.4.3	o	

B.6.4 ATM data path related failures and counters

Table B.73: ATM related near-end failures

Item	Failure	Reference	Status	Support	
				ATU-C	*ATU-R*
1	NCD-I	8.2.7.1	m		
2	NCD-F	8.2.7.1	m		
3	LCD-I	8.2.7.1	m		
4	LCD-F	8.2.7.1	m		

Table B.74: ATU-C ATM related near-end failure counters

Item	Failure counter	Reference	Status	Support
1	NCD-I	8.2.7.1, 8.2.4.3	m	
2	NCD-F	8.2.7.1, 8.2.4.3	m	
3	LCD-I	8.2.7.1, 8.2.4.3	m	
4	LCD-F	8.2.7.1, 8.2.4.3	m	

Table B.75: ATU-R ATM related near-end failure counters

Item	Failure counter	Reference	Status	Support
1	NCD-I	8.2.7.1, 8.2.4.3	o	
2	NCD-F	8.2.7.1, 8.2.4.3	o	
3	LCD-I	8.2.7.1, 8.2.4.3	o	
4	LCD-F	8.2.7.1, 8.2.4.3	o	

Table B.76: ATU-C ATM related far-end failures

Item	Failure	Reference	Status	Support
1	FNCD-I	8.2.7.2	m	
2	FNCD-F	8.2.7.2	m	
3	FLCD-I	8.2.7.2	m	
4	FLCD-F	8.2.7.2	m	

Table B.77: ATU-C ATM related far-end failure counters

Item	Failure counter	Reference	Status	Support
1	FNCD-I	8.2.7.2, 8.2.4.3	m	
2	FNCD-F	8.2.7.2, 8.2.4.3	m	
3	FLCD-I	8.2.7.2, 8.2.4.3	m	
4	FLCD-F	8.2.7.2, 8.2.4.3	m	

Table B.78: ATU-R ATM related far-end failures

Item	Failure	Reference	Status	Support
1	FNCD-I	8.2.7.2	o	
2	FNCD-F	8.2.7.2	o	
3	FLCD-I	8.2.7.2	o	
4	FLCD-F	8.2.7.2	o	

Table B.79: ATU-R ATM related far-end failure counters

Item	Failure Counters	Reference	Status	Support
1	FNCD-I	8.2.7.2, 8.2.4.3	o	
2	FNCD-F	8.2.7.2, 8.2.4.3	o	
3	FLCD-I	8.2.7.2, 8.2.4.3	o	
4	FLCD-F	8.2.7.2, 8.2.4.3	o	

B.6.5 Performance monitoring

Table B.80: ADSL related performance counters

Item	Counter	Reference	Status	Support	
				ATU-C	*ATU-R*
1	ADSL performance	8.2.8, Annex M	o		

Table B.81: ATM data path related near-end performance counters

Item	Counter	Reference	Status	Support	
				ATU-C	*ATU-R*
1	HEC-violation-I	8.2.10	m		
2	HEC-violation-F	8.2.10	m		
3	HEC-total-cell-I	8.2.10	m		
4	HEC- total-cell-F	8.2.10	m		

5	User-total-cell-I	8.2.10	m		
6	User- total-cell-F	8.2.10	m		

B.6.6 Test parameter Support

Table B.82: Near-end test parameter support

Item	Parameter	Reference	Status	Support	
				ATU-C	*ATU-R*
1	ATN	8.3.1	m		
2	SNR	8.3.1	m		

Table B.83: ATU-C far-end test parameter support

Item	Parameter	Reference	Status	Support
1	FATN	8.3.2	m	
2	FSNR	8.3.2	m	

ANNEX C: Electrical ADSL ICS

C.1 ATU and HPF Characteristics

C.1.1 ATU AND HPF DC CHARACTERISTICS

The table below shows the DC resistance requirements of the ATU and high pass filter.

Table C.1: ATU and HPF DC resistance

Item	Test label	Reference	Status	Support	Values	
					Allowed	Supported
1	ATU and HPF DC	12.1	m		>= 5 --MΩ	

C.1.2 ATU and HPF Input Impedance

The table below shows the AC impedance requirements of the ATU and HPF.

Table C.2: ATU and HPF Input Impedance

Item	Test label	Reference	Status	Support	Values	
					Allowed	Supported
1	ATU-R or ATU-C w/ Splitter	12.2.1	m		1.1..2.0 --kΩ	
2	ATU-C without Splitter	12.2.1	m		0.5..1.0 --kΩ	

C.1.3 ATU and HPF Longitudinal Balance

The table below shows the longitudinal balance requirements for the ATU and HPF.

Table C.3: ATU and HPF Longitudinal Balance

Item	Test label	Reference	Status	Support	Values	
					Allowed	Supported
1	Longitudinal Balance	12.3.1	m		> 40 --dB	

C.2 POTS Splitter Voice Band Characteristics

C.2.1 POTS Splitter DC Characteristics

The table below shows the DC resistance requirements of the P0TS Splitter LPF.

Table C.4: POTS Splitter DC Resistance

Item	Test label	Reference	Status	Support	Values	
					Allowed	Supported
1	Tip to Ring DC Resistance	E.2	m		<= 25 --Ω	
2	Tip, Ring to Ground DCR	E.2	m		>= 5 --MΩ	

C.2.2 POTS Splitter Voice Band Insertion Loss

The table below shows the source to termination insertion loss requirements. Measurements are made at 1004 Hz with and without the Splitter/ZHP combination inserted. The allowed values are the maximum insertion loss permitted due to the addition of the Splitter/ZHP.

Table C.5: POTS Splitter Voice Band Insertion Loss

Item	Test label	Reference	Status	Support	Values	
					Allowed	Supported
1	Short Loop Insertion Loss	E.3.1.2	m		<= 1.0 --dB	
2	Long Loop Insertion Loss	E.3.1.2	m		<= 0.75 --dB	

C.2.3 POTS Splitter Voice Band Attenuation Distortion

The table below shows the maximum permissible variation of insertion loss with frequency as compared to the 1004 Hz measurement with the POTS/ZHP.

Table C.6: POTS Splitter Voice Band Attenuation Distortion

Item	Test label	Reference	Status	Support	Values	
					Allowed	Supported
1	Short Loop Attenuation Distortion: 0.2 to 3.4 kHz	E.3.1.3	m		+1.5 .. —1.5 --dB	
2	Short Loop Attenuation Distortion: 3.4 to 4.0 kHz	E.3.1.3	m		+2.0 .. —2.0 --dB	
3	Long Loop Attenuation Distortion: 0.2 to 3.4 kHz	E.3.1.3	m		+0.5.. —1.5 --dB	
4	Long Loop Attenuation Distortion: 3.4 to 4.0 kHz	E.3.1.3	m		+1.0 .. —1.5 --dB	

C.2.4 POTS Splitter Voice Band Delay Distortion

The table below shows the maximum permissible variation of delay distortion by the addition of the POTS splitter.

Table C.7: POTS Splitter Voice Band Delay Distortion

Item	Test label	Reference	Status	Support	Values	
					Allowed	Supported
1	Short Loop Delay Distortion: 0.2 to 3.4 kHz	E.3.1.4	m		< 250 -- usec	
2	Short Loop Delay Distortion: 3.4 to 4.0 kHz	E.3.1.4	m		< 200 -- usec	
3	Long Loop Delay Distortion: 0.2 to 3.4 kHz	E.3.1.4	m		< 250 -- usec	
4	Long Loop Delay Distortion: 3.4 to 4.0 kHz	E.3.1.4	m		< 200 -- usec	

C.2.5 POTS Splitter Voice Band Return Loss

The table below shows the permissible values of return loss for the POTS splitter under the conditions specified in the reference.

Table C.8: POTS Splitter Return Loss

Item	Test label	Reference	Status	Support	Values	
					Allowed	Supported
1	CO Splitter ERL: Short Loop	E.3.1.5	m		> 8dB	
2	CO Splitter ERL: Long Loop	E.3.1.5	m		> 8dB	
3	CO Splitter SRL-L: Short Loop	E.3.1.5	m		> 5dB	
4	CO Splitter SRL-L: Long Loop	E.3.1.5	m		> 5dB	
5	CO Splitter SRL-H: Short Loop	E.3.1.5	m		> 5dB	
6	CO Splitter SRL-H: Long Loop	E.3.1.5	m		> 5dB	
7	CO Splitter SRL-H: Short Loop Single Frequency	E.3.1.5	m		> 2dB	
8	CO Splitter SRL-H: Long Loop Single Frequency	E.3.1.5	m		> 2 dB	
9	RT Splitter ERL: Short Loop	E.3.1.5	m		> 6 dB	
10	RT Splitter ERL: Long Loop	E.3.1.5	m		> 6 dB	
11	RT Splitter SRL-L: Short Loop	E.3.1.5	m		> 5 dB	
12	RT Splitter SRL-L: Long Loop	E.3.1.5	m		> 5 dB	
13	RT Splitter SRL-H: Short Loop	E.3.1.5	m		> 3 dB	
14	RT Splitter SRL-H: Long Loop	E.3.1.5	m		> 3 dB	
15	RT Splitter SRL-H: Short Loop Single Frequency	E.3.1.5	m		> 2 dB	
16	RT Splitter SRL-H: Long Loop Single Frequency	E.3.1.5	m		> 2dB	

C.2.6 POTS Splitter Harmonic Distortion

The table below shows the maximum permissible distortion contributed by the addition of the POTS splitter.

Table C.9: POTS Splitter Harmonic Distortion

Item	Test label	Reference	Status	Support	Values	
					Allowed	Supported
1	Second Order Distortion Product	E.3.1.6	m		>= 57 --dB	
2	Third Order Distortion Product	E.3.1.6	m		>= 60 --dB	

C.2.7 POTS Splitter Longitudinal Balance

The table below shows the maximum permissible imbalance contributed by the addition of the POTS splitter.

Table C.10: POTS Splitter Longitudinal Balance

Item	Test label	Reference	Status	Support	Values	
					Allowed	Supported
1	Single End Balance: .2-1kHz	E.3.2.1	o.6		> 58 --dB	
2	Single End Balance: 1-3kHz	E.3.2.1	o.6		> 58 dB @ 1kHz > 53dB @ 3kHz	
3	One Port Balance: .2-3kHz	E.3.2.2	o.6		52 --dB	

o.6: Either items 1 and 2 or item 3 is required.

C.2.8 POTS Splitter Transparent Testing Capacitance

The table below shows the permissible capacitance contributed by the addition of the POTS splitter.

Table C.11: POTS Splitter Transparent Testing Capacitance

Item	Test label	Reference	Status	Support	Values	
					Allowed	Supported
1	Two POTS Splitters with modems, tip to ring	E.3.3.1	m		<= 250 --nF	
2	Splitter w/o modem tip to ring capacitance	E.3.3.1	m		20..90 --nF	
3	Modem input w/o splitter	E.3.3.1	m		20..35 --nF	
4	Modem input with splitter	E.3.3.1	m		40..125 --nF	
5	Splitter capacitance to ground	E.3.3.2	m		< 1 --nF	

C.3 POTS Splitter ADSL Band Characteristics

C.3.1 POTS Splitter ADSL Band Attenuation

The table below shows the permissible ADSL attenuation contributed by the addition of the POTS splitter.

Table C.12: POTS Splitter ADSL Band Attenuation

Item	Test label	Reference	Status	Support	Values	
					Allowed	Supported
1	Attenuation: 30 to 300 kHz	E.4.1	m		> 65 --dB	
2	Attenuation: 300 to 1104 kHz	E.4.1	m		> 55 --dB	

C.3.2 POTS Splitter Input Impedance

The table below shows the permissible loading of the ADSL path contributed by the addition of the POTS splitter.

Table C.13: POTS Splitter ADSL Band Input Impedance

Item	Test label	Reference	Status	Support	Values	
					Allowed	Supported
1	Insertion Loss 30 to 1104 kHz	E.4.2	m		<= 0.25 dB	

List of tables