3GPP TSG-T (Terminals) Meeting #12
Stockholm, Sweden, 13 - 15 June, 2001

Tdoc TP-010091

TSG-RAN Working Group 2 (Radio L2 and Radio L3) *R2-011482*
Busan, Korea, 21 - 25 May 2001

Source: **TSG-RAN WG2**

To: **TSG-T, TSG-T WG1**

Cc:

Title: **Response to LS (T1-010165) on Corrections of RLC wording**

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TSG-RAN WG2 would like to thank TSG-T WG1 for LS contained in Tdoc T1-010165/R2-011194. TSG-RAN WG2 has reviewed the attached CR to TS34.108 and TS34.123-1.

After reviewing CRs, TSG-RAN WG2 agreed on CR to TS.34.108. However, for CR to TS34.123-1, it is felt that the description “(excluding Length Indicator)” is not necessary and even erroneous. Also, since PU(payload unit) concept no longer exists in TSG-RAN WG2, the word “PU” needs to be replaced with the word “PDU”

Revision of the CR to TS34.123-1 is proposed in the attached document. TSG-RAN WG2 kindly asks TSG-T WG1 to review the proposed revisions, and agree on the CR.

CR RLC tests - R2rev.zip

3GPP TSG-T1/SIG Meeting #17
Melbourne, Australia, 14-16 May, 2001

Tdoc T1S-~~010127~~01xxxx

CR-Form-v3

CHANGE REQUEST

⌘ **34.123-1 CR xxx** ⌘ rev **-1** ⌘ Current version: **3.3.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE **X** Radio Access Network **X** Core Network ☐

Title:	⌘	Clarification on RLC header
Source:	⌘	NTTDoCoMo
Work item code:	⌘	***Date:*** ⌘ 15 May. 2001
Category:	⌘ **F**	***Release:*** ⌘ R99

Use one of the following categories:
F *(essential correction)*
A *(corresponds to a correction in an earlier release)*
B *(Addition of feature),*
C *(Functional modification of feature)*
D *(Editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.9 the 00.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change: ⌘

1) Change of the wording of "RLC header"

T1 received LS from R2 (T1-010120(R2-01761)).

In the LS,

> It was concluded in RAN2 meeting #19 that the RLC header and PDU header shall be clarified. The conclusion was as following: UMD PDU header and AMD PDU header consist of the octets that contain SN field and are one and two octets long respectively. The RLC header consists the octets that contain the SN field and the Length Indication fields.

RLC header' is changed to 'AMD/UMD/TrD PDU header' wherever AM/UM/Tr modes are applicable.

2) Correction of section number

One editorial mistake shall be corrected.

3) Replacement of the word "PU" with "PDU"

It was concluded in RAN2 meeting that "payload unit" shall be replaced with "PDU"

Summary of change: ⌘

1) Change of the wording of "RLC header"

RLC header' is changed to 'AMD/UMD/TrD PDU header' wherever AM/UM/Tr modes are applicable.

2) Correction of section number

7.2.2.2.3 → 7.2.3.2.3

		3) Replacement of the word “PU” with “PDU”
Consequences if not approved:	⌘	Inconsistency between specifications.

Clauses affected:	⌘	7.2.2.1, 7.2.2.2.4, 7.2.3.1, 7.2.3.2.4			
Other specs Affected:	⌘	X	Other core specifications	⌘	25.322
			Test specifications		
			O&M Specifications		
Other comments:	⌘				

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

7.2 RLC testing

7.2.1 Transparent mode

7.2.1.1 Segmentation and reassembly

Transparent mode segmentation and reassembly are not tested in this release of the specification.

7.2.2 Unacknowledged mode

7.2.2.1 General information for UM tests

A generic Radio Access Bearer is provided for UM tests. This RAB is based upon the Stand-alone 3.4kbps UL/DL Signalling RB, with an additional UM 3.4kbps path mapped to a DTCH. This logical channel is multiplexed on the same transport channel as the DCCH.

The UM test RAB is set up using the Generic Procedure described in Clause 7.1.3 of TS 34.108, and with the default RAB replaced as follows:

Table 7.2/1 RAB Configuration for UM testing (7-bit Lis)

Higher layer	RAB/signalling RB		**SRB#1**	**SRB#2**	**SRB#3**	**SRB#4**	**RAB #1**
	User of Radio Bearer		RRC	RRC	NAS_DT High prio	NAS_DT Low prio	User Plane
RLC	Logical channel type		DCCH	DCCH	DCCH	DCCH	DTCH
	RLC mode		UM	AM	AM	AM	UM
	Payload sizes, bit		136	128	128	128	136
	Max data rate, bps		3400	3200	3200	3200	3400
	AMD/UMD PDU header ~~(excluding Length indicator)RLC header~~, bit		8	16	16	16	8
MAC	MAC header, bit		4	4	4	4	4
	MAC multiplexing		4 logical channel multiplexing				
Layer 1	TrCH type		DCH				
	TB sizes, bit		148				
	TFS	TF0, bts	0				
		TF1, bits	1x148				
	TTI, ms		40				
	Coding type		CC 1/3				
	CRC, bit		16				
	Max number of bits/TTI before rate matching		516				
	Uplink: Max number of bits/radio frame before rate matching		129				

The UM test RAB is used in all tests with the following exceptions:

- Tests that only involve 15-bit length indicators
- Tests that explicitly specify a different Radio Bearer configuration

Tests that involve only 15-bit length indicators require a modified Radio Bearer configuration. To accommodate the larger payload size, these tests use a coded composite transport channel consisting of two DCH. The first DCH is specified as for the 7-bit length indicators, but not including the DTCH (RAB#1). This is shown in Table 7.2/2A

Table 7.2/2A SRB Configuration for UM testing (15-bit Lis)

Higher layer	Signalling RB: **DCH 0**		**SRB#1**	**SRB#2**	**SRB#3**	**SRB#4**
	User of Radio Bearer		RRC	RRC	NAS_DT High prio	NAS_DT Low prio
RLC	Logical channel type		DCCH	DCCH	DCCH	DCCH
	RLC mode		UM	AM	AM	AM
	Payload sizes, bit		136	128	128	128
	Max data rate, bps		3400	3200	3200	3200
	AMD/UMD PDU header ~~(excluding Length indicator)RLC header, bit~~		8	16	16	16
MAC	MAC header, bit		4	4	4	4
	MAC multiplexing		4 logical channel multiplexing			
Layer 1	TrCH type		DCH			
	TB sizes, bit		148			
	TFS	TF0, bts	0			
		TF1, bits	1x148			
	TTI, ms		40			
	Coding type		CC 1/3			
	CRC, bit		16			
	Max number of bits/TTI before rate matching		516			
	Uplink: Max number of bits/radio frame before rate matching		129			

This DCH is combined with a traffic DCH (at lower MAC priority) as described in Table 7.2/2B

Table 7.2/2B RAB Configuration for UM testing (15-bit Lis)

Higher layer	RAB: **DCH 1**		**RAB**
RLC	Logical channel type		DTCH
	RLC mode		UM
	Payload sizes, bit		1280
	Max data rate, bps		64000
	UMD PDU header ~~(excluding Length indicator)RLC header~~, bit		8
MAC	MAC header, bit		0
	MAC multiplexing		N/A
Layer 1	TrCH type		DCH
	TB sizes, bit		1288
	TFS	TF0, bits	0
		TF1, bits	1x1288
	TTI, ms		20
	Coding type		TC
	CRC, bit		16

All other settings are the same.

7.2.2.2 Segmentation and reassembly / Selection of 7 or 15 bit Length Indicators

7.2.2.2.1 Definition

The UM RLC entity should select the appropriate length indicator size dependant upon the signaled ~~PU~~ PDU size.

This requirement applies to all UEs.

7.2.2.2.2 Conformance requirement

The size of the Length Indicator may be either 7 bits or 15 bits.

For UM, 7 bit indicators shall be used if the UMD PDU size is ≤ l25 octets. Otherwise 15bit indicators shall be used.

The length of the Length Indicator only depends on the size of the largest RLC PDU. The length of the Length Indicator is always the same for all ~~PUs~~PDUs, for one RLC entity.

RLC SDUs might be segmented. If possible, the last segment of a SDU shall be concatenated with the first segment of the next SDU in order to fill the data field completely and avoid unnecessary padding

Reference(s)

TS 25.322 Clauses 9.2.2.8, 9.2.2.9

7.2.2.2.3 Test purpose

To test that if PDU carries a single ~~PU~~PDU, and the ~~PU~~ PDU size is small enough that a 7 bit indicator is sufficient, 7 bit indicators are used, otherwise, 15 bit indicators are used.

7.2.2.2.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (Clause 7.1.3 of TS34.108) is executed, with all the parameters as specified in the procedure, with the following exceptions:

Higher layer	RAB/Signalling RB		RAB
RLC	Logical channel type		DTCH
	RLC mode		UM
	Payload sizes, bit		960
	Max data rate, bps		48000
	UMD PDU header ~~(excluding Length indicator)RLC header~~, bit		8
MAC	MAC header, bit		0
	MAC multiplexing		N/A
Layer 1	TrCH type		DCH
	TB sizes, bit		968
	TFS	TF0, bits	0
		TF1, bits	1x968
	TTI, ms		20
	Coding type		TC
	CRC, bit		16

These settings apply to both the uplink and downlink DTCH.

The radio bearer is placed into loop-back mode 1 with the UL SDU size set to 40 bytes.

Test procedure

a) The SS transmits an RLC SDU of size 80 bytes.

b) The SS checks the length indicator sizes and values of the RLC PDU returned on the uplink.

c) The SS reconfigures the Transport Channel as follows:

Higher layer	RAB/Signalling RB		RAB
RLC	Logical channel type		DTCH
	RLC mode		UM
	Payload sizes, bit		1280
	Max data rate, bps		64000
	UMD PDU header (excluding Length indicator)~~RLC header~~, bit		8
MAC	MAC header, bit		0
	MAC multiplexing		N/A
Layer 1	TrCH type		DCH
	TB sizes, bit		1288
	TFS	TF0, bits	0
		TF1, bits	1x1288
	TTI, ms		20
	Coding type		TC
	CRC, bit		16

All other settings the same.

d) The SS transmits an RLC SDUs of size 80 bytes.

e) The SS checks the length indicator sizes and values of the RLC PDU returned on the uplink

f) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1			RB ESTABLISHMENT	See generic procedures
2	←		DOWNLINK RLC PDU	80 byte SDU + padding
3	→		UPLINK RLC PDU	40 byte SDU + padding
4	←		TRANSPORT CHANNEL RECONFIGURATION	~~PU~~ PDU size > 127 bytes
5	←		DOWNLINK RLC PDU	80 byte SDU + padding
6	→		UPLINK RLC PDU	40 byte SDU + padding
7			RB RELEASE	Optional step

7.2.2.2.5 Test requirements

The UE shall send 7 bit length indicators with values that correctly indicate the end of SDU in step b).

The UE shall send 15 bit length indicators with values that correctly indicate the end of SDU in step e).

7.2.2.3 Segmentation / 7-bit Length Indicators / Padding

7.2.2.3.1 Definition

The RLC segments SDUs into blocks according to the configured payload unit size. Length indicators are added to indicate: the boundaries of SDUs within a ~~PU~~PDU, the addition of padding bytes.

This test applies to all UE.

7.2.2.3.2 Conformance requirement

The Length Indicator is used to indicate, each time, the end of an *S*DU occurs in the ~~PU~~PDU. The Length Indicator points out the number of octets between the end of the last Length Indicator field and up to and including the octet at the end of an SDU segment

A ~~PU~~ PDU that has unused space, to be referred to as padding, must use a Length Indicator to indicate that this space is used as padding. A padding Length Indicator must be placed after any Length Indicators for a ~~PU~~PDU.

One length indicator field shall be included for each end of a SDU that the PDU includes. The length indicator shall be set equal to the number octets between the end of the header fields and the end of the segment. If padding is needed another length indicator shall be added

Reference(s)

TS 25.322 Clauses 9.2.2.8 and 11.2.2.1.

7.2.2.3.3 Test purpose

To test that a large SDU is correctly segmented and padding added at the end.

7.2.2.3.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (Clause 7.1.3 of TS34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for UM 7-bit length indicator tests in Clause 7.2.2.1.

These settings apply to both the uplink and downlink DTCH.

The radio bearer is placed into loop-back mode 1 with the UL SDU size set to 18 bytes.

Test procedure

a) The SS transmits an RLC SDU of size 18 bytes.

b) The SS checks the length indicator sizes and values of the RLC PDU returned on the uplink, and checks the length and content of the received RLC SDU.

c) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1			RB ESTABLISHMENT	See generic procedures
2	←		DOWNLINK RLC PDU	SDU 1
3	←		DOWNLINK RLC PDU	SDU 1 & Padding
4	→		UPLINK RLC PDU	No LI
5	→		UPLINK RLC PDU	Check Lis and re-assembled SDU
6			RB RELEASE	Optional step

7.2.2.3.5 Test requirements

The UE shall return two RLC PDUs. The first shall have no LIs. The second shall have a LI indicating the PDU contains an SDU boundary after octet 1 of the data field, and the second shall indicate that the remainder of the PDU contains padding.

The length and data content of the received SDU should be the same as the transmitted SDU.

7.2.2.4 Segmentation / 7-bit Length Indicators / LI = 0

7.2.2.4.1 Definition

Tests the behaviour of the RLC when an SDU exactly fills a ~~PU~~PDU.

This test applies to all UE.

7.2.2.4.2 Conformance requirement

If the PDU is exactly filled with the last segment of a SDU and there is no room for a length indicator field a length indicator field set to only 0's shall be included in the next PDU.

Reference(s)

TS 25.322 Clause 11.2.2.1

7.2.2.4.3 Test purpose

To test that where an SDU exactly fills a ~~PU~~PDU, an LI of value zero is placed as the first LI in the next ~~PU~~PDU.

7.2.2.4.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (Clause 7.1.3 of TS34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for UM 7-bit length indicator tests in Clause 7.2.2.1.

These settings apply to both the uplink and downlink DTCH.

The radio bearer is placed into loop-back mode 1 with the UL SDU size set to 17 bytes.

Test procedure

a) The SS transmits an RLC SDU of size 34 bytes.

b) The SS checks the length indicator sizes and values of the RLC PDUs returned on the uplink, and checks the length and content of the received RLC SDU.

c) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1			RB ESTABLISHMENT	See generic procedures
2	←		DOWNLINK RLC PDU	SDU 1
3	←		DOWNLINK RLC PDU	SDU 1
4	←		DOWNLINK RLC PDU	LI=0 and padding
5	→		UPLINK RLC PDU	No Lis
6	→		UPLINK RLC PDU	Check Lis and re-assembled SDU
7			RB RELEASE	Optional step

7.2.2.4.5 Test requirements

The UE shall return two RLC PDUs. The first shall have no LIs. The second shall have an LI indicating that the SDU exactly filled the previous ~~PU~~PDU, and an LI indicating that the remainder of the PDU contains padding.

The length of the received SDU should be 17 bytes, and the data content the same as the first 17 bytes of the transmitted SDU.

7.2.2.5 Segmentation / 7-bit Length Indicators / Invalid LI value

7.2.2.5.1 Definition

Tests the behaviour of the RLC when a PDU contains an invalid length indicator.

This test applies to all UE.

7.2.2.5.2 Conformance requirement

Upon reception of an UMD PDU that contains Length Indicator value 1111110 ("piggybacked STATUS PDU") the receiver shall discard that UMD PDU.

Reference(s)

TS 25.322 Clause 11.2.4.1.

7.2.2.5.3 Test purpose

To test that PDUs with invalid length indicators are discarded by the receiving RLC.

7.2.2.5.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (Clause 7.1.3 of TS34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for UM 7-bit length indicator tests in Clause 7.2.2.1.

These settings apply to both the uplink and downlink DTCH.

The radio bearer is placed into loop-back mode 1with the UL SDU size set to 24 bytes.

Test procedure

a) The SS transmits two RLC SDUs of size 24 bytes. In the third PDU for transmission, the SS sets the value of the second (padding) LI to 1111110.

b) The SS checks the length indicator sizes and values of any RLC PDUs returned on the uplink, and checks for the presence of any received RLC SDUs.

c) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1			RB ESTABLISHMENT	See generic procedures
2	←		DOWNLINK RLC PDU	SDU 1
3	←		DOWNLINK RLC PDU	SDU 1 & SDU 2
4	←		DOWNLINK RLC PDU	SDU 2 and invalid LI (=11111110)
5	→		UPLINK RLC PDU	SDU 1
6	→		UPLINK RLC PDU	SDU 1: Check Lis and re-assembled SDU
7			RB RELEASE	Optional step

7.2.2.5.5 Test requirements

The UE shall return two RLC PDUs. The first shall have no LIs. The second shall have a LI indicating the end of the SDU, and a padding LI.

The length and data content of the received SDU should be the same as the first transmitted SDU. The second SDU should not be returned.

7.2.2.6 Segmentation / 7-bit Length Indicators / LI value > PDU size

7.2.2.6.1 Definition

Tests the behaviour of the RLC when a PDU contains an invalid length indicator.

This test applies to all UE.

7.2.2.6.2 Conformance requirement

If the length indicator of a PDU has a value that is larger than the PDU size, the PDU shall be discarded and treated as a missing PDU.

If a PDU with sequence number < VR(US) is missing then all SDUs that have segments in this PDU shall be discarded.

Reference(s)

TS 25.322 Clauses 11.2.4.2 and 11.2.3.

7.2.2.6.3 Test purpose

To test that PDUs with length indicators that point beyond the end of the PDU are discarded by the receiving RLC.

7.2.2.6.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (Clause 7.1.3 of TS34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for UM 7-bit length indicator tests in Clause 7.2.2.1.

These settings apply to both the uplink and downlink DTCH.

The radio bearer is placed into loop-back mode 1 with the UL SDU size set to 24 bytes.

Test procedure

a) The SS transmits three RLC SDUs of size 24 bytes. All the SDUs are concatenated or segmented over successive RLC PDUs. In the third PDU for transmission, the SS sets value of the length indicator to be 18 (decimal).

b) The SS checks the length indicator sizes and values of the RLC PDUs returned on the uplink, and checks the length and content of the received RLC SDUs.

c) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1			RB ESTABLISHMENT	See generic procedures
2	←		DOWNLINK RLC PDU	SDU 1
3	←		DOWNLINK RLC PDU	SDU 1 & SDU 2
4	←		DOWNLINK RLC PDU	SDU 2 & SDU 3, with bad LI
5	←		DOWNLINK RLC PDU	SDU 3
6	←		DOWNLINK RLC PDU	SDU 3 and padding
7	→		UPLINK RLC PDU	SDU 1
8	→		UPLINK RLC PDU	SDU 1 and padding: Check Lis and re-assembled SDU
9			RB RELEASE	Optional step

7.2.2.6.5 Test requirements

The UE shall return two RLC PDUs. The first shall have no LIs. The second shall have a LI indicating the end of an SDU and an LI indicating that the remainder of the PDU contains padding.

The length and data content of the received SDU should be the same as the first transmitted SDU. No further SDUs or PDUs should be received.

7.2.2.7 Segmentation / 7-bit Length Indicators / First data octet LI

7.2.2.7.1 Definition

Tests the behaviour of the UM RLC when the first data octet of the PDU contains the first octet of an SDU.

This test applies to all UE.

7.2.2.7.2 Conformance requirement

LI = 1111100, UMD PDU: The first data octet in this RLC PDU is the first octet of a RLC SDU.

Reference(s)

TS 25.322 Clause 9.2.2.8.

7.2.2.7.3 Test purpose

To test that where the previous PDU contains the end of an SDU and padding, the start of the next SDU is coincident with the start of the next PDU, and is marked by a length indicator of 1111100.

7.2.2.7.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (Clause 7.1.3 of TS34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for UM 7-bit length indicator tests in Clause 7.2.2.1.

These settings apply to both the uplink and downlink DTCH.

The radio bearer is placed into loop-back mode 1 with the UL SDU size set to 12 bytes.

Test procedure

a) The SS transmits a normal RLC SDU of size 12 bytes.

b) The SS waits until the SDU has been received back from the UE, and then transmits another SDU of 12 bytes.

c) The SS waits until this SDU has been received back from the UE.

c) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1			RB ESTABLISHMENT	See generic procedures
2	←		DOWNLINK RLC PDU	SDU 1
3			…	Wait for loopback
4	→		UPLINK RLC PDU	SDU 1
5	←		DOWNLINK RLC PDU	SDU 2 with LI = 1111100
6	→		UPLINK RLC PDU	SDU 2 with LI = 1111100
7			RB RELEASE	Optional step

7.2.2.7.5 Test requirements

The UE shall return two RLC PDUs. The second shall have a LI indicating that the first octet of the PDU contains the first octet of an SDU.

The length and data content of each received SDU should be the same as the transmitted SDU.

7.2.2.8 Segmentation / 15-bit Length Indicators / Padding

7.2.2.8.1 Definition

The RLC segments SDUs into blocks according to the configured payload unit size. Length indicators are added to indicate: the boundaries of SDUs within a ~~PU~~PDU, the addition of padding bytes.

This test applies to UE that support packet data.

7.2.2.8.2 Conformance requirement

The Length Indicator is used to indicate, each time, the end of an *S*DU occurs in the ~~PU~~PDU. The Length Indicator points out the number of octets between the end of the last Length Indicator field and up to and including the octet at the end of an SDU segment

A ~~PU~~ PDU that has unused space, to be referred to as padding, must use a Length Indicator to indicate that this space is used as padding. A padding Length Indicator must be placed after any Length Indicators for a ~~PU~~PDU.

One length indicator field shall be included for each end of a SDU that the PDU includes. The length indicator shall be set equal to the number octets between the end of the header fields and the end of the segment. If padding is needed another length indicator shall be added

Reference(s)

TS 25.322 Clauses 9.2.2.8 and 11.2.2.1.

7.2.2.8.3 Test purpose

To test that a large SDU is correctly segmented and padding added at the end.

7.2.2.8.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (Clause 7.1.3 of TS34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for UM 15-bit length indicator tests in Clause 7.2.2.1.

These settings apply to both the uplink and downlink DTCH.

The radio bearer is placed into loop-back mode 1 with the UL SDU size set to 161 bytes.

Test procedure

a) The SS transmits an RLC SDU of size 161 bytes.

b) The SS checks the length indicator sizes and values of the RLC PDU returned on the uplink, and checks the length and content of the received RLC SDU.

c) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1			RB ESTABLISHMENT	See generic procedures
2	←		DOWNLINK RLC PDU	SDU 1
3	←		DOWNLINK RLC PDU	SDU 1 & Padding
4	→		UPLINK RLC PDU	No LI
5	→		UPLINK RLC PDU	Check Lis and re-assembled SDU
6			RB RELEASE	Optional step

7.2.2.8.5 Test requirements

The UE shall return two RLC PDUs. The first shall have no LIs. The second shall have a LI indicating the PDU contains an SDU boundary after octet 1 of the data field, and the second shall indicate that the remainder of the PDU contains padding.

The length and data content of the received SDU should be the same as the transmitted SDU.

7.2.2.9 Segmentation / 15-bit Length Indicators / LI = 0

7.2.2.9.1 Definition

Tests the behaviour of the RLC when an SDU exactly fills a ~~PU~~PDU.

This test applies to all UE.

7.2.2.9.2 Conformance requirement

If the PDU is exactly filled with the last segment of a SDU and there is no room for a length indicator field a length indicator field set to only 0's shall be included in the next PDU.

Reference(s)

TS 25.322 Clause 11.2.2.1.

7.2.2.9.3 Test purpose

To test that where an SDU exactly fills a ~~PU~~PDU, an LI of value zero is placed as the first LI in the next ~~PU~~PDU.

7.2.2.9.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (Clause 7.1.3 of TS34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for UM 15-bit length indicator tests in Clause 7.2.2.1.

These settings apply to both the uplink and downlink DTCH.

The radio bearer is placed into loop-back mode 1 with the UL SDU size set to 160 bytes.

Test procedure

a) The SS transmits an RLC SDU of size 320 bytes.

b) The SS checks the length indicator sizes and values of the RLC PDUs returned on the uplink, and checks the length and content of the received RLC SDU.

c) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1			RB ESTABLISHMENT	See generic procedures
2	←		DOWNLINK RLC PDU	SDU 1
3	←		DOWNLINK RLC PDU	SDU 1
4	←		DOWNLINK RLC PDU	LI=0 and padding
5	→		UPLINK RLC PDU	No Lis
6	→		UPLINK RLC PDU	Check Lis and re-assembled SDU
7			RB RELEASE	Optional step

7.2.2.9.5 Test requirements

The UE shall return two RLC PDUs. The first shall have no LIs. The second shall have an LI indicating that the SDU exactly filled the previous ~~PU~~PDU, and an LI indicating that the remainder of the PDU contains padding.

The length of the received SDU should be 160 bytes, and the data content the same as the first 160 bytes of the transmitted SDU.

7.2.2.10 Segmentation / 15-bit Length Indicators / One octet short LI

7.2.2.10.1 Definition

Tests the behaviour of the RLC when 15-bit length indicators are used, and an SDU fills a ~~PU~~ PDU to one byte short of the payload size.

This test applies to all UE that support packet data.

7.2.2.10.2 Conformance requirement

In the case where the last segment of an RLC SDU is one octet short of exactly filling the last RLC ~~PU~~PDU, and 15-bit Length Indicators are used, the next Length Indicator shall be placed as the first Length Indicator in the next ~~PU~~ PDU and have value LI=111 1111 1111 1011.

Reference(s)

TS 25.322 Clause 9.2.2.8.

7.2.2.10.3 Test purpose

To test that where an SDU is one byte short of filling a ~~PU~~PDU, an LI indicating one byte short is placed as the first LI in the next ~~PU~~PDU.

7.2.2.10.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (Clause 7.1.3 of TS34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for UM 15-bit length indicator tests in Clause 7.2.2.1.

These settings apply to both the uplink and downlink DTCH.

The radio bearer is placed into loop-back mode 1 with the UL SDU size set to 159 bytes.

Test procedure

a) The SS transmits an RLC SDU of size 320 bytes.

b) The SS checks the length indicator sizes and values of the RLC PDUs returned on the uplink, and checks the length and content of the received RLC SDU.

c) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1			RB ESTABLISHMENT	See generic procedures
2	←		DOWNLINK RLC PDU	SDU 1
3	←		DOWNLINK RLC PDU	SDU 1
4	←		DOWNLINK RLC PDU	LI=0 and padding
5	→		UPLINK RLC PDU	No Lis
6	→		UPLINK RLC PDU	Check Lis and re-assembled SDU
7			RB RELEASE	Optional step

7.2.2.10.5 Test requirements

The UE shall return two RLC PDUs. The first shall have no LIs. The second shall have an LI indicating that the SDU was one byte short of filling the previous ~~PU~~PDU, and an LI indicating that the remainder of the PDU contains padding.

The length of the received SDU should be 159 bytes, and the data content the same as the first 159 bytes of the transmitted SDU.

7.2.2.11 Segmentation / 15-bit Length Indicators / LI value > PDU size

7.2.2.11.1 Definition

Tests the behaviour of the RLC when a PDU contains an invalid length indicator.

This test applies to all UE.

7.2.2.11.2 Conformance requirement

If the length indicator of a PDU has a value that is larger than the PDU size, the PDU shall be discarded and treated as a missing PDU.

If a PDU with sequence number < VR(US) is missing then all SDUs that have segments in this PDU shall be discarded.

Reference(s)

TS 25.322 Clauses 11.2.4.2 and 11.2.3.

7.2.2.11.3 Test purpose

To test that PDUs with length indicators that point beyond the end of the PDU are discarded by the receiving RLC.

7.2.2.11.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (Clause 7.1.3 of TS34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for UM 15-bit length indicator tests in Clause 7.2.2.1.

These settings apply to both the uplink and downlink DTCH.

The radio bearer is placed into loop-back mode 1 with the UL SDU size set to 220 bytes.

Test procedure

a) The SS transmits three RLC SDUs of size 220 bytes. All the SDUs are concatenated or segmented over successive RLC PDUs. In the third PDU for transmission, the SS sets value of the length indicator to be 161 (decimal).

b) The SS checks the length indicator sizes and values of the RLC PDUs returned on the uplink, and checks the length and content of the received RLC SDUs.

c) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1			RB ESTABLISHMENT	See generic procedures
2	←		DOWNLINK RLC PDU	SDU 1
3	←		DOWNLINK RLC PDU	SDU 1 & SDU 2
4	←		DOWNLINK RLC PDU	SDU 2 & SDU 3, with bad LI
5	←		DOWNLINK RLC PDU	SDU 3
6	←		DOWNLINK RLC PDU	SDU 3 and padding
7	→		UPLINK RLC PDU	SDU 1
8	→		UPLINK RLC PDU	SDU 1 and padding: Check Lis and re-assembled SDU
9			RB RELEASE	Optional step

7.2.2.11.5 Test requirements

The UE shall return two RLC PDUs. The first shall have no LIs. The second shall have a LI indicating the end of an SDU and an LI indicating that the remainder of the PDU contains padding.

The length and data content of the received SDU should be the same as the first transmitted SDU. No further SDUs or PDUs should be received.

7.2.2.12 Segmentation / 15-bit Length Indicators / First data octet LI

7.2.2.12.1 Definition

Tests the behaviour of the UM RLC when the first data octet of the PDU contains the first octet of an SDU.

This test applies to all UE.

7.2.2.12.2 Conformance requirement

LI = 111111111111100, UMD PDU: The first data octet in this RLC PDU is the first octet of a RLC SDU.

Reference(s)

TS 25.322 Clause 9.2.2.8.

7.2.2.12.3 Test purpose

To test that where the previous PDU contains the end of an SDU and padding, the start of the next SDU is coincident with the start of the next PDU, and is marked by a length indicator of 111111111111100.

7.2.2.12.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (Clause 7.1.3 of TS34.108) is executed, with all the parameters as specified in the procedure, with the exception that the default Radio Access Bearer is replaced with the RAB defined for UM 15-bit length indicator tests in Clause 7.2.2.1.

These settings apply to both the uplink and downlink DTCH.

The radio bearer is placed into loop-back mode 1 with the UL SDU size set to 150 bytes.

Test procedure

a) The SS transmits a normal RLC SDU of size 150 bytes.

b) The SS waits until the SDU has been received back from the UE, and then transmits another SDU of 150 bytes.

c) The SS waits until this SDU has been received back from the UE.

c) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1			RB ESTABLISHMENT	See generic procedures
2	←		DOWNLINK RLC PDU	SDU 1
3			…	Wait for loopback
4	→		UPLINK RLC PDU	SDU 1
5	←		DOWNLINK RLC PDU	SDU 2 with LI = 111111111111100
6	→		UPLINK RLC PDU	SDU 2 with LI = 111111111111100
7			RB RELEASE	Optional step

7.2.2.12.5 Test requirements

The UE shall return two RLC PDUs. The second shall have a LI indicating that the first octet of the PDU contains the first octet of an SDU.

The length and data content of each received SDU should be the same as the transmitted SDU.

7.2.3 Acknowledged mode

7.2.3.1 General information for AM tests

A generic Radio Access Bearer is provided for AM tests. This RAB is based upon the Stand-alone 3.4kbps UL/DL Signalling RB, with an additional AM 3.4kbps path mapped to a DTCH. This logical channel is multiplexed on the same transport channel as the DCCH.

The AM test RAB is set up using the Generic Procedure described in Clause 7.1.3 of TS 34.108, and with the default RAB replaced as shown in Tables 7.2/3A and 7.23B:

Table 7.2/3A RAB Configuration for AM testing (7-bit Lis)

Higher layer	RAB/signalling RB		**SRB#1**	**SRB#2**	**SRB#3**	**SRB#4**	**RAB #1**
	User of Radio Bearer		RRC	RRC	NAS_DT High prio	NAS_DT Low prio	User Plane
RLC	Logical channel type		DCCH	DCCH	DCCH	DCCH	DTCH
	RLC mode		UM	AM	AM	AM	AM
	Payload sizes, bit		136	128	128	128	128
	Max data rate, bps		3400	3200	3200	3200	3200
	AMD/UMD PDU header ~~(excluding Length indicator)RLC header~~, bit		8	16	16	16	16
MAC	MAC header, bit		4	4	4	4	4
	MAC multiplexing		4 logical channel multiplexing				
Layer 1	TrCH type		DCH				
	TB sizes, bit		148				
	TFS	TF0, bts	0				
		TF1, bits	1x148				
	TTI, ms		40				
	Coding type		CC 1/3				
	CRC, bit		16				
	Max number of bits/TTI before rate matching		516				
	Uplink: Max number of bits/radio frame before rate matching		129				

Unless specified in individual test cases, the default RLC settings are given in Table 7.2/3.

Table 7.2/3B RLC Parameters for AM testing

Uplink RLC	
Transmission RLC discard	
Max DAT retransmissions	
Max_DAT	4
Transmission window size	128
Timer_RST	500
Max_RST	4
Polling info	
Timer_poll_prohibit	disabled
Timer_poll	disabled
Poll_~~PU~~PDU	disabled
Poll_SDU	disabled
Last transmission ~~PU~~ PDU poll	TRUE
Last retransmission ~~PU~~ PDU poll	TRUE
Poll_Window	disabled
Timer_poll_periodic	disabled
Downlink RLC	
In-sequence delivery	TRUE
Receiving window size	128
Timer_Status_Prohibit	disabled
Timer_EPC	disabled
Missing ~~PU~~ PDU Indicator	TRUE
Timer_STATUS_periodic	disabled

The AM test RAB is used in all tests with the following exceptions:

- Tests that only involve 15-bit length indicators

- Tests that explicitly specify a different Radio Bearer configuration

Tests that involve only 15-bit length indicators require a modified Radio Bearer configuration. To accommodate the larger payload size, these tests use a coded composite transport channel consisting of two DCH. The first DCH is specified as for the 7-bit length indicators, but not including the DTCH (RAB#1). This is shown in Table 7.2/4A

Table 7.2/4A SRB Configuration for AM testing (15-bit Lis)

Higher layer	Signalling RB: **DCH 0**		**SRB#1**	**SRB#2**	**SRB#3**	**SRB#4**
	User of Radio Bearer		RRC	RRC	NAS_DT High prio	NAS_DT Low prio
RLC	Logical channel type		DCCH	DCCH	DCCH	DCCH
	RLC mode		UM	AM	AM	AM
	Payload sizes, bit		136	128	128	128
	Max data rate, bps		3400	3200	3200	3200
	AMD/UMD PDU header ~~(excluding Length indicator)RLC header~~, bit		8	16	16	16
MAC	MAC header, bit		4	4	4	4
	MAC multiplexing		4 logical channel multiplexing			
Layer 1	TrCH type		DCH			
	TB sizes, bit		148			
	TFS	TF0, bts	0			
		TF1, bits	1x148			
	TTI, ms		40			
	Coding type		CC 1/3			
	CRC, bit		16			
	Max number of bits/TTI before rate matching		516			
	Uplink: Max number of bits/radio frame before rate matching		129			

This DCH is combined with a traffic DCH (at lower MAC priority) as described in Table 7.2/4B

Table 7.2/4B RAB Configuration for UM testing (15-bit Lis)

Higher layer	RAB: **DCH 1**		**RAB**
RLC	Logical channel type		DTCH
	RLC mode		AM
	Payload sizes, bit		1280
	Max data rate, bps		64000
	AMD PDU header ~~(excluding Length indicator)RLC header~~, bit		16
MAC	MAC header, bit		0
	MAC multiplexing		N/A
Layer 1	TrCH type		DCH
	TB sizes, bit		1296
	TFS	TF0, bits	0
		TF1, bits	1x1296
	TTI, ms		20
	Coding type		TC
	CRC, bit		16

All other settings are the same.

7.2.3.2 Segmentation and reassembly / Selection of 7 or 15 bit Length Indicators

7.2.3.2.1 Definition

The UM RLC entity should select the appropriate length indicator size dependant upon the signaled ~~PU~~ PDU size.

This requirement applies to all UE.

7.2.3.2.2 Conformance requirement

The size of the Length Indicator may be either 7 bits or 15 bits.

For AM, 7bit indicators shall be used if the AMD PDU size is ≤ l26 octets. Otherwise 15bit indicators shall be used

The length of the Length Indicator only depends on the size of the largest RLC PDU. The length of the Length Indicator is always the same for all ~~PUs~~PDUs, for one RLC entity.

RLC SDUs might be segmented. If possible, the last segment of a SDU shall be concatenated with the first segment of the next SDU in order to fill the data field completely and avoid unnecessary padding

Reference(s)

TS 25.322 Clauses 9.2.2.8, 9.2.2.9

7.2.~~2~~3.2.3 Test purpose

To test that if PDU carries a single ~~PU~~PDU, and the ~~PU~~ PDU size is small enough that a 7 bit indicator is sufficient, 7 bit indicators are used, otherwise, 15 bit indicators are used.

7.2.3.2.4 Method of test

Initial conditions

The generic procedure for Radio Bearer establishment (Clause 7.1.3 of TS34.108) is executed, with all the parameters as specified in the procedure, with the following exceptions:

Higher layer	RAB/Signalling RB		RAB
RLC	Logical channel type		DTCH
	RLC mode		AM
	Payload sizes, bit		960
	Max data rate, bps		48000
	AMD PDU header ~~(excluding Length indicator)RLC header~~, bit		16
MAC	MAC header, bit		0
	MAC multiplexing		N/A
Layer 1	TrCH type		DCH
	TB sizes, bit		976
	TFS	TF0, bits	0
		TF1, bits	1x976
	TTI, ms		20
	Coding type		TC
	CRC, bit		16

These settings apply to both the uplink and downlink DTCH.

The radio bearer is placed into loop-back mode 1 with the UL SDU size set to 40 bytes.

Test procedure

a) The SS transmits an RLC SDU of size 80 bytes. The PDU carrying this SDU is transmitted with a poll for status.

b) The SS checks the length indicator sizes and values of the RLC PDU returned on the uplink.

c) The SS reconfigures the Transport Channel as follows:

Higher layer	RAB/Signalling RB		RAB
RLC	Logical channel type		DTCH
	RLC mode		AM
	Payload sizes, bit		1280
	Max data rate, bps		64000
	AMD PDU header ~~(excluding Length indicator)RLC header~~, bit		16
MAC	MAC header, bit		0
	MAC multiplexing		N/A
Layer 1	TrCH type		DCH
	TB sizes, bit		1296
	TFS	TF0, bits	0
		TF1, bits	1x1296
	TTI, ms		20
	Coding type		TC
	CRC, bit		16

All other settings the same.

d) The SS transmits an RLC SDUs of size 80 bytes. The PDU carrying this SDU is transmitted with a poll for status.

e) The SS checks the length indicator sizes and values of the RLC PDU returned on the uplink

f) The SS may optionally release the radio bearer.

Expected sequence

Step	Direction		Message	Comments
	UE	SS		
1			RB ESTABLISHMENT	See generic procedures
2	←		DOWNLINK RLC PDU	80 byte SDU + padding + poll
3	→		UPLINK RLC PDU	40 byte SDU + piggy-backed status + poll
3a	→		*STATUS PDU*	*If piggy-backed status is not used in 3*
4	←		STATUS PDU	
5	←		TRANSPORT CHANNEL RECONFIGURATION	~~PU~~ PDU size > 127 bytes
6	←		DOWNLINK RLC PDU	80 byte SDU + padding + poll
7	→		UPLINK RLC PDU	40 byte SDU + piggy-backed status + poll
7a	→		*STATUS PDU*	*If piggy-backed status is not used in 7*
8	←		STATUS PDU	
9			RB RELEASE	Optional step

7.2.3.2.5 Test requirements

The UE shall send 7 bit length indicators with values that correctly indicate the end of SDU in step b).

The UE shall send 15 bit length indicators with values that correctly indicate the end of SDU in step e).