

JTC 4

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Information technology — Telecommunications and information exchange between systems — X.25 DTE conformance testing —

Part 2: Data link layer conformance test suite (standards.iteh.ai)

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Technologies de l'information — Télécommunications et échanges
d'information entre systèmes — Essais de conformité X.25-ECCD —
Partie 2: Suite d'essais de conformité pour la couche liaison de données



Reference number
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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee ISO/IEC JTC1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

International Standard ISO/IEC 8882-2 was prepared by Joint Technical Committee ISO/IEC JTC1, *Information technology*.

Annexes A and B of this International Standard are for information only.

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Introduction

This part of ISO/IEC 8882 presents the X.25-DTE Conformance Test Suite for the Data Link Layer, described in Tree and Tabular Combined Notation (TTCN).

Part 1 of ISO/IEC 8882 explains the objectives and usage of this part of ISO/IEC 8882.

Clause 1 of this part of ISO/IEC 8882 is the scope which provides an objective basis for the applicability of the tests within this part of ISO/IEC 8882. Clauses 2 and 3 give the references, definitions and abbreviations used in this part of ISO/IEC 8882. Clause 4 contains information relating to procedures performed for conformance testing. The test suite structure is defined in terms of test groups and subgroups in Table 1. This clause also gives an overview of the test suite. Clause 5 contains the abstract test suite for the X.25-DTE LAPB Data Link Layer protocol. Finally, Clause 6 provides the abstract test selection rules.

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Information technology — Telecommunications and information exchange between systems — X.25 DTE conformance testing —

Part 2: Data link layer conformance test suite

1 Scope

This part of ISO/IEC 8882 defines an abstract test suite for testing the conformance of the Data Link Layer of an IUT with respect to ISO 7776 or the CCITT Recommendation X.25 (1980, 1984).

Conformance of a Data Terminal Equipment (DTE) to the above ISO International Standard or CCITT Recommendations is tested using a dedicated circuit between the tester and the DTE. It is noted that CCITT Recommendations X.25-1980 and X.25-1984 are written from the perspective of a DCE and therefore do not always explicitly specify the DTE's operation. In such cases it is assumed that recommended operation of a DTE is included by implication because of the need to communicate with X.25 DCEs. This part of ISO/IEC 8882 excludes the testing of the LAP procedures given in the CCITT Recommendations.

Note: Test cases for extended mode operation (Modulo 128), multilink procedure and DTE-DTE operation as per ISO 7776 are for further study.

The tests in this part of ISO/IEC 8882 are designed for three possible interworking situations, shown in Figure 1. This part specifies tests for all three cases shown in Figure 1, but recognizes that not every test may apply to a particular DTE. A test selection procedure has to be performed to determine the applicability of a test to a particular DTE. Such selection will be based on the PICS and the PIXIT.

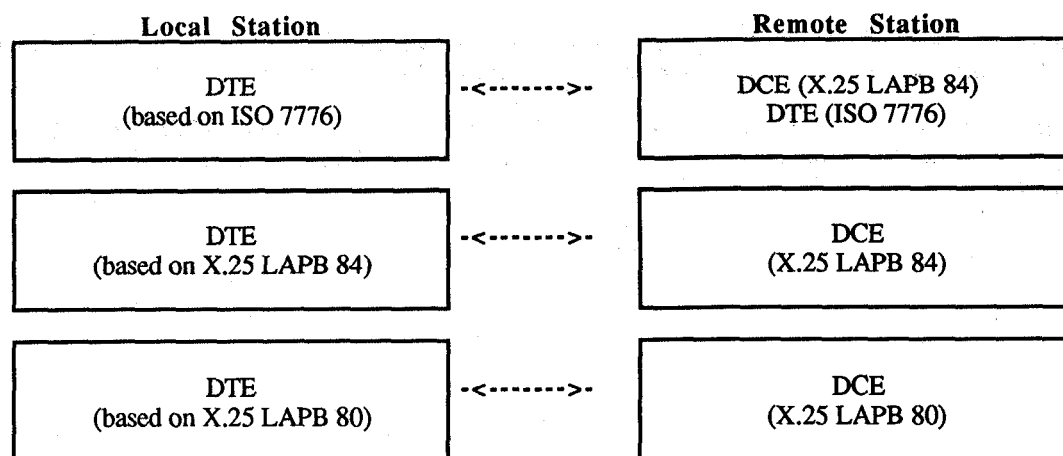


Figure 1. Testing X.25-DTE/DCE and X.25-DTE/DTE Interworking

In the rest of this part of ISO/IEC 8882, the term "X.25 standards" shall mean all three of CCITT Recommendation X.25(1980), CCITT Recommendation X.25(1984), and ISO/IEC 7776 International Standard, unless stated otherwise.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC 8882. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO/IEC 8882 are encouraged to investigate the possibility of applying the most recent editions of the standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 7498 : 1984, *Information processing systems -- Open Systems Interconnection -- Basic Reference Model* (See also CCITT Recommendation X.200).

ISO 7776 : 1986, *Information processing systems -- Data communication -- High-level data link control procedures - Description of the X.25 LAPB-compatible DTE data link procedures.*

ISO/IEC 8882-1 : -¹⁾, *Information technology -- Telecommunications and information exchange between systems - X.25-DTE conformance Testing -- Part 1, General Principles.*

ISO/IEC 9646-1 : 1991, *Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework -- Part 1: General concepts.* (See also CCITT Recommendation X.290 (1991)).

ISO/IEC 9646-2 : 1991, *Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework -- Part 2: Abstract Test Suite Specification.* (See also CCITT Recommendation X.291 (1991)).

ISO/IEC 9646-3 : -¹⁾, *Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework -- Part 3: The tree and tabular combined notation (TTCN).*

ISO/IEC 9646-4 : 1991, *Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework -- Part 4: Test realization.* (See also CCITT Recommendation X.293 (1991)).

ISO/IEC 9646-5 : 1991, *Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework -- Part 5: Requirements on test laboratories and clients for the conformance assessment process.* (See also CCITT Recommendation X.294 (1991)).

CCITT Recommendation X.25 (1980), *Interface Between Data Terminating Equipment (DTE) and Data Circuit-Terminating Equipment (DCE) for Terminals Operating in the Packet Mode on the Public Data Networks.*

CCITT Recommendation X.25 (1984), *Interface Between Data Terminating Equipment (DTE) and Data Circuit-Terminating Equipment (DCE) for terminals operating in the Packet Mode on the Public Data Networks by Dedicated Circuit.*

¹⁾ To be published.

3 Definitions and abbreviations

For the purposes of this part of ISO/IEC 8882, the definitions given in 3.4 and in the following International Standards apply:

- a) ISO 7498;
- b) ISO/IEC 9646;
- c) ISO/IEC 8882-1.

3.1 Reference model definitions

The following terms defined in ISO 7498 are used:

- a) (N)-protocol data unit (N-PDU). In the context of this part of ISO/IEC 8882 (N) is layer 2 and so N-PDU is abbreviated to PDU. A PDU in the Data Link Layer is also referred to as a "frame".
- b) Data Link Layer

3.2 Conformance testing terms

The following terms are used from the Conformance Testing Methodology and Framework International Standard (ISO/IEC 9646):

- a) Conformance Testing
- b) Conformance Test Suite
- c) Implementation Under Test (IUT)
- d) Protocol Implementation Conformance Statement (PICS)
- e) Protocol Implementation Extra Information for Testing (PIXIT)
- f) Static Conformance Requirements (SCR)
- g) Behaviour Testing
- h) Test Purpose
- i) Tree and Tabular Combined Notation (TTCN)
- j) Preamble
- k) Test Body <https://standards.iteh.ai/catalog/standards/sist/882d3b2f-f2c8-45c7-bf0d-9d186f63c4ce/iso-iec-8882-2-1992>
- l) Test Step [ISO/IEC 8882-2:1992](https://standards.iteh.ai/catalog/standards/sist/882d3b2f-f2c8-45c7-bf0d-9d186f63c4ce/iso-iec-8882-2-1992)
- m) Test Event
- n) Abstract Service Primitive (ASP)
- o) Test Group
- p) Abstract Test Suite (ATS)
- q) Executable Test Suite (ETS)
- q) Test Verdicts
- r) Lower Tester
- s) Upper Tester
- t) Test Methods
- u) Remote Single (layer) Test Method (RS method)
- v) Valid Test Event
- w) Invalid Test Event
- x) Inopportune Test Event
- y) Point of Control and Observation (PCO)

3.3 X.25-DTE conformance testing terms

This part of ISO/IEC 8882 makes use of the following terms defined in ISO/IEC 8882-1:

- a) Improper PDU
- b) Proper PDU
- c) Test Case
- d) Test Subgroup
- e) Tester

3.4 Additional definitions

This test suite uses test subgroups for proper, improper and inopportune frames to test the IUT behaviour. These terms are defined below.

3.4.1 improper frame: A frame that satisfies one or more of the following conditions:

- a) it is not properly bounded by two flags;
- b) it contains fewer than 32 bits between flags;
- c) it contains a Frame Check Sequence (FCS) error;
- d) it contains an invalid address field encoding;
- e) it contains a command or response control field encoding that is undefined or not implemented in X.25-DTE LAPB Data Link Layer protocol as specified in ISO 7776;
- f) it is an I frame exceeding the maximum established frame length;
- g) it is an unnumbered or supervisory frame with an information field which is not permitted;
- h) it is a frame with an invalid N(R).

3.4.2 inopportune frame: A syntactically valid frame arriving at a time (DTE's state) when it should be considered irrelevant by the DTE. Syntactically valid frames are those that are allowed by the X.25 standards for a DTE using the LAPB procedure and are not covered by 3.4.1.

3.4.3 proper frame: A valid frame arriving at the correct DTE's state or phase and not covered by 3.4.1 or 3.4.2.

3.5 Abbreviations

The abbreviation IUT is used in this part of ISO/IEC 8882 to refer to an X.25-DTE under test.

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4 Conformance test suite - Data link layer

The X.25-DTE Data Link Layer Conformance Test Suite structure is outlined in table 1.

Table 1 - Data link layer test suite structure

Data Link Layer Test Groups	Test State Abbreviation	Test Group Name	Current State of IUT
DL1	DP	Disconnected Phase.	DISC received and UA or DM transmitted (see clause 4.10).
DL2	LD	Link Disconnection phase.	DISC transmitted from any phase (see clause 4.11)
DL3	LS	Link Set-up phase.	SABM transmitted from DP (see clause 4.11)
DL4	IT	Information Transfer phase.	SABM received and UA transmitted, or SABM transmitted and UA received, while in DP or IT phase.
DL5	FR	Frame Reject condition	FRMR transmitted from IT phase (see clause 4.10).
DL6	BY	IUT Busy condition	RNR transmitted from IT phase (see clauses 4.10 and 4.11).
DL7	SR	Sent Reject condition.	REJ transmitted from IT phase.
DL8	SP	System Parameters and error recovery.	See note below.

Note: Test Group DL8 tests the setting of the system parameters:
 T1 - Retransmission timer;
 N2 - Maximum number of attempts by IUT to complete a transmission.
 The setting of maximum established length and k (window size) are tested under test group DL4.

4.1 Data link layer test groups and subgroups

The first seven test groups shown in table 1, called Data Link Layer Test Groups DL1 to DL7, are provided to test the interactive capability of the IUT in every phase. The test groups are further divided into three subgroups according to the definitions in clause 3.4, above. These are as follows:

- Subgroup 1 involves those test cases where the tester transmits a proper frame.
- Subgroup 2 involves those test cases where the tester transmits an improper frame.
- Subgroup 3 involves those test cases where the tester transmits an inopportune frame.

The eighth test group (DL8) is designed to test the operational correctness of the IUT system parameters listed in table 1.

4.2 Test suite overview

An overview of the test suite is outlined in table 2. The description column contains the stimulus sent by tester.

Table 2 - Data link layer test suite overview

Test Suite Overview			
Suite Name:		LAPB	
Standards ref:		ISO 7776, CCITT X.25-1984, CCITT X.25-1980	
PICS proforma ref:		ISO 7776 (DAM 1)	
PIXIT proforma ref:		ISO/IEC 8882-2 PIXIT Proforma	
PICS/PIXIT use:		ISO/IEC 8882-2 clause PICS and PIXIT abstract test selection rules	
Test Method(s):		Remote Single Layer	
Comments:			
Test Case Identifier	Test Case Reference	Page	Description
DL1_101	LAPB/DL1/DL1_101	60	DISC/P=1
DL1_102	LAPB/DL1/DL1_102	60	DISC/P=0
DL1_103	LAPB/DL1/DL1_103	61	SABM/P=1
DL1_104	LAPB/DL1/DL1_104	61	SABM/P=0
DL1_105	LAPB/DL1/DL1_105	62	DM/F=0
DL1_201	LAPB/DL1/DL1_201	63	Undefined command
DL1_202	LAPB/DL1/DL1_202	63	Undefined response
DL1_203	LAPB/DL1/DL1_203	64	Invalid address
DL1_204	LAPB/DL1/DL1_204	64	Tester sends FCS error
DL1_205	LAPB/DL1/DL1_205	65	DM/F=1
DL1_206	LAPB/DL1/DL1_206	65	DM/F=0 with info. field
DL1_207	LAPB/DL1/DL1_207	66	SABM/P=1 with info. field
DL1_208	LAPB/DL1/DL1_208	66	UA/F=0 with info. field
DL1_209	LAPB/DL1/DL1_209	67	RR/P=1 with info. field
DL1_210	LAPB/DL1/DL1_210	67	RNR/P=1 with info. field
DL1_211	LAPB/DL1/DL1_211	68	REJ/P=1 with info. field
DL1_212	LAPB/DL1/DL1_212	68	LONG I/P=0 frame
DL1_213	LAPB/DL1/DL1_213	69	DISC/P=0 with info. field
DL1_214	LAPB/DL1/DL1_214	69	DISC/P=1 with info. field
DL1_215	LAPB/DL1/DL1_215	70	SABM/P=0 with info. field
DL1_301	LAPB/DL1/DL1_301	71	I/P=1
DL1_302	LAPB/DL1/DL1_302	71	RR/P=1
DL1_303	LAPB/DL1/DL1_303	72	RNR/P=1
DL1_304	LAPB/DL1/DL1_304	72	REJ/P=1
DL1_305	LAPB/DL1/DL1_305	73	UA/F=0
DL1_306	LAPB/DL1/DL1_306	73	UA/F=1
DL1_307	LAPB/DL1/DL1_307	74	FRMR/F=0
DL1_308	LAPB/DL1/DL1_308	74	FRMR/F=1
DL1_309	LAPB/DL1/DL1_309	74	I/P=0
DL1_310	LAPB/DL1/DL1_310	75	RR/F=0
DL1_311	LAPB/DL1/DL1_311	75	RNR/F=0
DL1_312	LAPB/DL1/DL1_312	75	REJ/F=0
DL1_313	LAPB/DL1/DL1_313	76	RR/F=1
DL1_314	LAPB/DL1/DL1_314	76	RNR/F=1
DL1_315	LAPB/DL1/DL1_315	76	REJ/F=1
DL1_316	LAPB/DL1/DL1_316	77	RR/P=0
DL1_317	LAPB/DL1/DL1_317	77	RNR/P=0
DL1_318	LAPB/DL1/DL1_318	77	REJ/P=0
DL1_319	LAPB/DL1/DL1_319	78	I/P=0 with no info. field

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Test Case Identifier	Test Case Reference	Page	Description
DL2_101	LAPB/DL2/DL2_101	79	DISC/P=0
DL2_102	LAPB/DL2/DL2_102	80	DISC/P=1
DL2_103	LAPB/DL2/DL2_103	80	SABM/P=0
DL2_104	LAPB/DL2/DL2_104	81	SABM/P=1
DL2_105	LAPB/DL2/DL2_105	81	Proper DM
DL2_106	LAPB/DL2/DL2_106	82	DM/F=0
DL2_107	LAPB/DL2/DL2_107	82	Proper UA
DL2_201	LAPB/DL2/DL2_201	83	Undefined command
DL2_202	LAPB/DL2/DL2_202	83	Undefined response
DL2_203	LAPB/DL2/DL2_203	84	DISC/P=0 with info. field
DL2_204	LAPB/DL2/DL2_204	84	SABM/P=1 with info. field
DL2_205	LAPB/DL2/DL2_205	85	UA with info. field
DL2_206	LAPB/DL2/DL2_206	85	DM with info. field
DL2_207	LAPB/DL2/DL2_207	86	LONG I/P=1 frame
DL2_208	LAPB/DL2/DL2_208	86	RR/P=1 with info. field
DL2_209	LAPB/DL2/DL2_209	86	RNR/P=1 with info. field
DL2_210	LAPB/DL2/DL2_210	87	REJ/P=1
DL2_211	LAPB/DL2/DL2_211	87	Invalid address
DL2_212	LAPB/DL2/DL2_212	87	DISC with FCS error
DL2_213	LAPB/DL2/DL2_213	88	Invalid DM/F=1 (1980)
DL2_214	LAPB/DL2/DL2_214	88	UA with invalid F bit
DL2_301	LAPB/DL2/DL2_301	89	RR/P=1
DL2_302	LAPB/DL2/DL2_302	89	RR/P=0
DL2_303	LAPB/DL2/DL2_303	89	RNR/P=1
DL2_304	LAPB/DL2/DL2_304	90	RNR/P=0
DL2_305	LAPB/DL2/DL2_305	90	REJ/P=1
DL2_306	LAPB/DL2/DL2_306	90	REJ/P=0
DL2_307	LAPB/DL2/DL2_307	91	FRMR/F=0
DL2_308	LAPB/DL2/DL2_308	91	RR/F=1
DL2_309	LAPB/DL2/DL2_309	91	RR/F=0
DL2_310	LAPB/DL2/DL2_310	92	RNR/F=1
DL2_311	LAPB/DL2/DL2_311	92	RNR/F=0
DL2_312	LAPB/DL2/DL2_312	92	REJ/F=1
DL2_313	LAPB/DL2/DL2_313	93	REJ/F=0
DL2_314	LAPB/DL2/DL2_314	93	FRMR/F=1
DL2_315	LAPB/DL2/DL2_315	93	I/P=0
DL2_316	LAPB/DL2/DL2_316	94	I/P=1
DL2_317	LAPB/DL2/DL2_317	94	I/P=0 with no info. field

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Test Case Identifier	Test Case Reference	Page	Description
DL3_101	LAPB/DL3/DL3_101	95	SABM/P=0
DL3_102	LAPB/DL3/DL3_102	96	SABM/P=1
DL3_103	LAPB/DL3/DL3_103	96	DISC/P=0
DL3_104	LAPB/DL3/DL3_104	97	DISC/P=1
DL3_105	LAPB/DL3/DL3_105	97	Proper UA
DL3_106	LAPB/DL3/DL3_106	97	DM with invalid F bit
DL3_107	LAPB/DL3/DL3_107	98	DM/F=1
DL3_201	LAPB/DL3/DL3_201	99	Undefined command
DL3_202	LAPB/DL3/DL3_202	99	Undefined response
DL3_203	LAPB/DL3/DL3_203	100	UA with info. field
DL3_204	LAPB/DL3/DL3_204	100	DISC/P=0 with info. field
DL3_205	LAPB/DL3/DL3_205	101	SABM/P=1 with info. field
DL3_206	LAPB/DL3/DL3_206	101	DM with info. field
DL3_207	LAPB/DL3/DL3_207	102	LONG I/P=1 frame
DL3_208	LAPB/DL3/DL3_208	102	I/P=0 with no info. field
DL3_209	LAPB/DL3/DL3_209	102	RR/P=1 with info. field
DL3_210	LAPB/DL3/DL3_210	103	RNR/P=1 with info. field
DL3_211	LAPB/DL3/DL3_211	103	REJ/P=1 with info. field
DL3_212	LAPB/DL3/DL3_212	104	Invalid address
DL3_213	LAPB/DL3/DL3_213	104	SABM/P=1 with FCS error
DL3_214	LAPB/DL3/DL3_214	105	DM with invalid F (1980)
DL3_215	LAPB/DL3/DL3_215	105	UA with invalid F bit
DL3_301	LAPB/DL3/DL3_301	106	RR/P=1
DL3_302	LAPB/DL3/DL3_302	106	RR/P=0
DL3_303	LAPB/DL3/DL3_303	107	RR/F=1
DL3_304	LAPB/DL3/DL3_304	107	RR/F=0
DL3_305	LAPB/DL3/DL3_305	107	FRMR/F=0
DL3_306	LAPB/DL3/DL3_306	108	FRMR/F=1
DL3_307	LAPB/DL3/DL3_307	108	I/P=0
DL3_308	LAPB/DL3/DL3_308	108	I/P=1
DL3_309	LAPB/DL3/DL3_309	109	RNR/P=0
DL3_310	LAPB/DL3/DL3_310	109	RNR/F=0
DL3_311	LAPB/DL3/DL3_311	109	RNR/P=1
DL3_312	LAPB/DL3/DL3_312	110	REJ/P=0
DL3_313	LAPB/DL3/DL3_313	110	REJ/F=0
DL3_314	LAPB/DL3/DL3_314	110	REJ/P=1
DL3_315	LAPB/DL3/DL3_315	111	RNR/F=1
DL3_316	LAPB/DL3/DL3_316	111	REJ/F=1

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Test Case Identifier	Test Case Reference	Page	Description
DL4_101	LAPB/DL4/DL4_101	112	DISC/P=1
DL4_102	LAPB/DL4/DL4_102	112	SABM/P=1
DL4_103	LAPB/DL4/DL4_103	113	FRMR/F=0
DL4_104	LAPB/DL4/DL4_104	114	I/P=0 frame acknowledged
DL4_105	LAPB/DL4/DL4_105	115	I/P=1 frame acknowledged
DL4_106	LAPB/DL4/DL4_106	115	RR/P=1
DL4_107	LAPB/DL4/DL4_107	116	REJ/P=1
DL4_108	LAPB/DL4/DL4_108	117	REJ/P=0
DL4_109	LAPB/DL4/DL4_109	117	REJ/F=0
DL4_110	LAPB/DL4/DL4_110	118	DM/F=0
DL4_111	LAPB/DL4/DL4_111	118	I frame with N(S) error
DL4_112	LAPB/DL4/DL4_112	119	I/P=0 with no info. field
DL4_113	LAPB/DL4/DL4_113	120	Single flag between frames
DL4_114	LAPB/DL4/DL4_114	121	Window rotation test
DL4_115	LAPB/DL4/DL4_115	121	DISC/P=0
DL4_116	LAPB/DL4/DL4_116	122	SABM/P=0
DL4_117	LAPB/DL4/DL4_117	122	RR/P=0
DL4_118	LAPB/DL4/DL4_118	123	RR/F=0
DL4_119	LAPB/DL4/DL4_119	123	Busy condition test
DL4_201	LAPB/DL4/DL4_201	125	UA/F=0
DL4_202	LAPB/DL4/DL4_202	125	UA/F=1
DL4_203	LAPB/DL4/DL4_203	126	FRMR/F=1
DL4_204	LAPB/DL4/DL4_204	126	unsolicited DM/F=1
DL4_205	LAPB/DL4/DL4_205	127	I with invalid N(R)
DL4_206	LAPB/DL4/DL4_206	127	LONG I/P=0 frame
DL4_207	LAPB/DL4/DL4_207	128	Undefined command
DL4_208	LAPB/DL4/DL4_208	128	Undefined response
DL4_209	LAPB/DL4/DL4_209	129	DM/F=0 with info. field
DL4_210	LAPB/DL4/DL4_210	129	DISC/P=0 with info. field
DL4_211	LAPB/DL4/DL4_211	130	SABM/P=1 with info. field
DL4_212	LAPB/DL4/DL4_212	130	UA/F=0 with info. field
DL4_213	LAPB/DL4/DL4_213	131	RR/F=0 with info. field
DL4_214	LAPB/DL4/DL4_214	131	RNR/F=0 with info. field
DL4_215	LAPB/DL4/DL4_215	132	REJ/F=0 with info. field
DL4_216	LAPB/DL4/DL4_216	132	RR/P=1 with info. field
DL4_217	LAPB/DL4/DL4_217	133	RNR/P=1 with info. field
DL4_218	LAPB/DL4/DL4_218	133	REJ/P=1 with info. field
DL4_219	LAPB/DL4/DL4_219	134	I frame with FCS error
DL4_220	LAPB/DL4/DL4_220	134	Incorrect address
DL4_221	LAPB/DL4/DL4_221	135	Frame too short
DL4_222	LAPB/DL4/DL4_222	135	Aborted I frame
DL4_301	LAPB/DL4/DL4_301	136	Unsolicited RR/F=1 response
DL4_302	LAPB/DL4/DL4_302	136	Unsolicited RNR/F=1 response
DL4_303	LAPB/DL4/DL4_303	137	Unsolicited REJ/F=1 response

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