

ETSI TS 102 694-2 V7.3.0 (2011-01)

Technical Specification

Smart Cards; Test specification for the Single Wire Protocol (SWP) interface; Part 2: UICC features (Release 7)



Reference

RTS/SCP-00SWPUv730

Keywords

smart card, terminal

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

Individual copies of the present document can be downloaded from:

<http://www.etsi.org>

The present document may be made available in more than one electronic version or in print. In any case of existing or perceived difference in contents between such versions, the reference version is the Portable Document Format (PDF). In case of dispute, the reference shall be the printing on ETSI printers of the PDF version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at

<http://portal.etsi.org/tb/status/status.asp>

If you find errors in the present document, please send your comment to one of the following services:

http://portal.etsi.org/chaicor/ETSI_support.asp

Copyright Notification

No part may be reproduced except as authorized by written permission.
The copyright and the foregoing restriction extend to reproduction in all media.

© European Telecommunications Standards Institute 2011.
All rights reserved.

DECT™, **PLUGTESTS™**, **UMTS™**, **TIPHON™**, the TIPHON logo and the ETSI logo are Trade Marks of ETSI registered for the benefit of its Members.

3GPP™ is a Trade Mark of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.

LTE™ is a Trade Mark of ETSI currently being registered

for the benefit of its Members and of the 3GPP Organizational Partners.

GSM® and the GSM logo are Trade Marks registered and owned by the GSM Association.

Contents

Intellectual Property Rights	10
Foreword.....	10
Introduction	10
1 Scope	11
2 References	11
2.1 Normative references	11
2.2 Informative references.....	12
3 Definitions, symbols and abbreviations	12
3.1 Definitions	12
3.2 Symbols.....	13
3.3 Abbreviations	13
3.4 Formats.....	14
3.4.1 Format of the table of optional features	14
3.4.2 Format of the applicability table	14
3.4.3 Status and Notations	14
4 Test environment.....	15
4.1 Table of optional features.....	15
4.2 Applicability table	15
4.3 Information to be provided by the DUT supplier	18
4.4 Test equipment	18
4.4.1 Measurement/setting uncertainties.....	19
4.4.2 Default conditions for DUT operation.....	19
4.4.2.1 Temperature	19
4.4.2.2 TS 102 221 interface contacts (CLK, RST, I/O) and contact Vcc	20
4.4.2.3 TS 102 600 interface contacts (IC_DP, IC_DM).....	20
4.4.2.4 TS 102 613 interface contact (SWIO).....	21
4.4.2.5 Status of UICC interfaces.....	21
4.4.2.6 Characteristics of LLC's.....	21
4.4.2.6.1 ACT LLC	21
4.4.2.6.2 SHDLC LLC	21
4.4.2.6.3 CLT LLC.....	21
4.4.3 Minimum/maximum conditions for DUT operation.....	22
4.4.3.1 Temperature	22
4.4.3.2 Contact Vcc.....	22
4.5 Test execution	22
4.5.1 Parameter variations	22
4.6 Pass criterion	22
5 Test cases.....	23
5.1 Principle of the Single Wire Protocol.....	23
5.2 System architecture	23
5.2.1 General overview	23
5.2.2 TS 102 221 support.....	23
5.2.2.1 Conformance requirements	23
5.2.3 Configurations	23
5.2.3.1 Conformance requirements	23
5.2.3.2 Test case 1: Global Interface bytes of the ATR	24
5.2.3.2.1 Test execution.....	24
5.2.3.2.2 Initial conditions	24
5.2.3.2.3 Test procedure	24
5.2.3.3 Test case 2: interaction with TS 102 221 interface - SWP activation while the UICC receives data.....	24
5.2.3.3.1 Test execution.....	24
5.2.3.3.2 Initial conditions.....	24

5.2.3.3.3	Test procedure	24
5.2.3.4	Test case 3: interaction with TS 102 221 interface - SWP activation while the UICC sends data.....	25
5.2.3.4.1	Test execution.....	25
5.2.3.4.2	Initial conditions	25
5.2.3.4.3	Test procedure	25
5.2.4	Interaction with other interfaces	25
5.2.4.1	Conformance requirements	25
5.2.4.2	Test case 1: interaction with TS 102 221 interface - TS 102 221 clock stop	25
5.2.4.2.1	Test execution.....	25
5.2.4.2.2	Initial conditions	26
5.2.4.2.3	Test procedure	26
5.2.4.3	Test case 2: interaction with TS 102 221 interface - TS 102 221 reset.....	26
5.2.4.3.1	Test execution.....	26
5.2.4.3.2	Initial conditions	26
5.2.4.3.3	Test procedure	26
5.2.4.4	Test case 3: interaction with TS 102 221 interface - SWP deactivation while the UICC receives data.....	27
5.2.4.4.1	Test execution.....	27
5.2.4.4.2	Initial conditions	27
5.2.4.4.3	Test procedure	27
5.2.4.5	Test case 4: interaction with TS 102 221 interface - SWP deactivation while the UICC sends data.....	27
5.2.4.5.1	Test execution.....	27
5.2.4.5.2	Initial conditions	27
5.2.4.5.3	Test procedure	28
5.2.4.6	Test case 5: interaction with TS 102 221 interface - reset SWP while the UICC receives data.....	28
5.2.4.6.1	Test execution.....	28
5.2.4.6.2	Initial conditions	28
5.2.4.6.3	Test procedure	28
5.2.4.7	Test case 6: interaction with TS 102 221 interface - reset SWP while the UICC sends data.....	29
5.2.4.7.1	Test execution.....	29
5.2.4.7.2	Initial conditions	29
5.2.4.7.3	Test procedure	29
5.3	Physical characteristics.....	29
5.3.1	Temperature range for card operations	29
5.3.1.1	Conformance requirements	29
5.3.2	Contacts	30
5.3.2.1	Provision of contacts	30
5.3.2.1.1	Conformance requirements.....	30
5.3.2.2	Contact activation and deactivation	30
5.3.2.2.1	Conformance requirements.....	30
5.3.2.3	Interface activation.....	30
5.3.2.3.1	Conformance requirements.....	30
5.3.2.3.2	Test case 1: initial activation in low power mode	31
5.3.2.3.3	Test case 2: initial activation in low power mode with corrupted frames	31
5.3.2.3.4	Test case 3: no activation.....	32
5.3.2.3.5	Void.....	32
5.3.2.3.6	Test case 5: full power mode activation	32
5.3.2.3.7	Test case 6: low power mode activation with re-transmission of ACT_SYNC.....	33
5.3.2.3.8	Test case 7: full power mode activation with re-transmission of ACT_SYNC	33
5.3.2.3.9	Void.....	34
5.3.2.3.10	Test case 9: low power mode activation with multiple re-transmission of ACT_SYNC	34
5.3.2.3.11	Test case 10: full power mode activation with re-transmission of ACT_READY	34
5.3.2.3.12	Test case 11: full power mode activation with multiple re-transmission of ACT_SYNC.....	35
5.3.2.3.13	Test case 12: subsequent activation in low power mode	36
5.3.2.3.14	Test case 13: subsequent activation in full power mode.....	36
5.3.2.3.15	Void.....	37
5.3.2.4	Behaviour of a UICC in a terminal not supporting SWP	37
5.3.2.4.1	Conformance requirements.....	37
5.3.2.4.2	Test case 1: detect terminal not supporting SWP by TERMINAL CAPABILITIES, classes B and C	37
5.3.2.4.3	Test case 2: detect terminal not supporting SWP by TERMINAL CAPABILITIES, class A.....	37
5.3.2.5	Behaviour of a terminal connected to a UICC not supporting SWP	38

5.3.2.6	Inactive contacts.....	38
5.4	Electrical characteristics.....	38
5.4.1	Operating conditions.....	38
5.4.1.1	Operating conditions.....	38
5.4.1.2	Supply voltage classes.....	38
5.4.1.2.1	Conformance requirements.....	38
5.4.1.2.2	Test case 1: TS 102 221 voltage classes B and C support.....	38
5.4.1.3	Vcc (C1) low power mode definition.....	39
5.4.1.3.1	Conformance requirements.....	39
5.4.1.3.2	Test case 1: operation in low power mode.....	39
5.4.1.4	Signal S1.....	40
5.4.1.4.1	Conformance requirements.....	40
5.4.1.4.2	Test case 1: S1 communication in voltage class B.....	40
5.4.1.4.3	Test case 2: S1 communication in voltage class C, full power mode.....	41
5.4.1.4.4	Test case 3: S1 communication in low power mode.....	42
5.4.1.5	Signal S2.....	43
5.4.1.5.1	Signal S2.....	43
5.4.1.5.2	Operating current for S2.....	43
5.5	Physical transmission layer.....	47
5.5.1	S1 Bit coding and sampling time.....	47
5.5.1.1	Conformance requirements.....	47
5.5.1.2	Test case 1: communication with timing variation, default bit duration.....	47
5.5.1.2.1	Test execution.....	47
5.5.1.2.2	Initial conditions.....	47
5.5.1.2.3	Test procedure.....	48
5.5.1.3	Test case 2: communication with timing variation, extended bit duration.....	48
5.5.1.3.1	Test execution.....	48
5.5.1.3.2	Initial conditions.....	48
5.5.1.3.3	Test procedure.....	49
5.5.1.4	Test case 3: S1 rise and fall time.....	49
5.5.1.4.1	Test execution.....	49
5.5.1.4.2	Initial conditions.....	49
5.5.1.4.3	Test procedure.....	50
5.5.1.5	Test case 4: measurement of C6 input capacitance.....	50
5.5.1.5.1	Test execution.....	50
5.5.1.5.2	Initial conditions.....	50
5.5.1.5.3	Test procedure.....	50
5.5.1.5.4	Example for C6 input capacitance test implementation (informative).....	50
5.5.1.6	Test case y: communication with variation in bit duration.....	51
5.5.1.6.1	Test execution.....	51
5.5.1.6.2	Initial conditions.....	51
5.5.1.6.3	Test procedure.....	51
5.5.2	S2 switching management.....	51
5.5.2.1	Conformance requirements.....	51
5.5.2.2	Test case 1: S2 switching management.....	51
5.5.2.2.1	Test execution.....	51
5.5.2.2.2	Initial conditions.....	51
5.5.2.2.3	Test procedure.....	52
5.5.3	SWP interface states management.....	52
5.5.3.1	Conformance requirements.....	52
5.5.3.2	Test case 1: SWP interface states management by the UICC.....	52
5.5.3.2.1	Test execution.....	52
5.5.3.2.2	Initial conditions.....	52
5.5.3.2.3	Test procedure.....	52
5.5.4	Power mode states/transitions and Power saving mode.....	53
5.5.4.1	Conformance requirements.....	53
5.5.4.2	Test case 1: power states in low power mode (ACT_POWER_MODE).....	53
5.5.4.2.1	Test execution.....	53
5.5.4.2.2	Initial conditions.....	53
5.5.4.2.3	Test procedure.....	53
5.5.4.3	Test case 2: power states in low power mode (non-ACT).....	53
5.5.4.3.1	Test execution.....	53

5.5.4.3.2	Initial conditions	54
5.5.4.3.3	Test procedure	54
5.5.4.4	Test case 3: power states in full power mode, without TS 102 221	54
5.5.4.4.1	Test execution.....	54
5.5.4.4.2	Initial conditions.....	54
5.5.4.4.3	Test procedure	54
5.5.4.5	Test case 4: power saving mode with TS 102 221 interface - restart TS 102 221 interface first	54
5.5.4.5.1	Test execution.....	54
5.5.4.5.2	Initial conditions	54
5.5.4.5.3	Test procedure	55
5.5.4.6	Test case 5: power saving mode with TS 102 221 interface - restart TS 102 613 interface first	55
5.5.4.6.1	Test execution.....	55
5.5.4.6.2	Initial conditions	55
5.5.4.6.3	Test procedure	55
5.5.4.7	Test case 6: power saving mode with TS 102 600 interface - restart TS 102 600 interface first	55
5.5.4.7.1	Test execution.....	55
5.5.4.7.2	Initial conditions.....	56
5.5.4.7.3	Test procedure	56
5.5.4.8	Test case 7: power saving mode with TS 102 600 interface - restart TS 102 613 interface first	56
5.5.4.8.1	Test execution.....	56
5.5.4.8.2	Initial conditions	56
5.5.4.8.3	Test procedure	56
5.5.4.9	Test case 8: power states in full power mode, with TS 102 221	56
5.5.4.9.1	Test execution.....	56
5.5.4.9.2	Initial conditions	57
5.5.4.9.3	Test procedure	57
5.6	Data link layer	57
5.6.1	Overview	57
5.6.2	Medium Access Control (MAC) layer.....	57
5.6.2.1	Bit order	57
5.6.2.1.1	Conformance requirements.....	57
5.6.2.1.2	Void.....	57
5.6.2.2	Structure.....	57
5.6.2.2.1	Conformance requirements.....	57
5.6.2.2.2	Test case 1: interpretation of incorrectly formed frames - ACT LLC	58
5.6.2.2.3	Test case 2: interpretation of incorrectly formed frames - SHDLC RSET frames	58
5.6.2.2.4	Test case 3: interpretation of incorrectly formed frames - SHDLC I-frames	59
5.6.2.2.5	Test case 4: communication with frames - idle bits and wakeup sequence	59
5.6.2.3	Bit stuffing	60
5.6.2.3.1	Conformance requirements.....	60
5.6.2.3.2	Test case 1: behaviour of UICC with bit stuffing in frame.....	60
5.6.2.4	Error detection.....	60
5.6.2.4.1	Conformance requirements.....	60
5.6.2.4.2	Test case 1: RSET with CRC error.....	60
5.6.3	Supported LLC layers	61
5.6.3.1	Supported LLC layers	61
5.6.3.1.1	Conformance requirements.....	61
5.6.3.1.2	Test case 1: support of ACT LLC and ACT LPDU structure.....	61
5.6.3.1.3	Test case 2: support of SHDLC LLC and SHDLC LPDU structure	61
5.6.3.2	Interworking of the LLC layers.....	62
5.6.3.2.1	Conformance requirements.....	62
5.6.3.2.2	Test case 1: error handling of ACT LLC on reception of corrupted frame, after SWIO activation	62
5.6.3.2.3	Test case 2: ignore ACT LLC frame reception after the SHDLC link establishment	63
5.6.3.2.4	Test case 3: ignore ACT LLC frame reception in CLT session.....	63
5.6.3.2.5	Test case 4: CLT session during SHDLC communication	64
5.6.3.2.6	Test case 5: closing condition of CLT session whereas SHDLC link has been established before CLT session.....	64
5.6.3.2.7	Test case 6: closing condition of CLT session whereas SHDLC link has not been established before CLT session.....	64
5.6.3.2.8	Test case 7: interpretation of corrupted frames - single SHDLC frame	65
5.6.3.2.9	Void.....	65

5.6.3.2.10	Test case 9: interpretation of corrupted frames - CLT frames	65
5.6.4	ACT LLC definition	66
5.6.4.1	ACT LLC definition	66
5.6.4.1.1	Conformance requirements	66
5.6.4.1.2	Test case 1: structure of ACT LPDU - full power mode	66
5.6.4.1.3	Test case 2: structure of ACT LPDU - low power mode	66
5.6.4.1.4	Test case 3: behaviour of UICC on reception of ACT frames - values of INF bit	67
5.6.4.1.5	Test case 4: RFU values in ACT_INFORMATION field	67
5.6.4.1.6	Test case 5: extended bit durations as per ACT_INFORMATION field	68
5.6.4.2	SYNC_ID verification process	68
5.6.4.2.1	Conformance requirements	68
5.7	SHDLC LLC definition	69
5.7.1	SHDLC overview	69
5.7.1.1	Conformance requirements	69
5.7.1.2	Test Case 1: data passed up to the next layer	69
5.7.1.2.1	Test execution	69
5.7.1.2.2	Initial conditions	69
5.7.1.2.3	Test procedure	69
5.7.1.3	Test Case 2: error management, EUT sending I-Frame	69
5.7.1.3.1	Test execution	69
5.7.1.3.2	Initial Conditions	69
5.7.1.3.3	Test procedure	70
5.7.1.4	Test Case 3: error management	70
5.7.1.4.1	Test execution	70
5.7.1.4.2	Initial Conditions	70
5.7.1.4.3	Test procedure	70
5.7.2	Endpoints	70
5.7.2.1	Conformance requirements	70
5.7.3	SHDLC frames types	70
5.7.3.1	Conformance requirements	70
5.7.4	Control Field	70
5.7.4.1	Conformance requirements	70
5.7.4.2	I-Frames coding	71
5.7.4.2.1	Conformance requirements	71
5.7.4.3	S-Frames coding	71
5.7.4.3.1	Conformance requirements	71
5.7.4.4	U-Frames coding	71
5.7.4.4.1	Conformance requirements	71
5.7.5	Changing sliding window size and endpoint capabilities	71
5.7.5.1	Conformance requirements	71
5.7.5.2	RSET frame payload	71
5.7.5.2.1	Conformance requirements	71
5.7.5.3	UA frame payload	71
5.7.5.3.1	Conformance requirements	71
5.7.5.3.2	Void	72
5.7.6	SHDLC context	72
5.7.6.1	Conformance requirements	72
5.7.6.2	Constants	72
5.7.6.2.1	Conformance requirements	72
5.7.6.3	Variables	72
5.7.6.3.1	Conformance requirements	72
5.7.6.4	Initial Reset state	72
5.7.6.4.1	Conformance requirements	72
5.7.6.4.2	Test case 1: initial state at link reset - reset by the EUT	72
5.7.6.4.3	Test case 2: initial state at link reset - reset by the ES	73
5.7.7	SHDLC sequence of frames	73
5.7.7.1	Conformance requirements	73
5.7.7.2	Nomenclature	73
5.7.7.2.1	Conformance requirements	73
5.7.7.3	Link establishment with default sliding window size	74
5.7.7.3.1	Conformance requirements	74
5.7.7.3.2	Test Case 1: link establishment by the EUT	74

5.7.7.3.3	Test Case 2: link establishment by the ES	75
5.7.7.3.4	Test case 3: discard frames before initialization.....	76
5.7.7.3.5	Test case 4: connection time - reset by EUT	76
5.7.7.3.6	Test case 5: connection time - reset by ES	77
5.7.7.3.7	Test case 6: EUT discards I-frames and S-frames during link establishment.....	77
5.7.7.3.8	Test case 7: requesting unsupported window size - link establishment by ES	78
5.7.7.3.9	Test Case 8: requesting unsupported SREJ support - link establishment by ES.....	78
5.7.7.3.10	Test Case 9: requesting unsupported window size and SREJ support - link establishment by ES	78
5.7.7.3.11	Test Case 10: forcing lower window size - link establishment by the EUT	79
5.7.7.3.12	Test Case 11: forcing SREJ not used - link establishment by the EUT	79
5.7.7.3.13	Test Case 12: forcing lower window size and SREJ not used - link establishment by the EUT	80
5.7.7.3.14	Test case 13: discard buffered frames on link re-establishment	80
5.7.7.4	Link establishment with custom sliding window size	80
5.7.7.4.1	Conformance requirements.....	80
5.7.7.5	Data flow.....	81
5.7.7.5.1	Conformance requirements.....	81
5.7.7.5.2	Test case 1: I-frame transmission	81
5.7.7.5.3	Test case 2: I-frame reception - single I-Frame reception	81
5.7.7.5.4	Test case 3: I-frame reception - multiple I-Frame reception	82
5.7.7.5.5	Test case 4: piggybacking.....	82
5.7.7.6	Reject (go N back)	83
5.7.7.6.1	Conformance requirements.....	83
5.7.7.6.2	Test case 1: REJ transmission	83
5.7.7.6.3	Test case 2: REJ transmission - multiple I-frames received	84
5.7.7.6.4	Test case 3: REJ reception.....	84
5.7.7.7	Last Frame Loss	85
5.7.7.7.1	Conformance requirements.....	85
5.7.7.7.2	Test Case 1: retransmission of a single frame	85
5.7.7.7.3	Test Case 2: retransmission of multiple frames.....	85
5.7.7.8	Receive and not ready	86
5.7.7.8.1	Conformance requirements.....	86
5.7.7.8.2	Test case 1: RNR reception	86
5.7.7.8.3	Test case 2: Empty I-frame transmission.....	87
5.7.7.9	Selective reject	88
5.7.7.9.1	Conformance requirements.....	88
5.7.7.9.2	Test case 1: SREJ transmission	88
5.7.7.9.3	Test case 2: SREJ transmission - multiple I-frames received.....	88
5.7.7.9.4	Test case 3: SREJ reception.....	89
5.7.7.9.5	Test case 4: only one SREJ at any one time for each erroneous frame	89
5.7.8	Implementation	90
5.7.8.1	Conformance requirements	90
5.7.8.2	Information Frame emission	90
5.7.8.2.1	Conformance requirements.....	90
5.7.8.3	Information Frame reception.....	90
5.7.8.3.1	Conformance requirements.....	90
5.7.8.4	Reception Ready Frame reception	90
5.7.8.4.1	Conformance requirements.....	90
5.7.8.5	Reject Frame reception	90
5.7.8.5.1	Conformance requirements.....	90
5.7.8.6	Selective Reject Frame reception	91
5.7.8.6.1	Conformance requirements.....	91
5.7.8.7	Acknowledge timeout	91
5.7.8.7.1	Conformance requirements.....	91
5.7.8.8	Guarding/transmit timeout	91
5.7.8.8.1	Conformance requirements.....	91
5.8	CLT LLC definition	91
5.8.1	System Assumptions.....	91
5.8.2	Overview	91
5.8.3	Supported RF protocols	91
5.8.3.1	Conformance requirements	91
5.8.4	CLT Frame Format	92

5.8.4.1	Conformance requirements	92
5.8.4.2	Test case 1: Padding of CLT PAYLOAD in Type A aligned structure	92
5.8.4.2.1	Test execution.....	92
5.8.4.2.2	Initial conditions	92
5.8.4.2.3	Test procedure	92
5.8.5	CLT Command Set	93
5.8.5.1	Conformance requirements	93
5.8.5.2	Test case 1: CLT commands, ISO/IEC 14443 Type A	93
5.8.5.2.1	Test execution.....	93
5.8.5.2.2	Initial conditions	93
5.8.5.2.3	Test procedure	94
5.8.5.3	Test case 2: CLT commands, ISO/IEC 18092	94
5.8.5.3.1	Test execution.....	94
5.8.5.3.2	Initial conditions	94
5.8.5.3.3	Test procedure	95
5.8.6	CLT Frame Interpretation.....	95
5.8.6.1	CLT frames with Type A aligned DATA_FIELD	95
5.8.6.1.1	Conformance requirements.....	95
5.8.6.2	Handling of DATA_FIELD by the CLF	95
5.8.6.2.1	Conformance requirements.....	95
5.8.6.3	Handling of ADMIN_FIELD	96
5.8.6.3.1	CL_PROTO_INF(A)	96
5.8.6.3.2	CL_PROTO_INF(F).....	97
5.8.6.3.3	CL_GOTO_INIT and CL_GOTO_HALT.....	97
5.8.7	CLT Protocol Rules	97
5.8.7.1	Rules for the CLF.....	97
5.8.7.2	Rules for the UICC.....	97
5.8.7.2.1	Conformance requirements.....	97
5.9	Timing and performance	98
Annex A (informative): State diagrams.....		99
A.1	SDL symbols definition.....	99
A.2	Initial SWP interface activation	100
A.3	SHDLC operation.....	102
Annex B (informative): Bibliography.....		110
Annex C (informative): Change history		111
History		112

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: "*Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards*", which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<http://webapp.etsi.org/IPR/home.asp>).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Smart Card Platform (SCP).

The contents of the present document are subject to continuing work within TC SCP and may change following formal TC SCP approval. If TC SCP modifies the contents of the present document, it will then be republished by ETSI with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
 - 0 early working draft;
 - 1 presented to TC SCP for information;
 - 2 presented to TC SCP for approval;
 - 3 or greater indicates TC SCP approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

The present document is part 2 of a multi-part deliverable covering the Test specification for the Single Wire Protocol (SWP) interface, as identified below:

Part 1: "Terminal features (Release 7)";

Part 2: "UICC features (Release 7)".

Introduction

The present document defines test cases for the UICC relating to Single Wire Protocol (SWP). SWP is the communication interface between the UICC and a contactless frontend (CLF) as specified in TS 102 613 [1].

The aim of the present document is to ensure interoperability between the terminal and the UICC independently of the respective manufacturer, card issuer or operator.

1 Scope

The present document covers the minimum characteristics which are considered necessary for the UICC in order to provide compliance to TS 102 613 [1].

The present document specifies the test cases for:

- the physical layer of the interface CLF - UICC;
- the electrical interface of the UICC;
- the initial communication establishment CLF - UICC;
- the data link layer.

Test cases for the terminal relating to TS 102 613 [1] and test cases for the host controller interface (HCI) covering both terminal and UICC are out of scope of the present document.

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

- In the case of a reference to a TC SCP document, a non specific reference implicitly refers to the latest version of that document in the same Release as the present document.

Referenced documents which are not found to be publicly available in the expected location might be found at <http://docbox.etsi.org/Reference>.

NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

2.1 Normative references

The following referenced documents are necessary for the application of the present document.

- [1] ETSI TS 102 613: "Smart Cards; UICC - Contactless Front-end (CLF) Interface; Part 1: Physical and data link layer characteristics.
- [2] ETSI TS 102 221: "Smart Cards; UICC-Terminal interface; Physical and logical characteristics".
- [3] ETSI TS 102 600: "Smart Cards; UICC-Terminal interface; Characteristics of the USB interface".
- [4] ETSI TS 102 622: " Smart Cards; UICC - Contactless Front-end (CLF) Interface; Host Controller Interface (HCI)".
- [5] ISO/IEC 9646-7: "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 7: Implementation Conformance Statements".
- [6] ISO/IEC 14443-3: "Identification cards - Contactless integrated circuit(s) cards - Proximity cards - Part 3: Initialization and anticollision".
- [7] Void.
- [8] ISO/IEC 18092: "Information technology - Telecommunications and information exchange between systems - Near Field Communication - Interface and Protocol (NFCIP-1)".
- [9] ISO/IEC 13239: "Information technology - Telecommunications and information exchange between systems - High-level data link control (HDLC) procedures".

2.2 Informative references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

Not applicable.

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TS 102 613 [1] and the following apply:

corrupted frame: SWP frame which is well-formed with respect to the MAC layer, with the exception that the CRC16 in the frame does not match with the CRC16 result calculated over the payload

NOTE: This frame has at least 1 byte payload. Used by the TE to represent the situation where the DUT receives a corrupted frame (unless otherwise specified).

non-occurrence RQ: RQ which has been extracted from TS 102 613 [1], but which indicates a situation which should never occur

NOTE: The consequence is that such RQs cannot be explicitly tested.

Nomenclature used for tests involving SHDLC LLC:

For SHDLC link establishment, following definitions apply:

- ES transmits RSET:
 - RSET(): RSET frame without payload.
 - RSET(W_s=w): RSET frame with one byte payload.
 - RSET(W_s=w, SREJ=S): RSET frame with two bytes payload. For the endpoint capabilities byte, SREJ=0 represents the value 0x00, SREJ=1 represents the value 0x01.
- EUT transmits RSET:
 - RSET: RSET frame with any valid payload.
 - RSET(): RSET frame without payload.
 - RSET(W_s=w): RSET frame with one byte payload.
 - RSET(W_s=w, SREJ=S): RSET frame with two bytes payload. For the endpoint capabilities byte, SREJ=0 represents the value 0x00, SREJ=1 represents the value 0x01.

For every calculation on NS0_T, NS0_S or NR in the test procedures use modulo 8.

representative SWP frame exchange procedure: sequence of SWP frames exchanged between TE and DUT

NOTE: Used by the TE to cause SWP communication traffic where needed in test procedures. This sequence shall provide the following characteristics, unless otherwise specified or more precisely stated in test procedures:

- Amount of data exchanged between TE and DUT at least 500 byte (with respect to the MAC layer), valid for both directions.
- Some half-duplex SWP communication.
- Some full-duplex SWP communication.
- Frame transmission started by the TE while the DUT yet sends a frame.
- Exchanged data shall enforce occurrence of some bit stuffing in both directions.
- Some variation of frame length sent from the TE.

The DUT provider shall provide sufficient information to allow this procedure to be defined.

representative USB frame exchange procedure: sequence of USB frames exchanged between TE and DUT

NOTE: Used by the TE to cause USB communication traffic where needed in test procedures.

user: logical or physical entity which controls the test equipment in a way that it is able to trigger activities of the DUT

3.2 Symbols

For the purposes of the present document, the symbols given in TS 102 613 [1] and the following apply:

The characters x, y, z represent any values for the current test, unless otherwise specified.

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in TS 102 613 [1] and the following apply:

CLK	CLock
CLT	ContactLess Tunnelling
DUT	Device Under Test
ES	SHDLC endpoint of test equipment (i.e. the terminal simulator)
EUT	SHDLC Endpoint Under Test (i.e. the DUT)
FFS	For Further Study
GND	GrouND
RF	Radio Frequency
RNR	Receive Not Ready
RQ	Conformance requirement
RR	Receive Ready
RSET	ReSET
RST	ReSeT
SHDLC	Simplified High Level Data Link Control
SREJ	Selective Reject
SWIO	Single Wire protocol Input/Output
SWP	Single Wire Protocol
T	Terminal, i.e. the terminal simulator (shortcut used only in test procedure tables)
TE	Test Equipment
UA	Unnumbered Acknowledgment

3.4 Formats

3.4.1 Format of the table of optional features

The columns in table 4.1 have the following meaning.

Column	Meaning
Option:	The optional feature supported or not by the implementation.
Status:	See clause 3.4.3, 'Status and Notations'.
Support:	The support columns shall be filled in by the supplier of the implementation. The following common notations, defined in ISO/IEC 9646-7 [5], are used for the support column in table 4.1. <ul style="list-style-type: none"> • 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).
Mnemonic:	The mnemonic column contains mnemonic identifiers for each item.

3.4.2 Format of the applicability table

The applicability of every test in table 4.2 a) is formally expressed by the use of Boolean expression defined in the following clause.

The columns in table 4.2 a) have the following meaning.

Column	Meaning
Test case:	The "Test case" column gives a reference to the test case number(s) detailed in the present document and required to validate the implementation of the corresponding item in the "Description" column.
Description:	In the "Description" column a short non-exhaustive description of the requirement is found.
Release:	The "Release" column gives the Release applicable and onwards, for the item in the "Description" column.
Rel-x UICC:	For the given Release, the corresponding "Rel-x UICC" column lists the tests required for a UICC to be declared compliant to this Release.
Support:	The "Support" column is blank in the proforma, and shall be completed by the manufacturer in respect of each particular requirement to indicate the choices, which have been made in the implementation.

3.4.3 Status and Notations

The "Rel-x UICC" columns show the status of the entries as follows:

The following notations, defined in ISO/IEC 9646-7 [5], 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 a unique group of related optional items and the logic of their selection which is defined immediately following the table.
Ci	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 a unique conditional status expression which is defined immediately following the table. For nested conditional expressions, the syntax "IF ... THEN (IF ... THEN ... ELSE...) ELSE ..." shall be used to avoid ambiguities.

References to items:

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

EXAMPLE: A.1/4 is the reference to the answer of item 4 in table A.1.

4 Test environment

4.1 Table of optional features

The supplier of the implementation shall state the support of possible options in table 4.1.

Table 4.1: Options

Item	Option	Status	Support	Mnemonic
1	Class A on TS 102 221 [2] interface	O		O_CLASS_A
2	CLT, ISO/IEC 14443 [6] Type A	O		O_CLT_A
3	CLT, ISO/IEC 18092 [8]	O		O_CLT_F
4	Extended bit durations	O		O_EXTENDED_T
5	SREJ	O		O_SREJ
6	Sliding window size of 3	O		O_WS_3
7	Sliding window size of 4 (see note)	O		O_WS_4
8	HCI as per TS 102 622 [4]	O		O_102_622
9	USB as per TS 102 600 [3]	O		O_102_600
10	Void			
11	Support of TERMINAL CAPABILITY	O		O_TERM_CAP

NOTE: If the UICC supports O_WS_4, then it also shall support O_WS_3.

4.2 Applicability table

Table 4.2 a) specifies the applicability of each test case to the device under test. See clause 3.4 for the format of table 4.2 a).

Table 4.2 a): Applicability of tests

Test case	Description	Release	Rel-7 UICC	Support
	System architecture tests			
5.2.3.2	Global Interface bytes of the ATR	Rel-7	M	
5.2.3.3	interaction with TS 102 221 [2] interface - SWP activation while the UICC receives data	Rel-7	M	
5.2.3.4	interaction with TS 102 221 [2] interface - SWP activation while the UICC sends data	Rel-7	M	
5.2.4.2	interaction with TS 102 221 [2] interface - TS 102 221 [2] clock stop	Rel-7	M	
5.2.4.3	interaction with TS 102 221 [2] interface - TS 102 221 [2] reset	Rel-7	M	
5.2.4.4	interaction with TS 102 221 [2] interface - SWP deactivation while the UICC receives data	Rel-7	M	
5.2.4.5	interaction with TS 102 221 [2] interface - SWP deactivation while the UICC sends data	Rel-7	M	
5.2.4.6	interaction with TS 102 221 [2] interface - reset SWP while the UICC receives data	Rel-7	M	
5.2.4.7	interaction with TS 102 221 [2] interface - reset SWP while the UICC sends data	Rel-7	M	
	Physical characteristics tests			
5.3.2.3.2	initial activation in low power mode	Rel-7	M	

Test case	Description	Release	Rel-7 UICC	Support
5.3.2.3.3	initial activation in low power mode with corrupted frames	Rel-7	M	
5.3.2.3.4	no activation	Rel-7	M	
5.3.2.3.6	full power mode activation	Rel-7	M	
5.3.2.3.7	low power mode activation with re-transmission of ACT_SYNC	Rel-7	M	
5.3.2.3.8	full power mode activation with re-transmission of ACT_SYNC	Rel-7	M	
5.3.2.3.10	low power mode activation with multiple re-transmission of ACT_SYNC	Rel-7	M	
5.3.2.3.11	full power mode activation with re-transmission of ACT_READY	Rel-7	M	
5.3.2.3.12	full power mode activation with multiple re-transmission of ACT_SYNC	Rel-7	M	
5.3.2.3.13	subsequent activation in low power mode	Rel-7	M	
5.3.2.3.14	subsequent activation in full power mode	Rel-7	M	
5.3.2.4.2	detect terminal not supporting SWP by TERMINAL CAPABILITIES, classes B and C	Rel-7	C007	
5.3.2.4.3	detect terminal not supporting SWP by TERMINAL CAPABILITIES, class A	Rel-7	C008	
	Electrical characteristics tests			
5.4.1.2.2	TS 102 221 [2] voltage classes B and C support	Rel-7	M	
5.4.1.3.2	operation in low power mode	Rel-7	M	
5.4.1.4.2	S1 communication in voltage class B	Rel-7	M	
5.4.1.4.3	S1 communication in voltage class C, full power mode	Rel-7	M	
5.4.1.4.4	S1 communication in low power mode	Rel-7	M	
5.4.1.5.2.2	S2 communication in voltage class B	Rel-7	M	
5.4.1.5.2.3	S2 communication in voltage class C, full power mode	Rel-7	M	
5.4.1.5.2.4	S2 communication in low power mode	Rel-7	M	
	Physical transmission layer tests			
5.5.1.2	communication with timing variation, default bit duration	Rel-7	M	
5.5.1.3	communication with timing variation, extended bit duration	Rel-7	C004	
5.5.1.4	S1 rise and fall time	Rel-7	M	
5.5.1.5	measurement of C6 input capacitance	Rel-7	M	
5.5.1.6	communication with variation in bit duration	Rel-7	M	
5.5.2.2	S2 switching management	Rel-7	M	
5.5.3.2	SWP interface states management by the UICC	Rel-7	M	
5.5.4.2	power states in low power mode (ACT_POWER_MODE)	Rel-7	M	
5.5.4.3	power states in low power mode (non-ACT)	Rel-7	M	
5.5.4.4	power states in full power mode, without TS 102 221 [2]	Rel-7	M	
5.5.4.5	power saving mode with TS 102 221 [2] interface - restart TS 102 221 [2] interface first	Rel-7	M	
5.4.6	power saving mode with TS 102 221 [2] interface - restart TS 102 613 [1] interface first	Rel-7	M	
5.5.4.7	power saving mode with TS 102 600 [3] interface - restart TS 102 600 [3] interface first	Rel-7	C005	
5.5.4.8	power saving mode with TS 102 600 [3] interface - restart TS 102 613 [1] interface first	Rel-7	C005	
5.5.4.9	power states in full power mode, with TS 102 221 [2]	Rel-7	M	
	Data link layer tests			
5.6.2.2.2	interpretation of incorrectly formed frames - ACT LLC	Rel-7	M	
5.6.2.2.3	interpretation of incorrectly formed frames - SHDLC RSET frames	Rel-7	M	
5.6.2.2.4	interpretation of incorrectly formed frames - SHDLC I-frames	Rel-7	M	
5.6.2.2.5	communication with frames - idle bits and wakeup sequence	Rel-7	M	
5.6.2.3.2	behaviour of UICC with bit stuffing in frame	Rel-7	M	
5.6.2.4.2	RSET with CRC error	Rel-7	M	
5.6.3.1.2	support of ACT LLC and ACT LPDU structure	Rel-7	M	
5.6.3.1.3	support of SHDLC LLC and SHDLC LPDU structure	Rel-7	M	
5.6.3.2.2	error handling of ACT LLC on reception of corrupted frame, after SWIO activation	Rel-7	M	
5.6.3.2.3	ignore ACT LLC frame reception after the SHDLC link establishment	Rel-7	M	
5.6.3.2.4	ignore ACT LLC frame reception in CLT session	Rel-7	C003	
5.6.3.2.5	CLT session during SHDLC communication	Rel-7	C003	

Test case	Description	Release	Rel-7 UICC	Support
5.6.3.2.6	closing condition of CLT session whereas SHDLC link has been established before CLT session	Rel-7	C003	
5.6.3.2.7	closing condition of CLT session whereas SHDLC link has not been established before CLT session	Rel-7	C003	
5.6.3.2.8	interpretation of corrupted frames - single SHDLC frame	Rel-7	M	
5.6.3.2.9	interpretation of corrupted frames - SHDLC I-frames	Rel-7	M	
5.6.3.2.10	interpretation of corrupted frames - CLT frames	Rel-7	C003	
5.6.4.1.2	structure of ACT LPDU - full power mode	Rel-7	M	
5.6.4.1.3	structure of ACT LPDU - low power mode	Rel-7	M	
5.6.4.1.4	behaviour of UICC on reception of ACT frames - values of INF bit	Rel-7	M	
5.6.4.1.5	RFU values in ACT_INFORMATION field	Rel-7	M	
5.6.4.1.6	extended bit durations as per ACT_INFORMATION field	Rel-7	C004	
	SHDLC LLC definition tests			
5.7.1.2	data passed up to the next layer	Rel-7	C001	
5.7.1.3	error management, EUT sending I-frame	Rel-7	M	
5.7.1.4	error management	Rel-7	M	
5.7.6.4.2	initial state at link reset - reset by the EUT	Rel-7	M	
5.7.6.4.3	initial state at link reset - reset by the ES	Rel-7	M	
5.7.7.3.2	link establishment by the EUT	Rel-7	M	
5.7.7.3.3	link establishment by the ES	Rel-7	M	
5.7.7.3.4	discard frames before initialization	Rel-7	M	
5.7.7.3.5	connection time - reset by EUT	Rel-7	M	
5.7.7.3.6	connection time - reset by ES	Rel-7	C107	
5.7.7.3.7	EUT discards I-frames and S-frames during link establishment	Rel-7	M	
5.7.7.3.8	requesting unsupported window size - link establishment by ES	Rel-7	C103	
5.7.7.3.9	requesting unsupported SREJ support - link establishment by ES	Rel-7	C104	
5.7.7.3.10	requesting unsupported window size and SREJ support - link establishment by ES	Rel-7	C105	
5.7.7.3.11	forcing lower window size - link establishment by the EUT	Rel-7	C101	
5.7.7.3.12	forcing SREJ not used - link establishment by the EUT	Rel-7	C102	
5.7.7.3.13	forcing lower window size and SREJ not used - link establishment by the EUT	Rel-7	C106	
5.7.7.3.14	discard buffered frames on link re-establishment	Rel-7	C102	
5.7.7.5.2	I-frame transmission	Rel-7	M	
5.7.7.5.3	I-frame reception - single I-Frame reception	Rel-7	M	
5.7.7.5.4	I-frame reception - multiple I-Frame reception	Rel-7	M	
5.7.7.5.5	piggybacking	Rel-7	M	
5.7.7.6.2	REJ transmission	Rel-7	M	
5.7.7.6.3	REJ transmission - multiple I-frames received	Rel-7	C101	
5.7.7.6.4	REJ reception	Rel-7	M	
5.7.7.7.2	retransmission of a single frame	Rel-7	M	
5.7.7.7.3	retransmission of multiple frames	Rel-7	M	
5.7.7.8.2	RNR reception	Rel-7	M	
5.7.7.8.3	Empty I-frame transmission	Rel-7	M	
5.7.7.9.2	SREJ transmission	Rel-7	C102	
5.7.7.9.3	SREJ transmission - multiple I-frames received	Rel-7	C106	
5.7.7.9.4	SREJ reception	Rel-7	C102	
5.7.7.9.5	only one SREJ at any one time for each erroneous frame	Rel-7	C109	
	CLT LLC definition tests			
5.8.4.2	Padding of CLT PAYLOAD in Type A aligned structure	Rel-7	C110	
5.8.5.2	CLT commands, ISO/IEC 14443 [6] Type A	Rel-7	C110	
5.8.5.3	CLT commands, ISO/IEC 18092 [8]	Rel-7	C111	
5.8.6.3.1.2	Interpretation of CL_PROTO_INF(A)	Rel-7	C110	
	Timing and performance tests			
	(No test cases present for this clause)			

Table 4.2 b): Conditional items referenced by table 4.2 a)

Conditional item	Condition
C001	IF O_102_622 THEN M ELSE N/A
C002	IF O_CLASS_A THEN M ELSE N/A
C003	IF (O_CLT_A OR O_CLT_F) THEN M ELSE N/A
C004	IF O_EXTENDED_T THEN M ELSE N/A
C005	IF O_102_600 THEN M ELSE N/A
C006	Void
C007	IF O_TERM_CAP THEN M ELSE N/A
C008	IF O_CLASS_A AND O_TERM_CAP THEN M ELSE N/A
C101	IF O_WS_3 THEN M ELSE N/A
C102	IF O_SREJ THEN M ELSE N/A
C103	IF NOT O_WS_4 THEN M ELSE N/A
C104	IF NOT O_SREJ THEN M ELSE N/A
C105	IF NOT O_SREJ AND NOT O_WS_4 THEN M ELSE N/A
C106	IF O_SREJ AND O_WS_3 THEN M ELSE N/A
C107	IF NOT (O_SREJ AND O_WS_4) THEN M ELSE N/A
C108	IF O_WS_3 OR O_SREJ THEN M ELSE N/A
C109	IF O_WS_4 AND O_SREJ THEN M ELSE N/A
C110	IF O_CLT_A THEN M ELSE N/A
C111	IF O_CLT_F THEN M ELSE N/A

4.3 Information to be provided by the DUT supplier

Void.

4.4 Test equipment

The test equipment shall provide a terminal simulator which is connected to the DUT during test procedure execution, unless otherwise specified.

With respect to the UICC, the terminal simulator shall act as a valid terminal according to TS 102 613 [1], TS 102 221 [2], and TS 102 600 [3] (if this interface is present at the UICC), unless otherwise specified. In particular, during test procedure execution, the terminal simulator shall respect the electrical and signalling conditions for all UICC contacts within the limits given by TS 102 613 [1], TS 102 221 [2] and TS 102 600 [3]). The accuracy of the terminal simulator's settings shall be taken into account when ensuring this.

Some test cases might require the presence of an upper layer, such as HCI (as specified in TS 102 622 [4]). The test equipment shall provide this layer if required. If message fragmentation is used, all HCP packets, with the possible exception of the last packet, shall contain the maximum amount of data possible for HCP packets.

4.4.1 Measurement/setting uncertainties

The following accuracy applies for measurement and setting of electrical parameter for the test equipment.

Table 4.3 a): Measurement accuracy

Parameter	Tolerance	Remark
I_{CC}	$\pm 0,1$ mA	
I_H	± 25 μ A	
I_L	± 5 μ A	
$T_{S2_INHIBIT}$, $T_{S2_ACT_RES_V}$, $T_{S2_ACT_RES_D}$, $T_{S2_ACT_FRP}$	± 20 μ s	
P3	± 100 ns	
C_{LOAD}	FFS	
T2, T3	± 100 μ s	
Enter power saving mode time (clause 5.5.4.1, RQ5)	± 100 μ s	
Connect low impedance time (clause 5.3.2.4.1, RQ1)	± 100 ms	

Table 4.3 b): Setting uncertainty

Parameter	Tolerance	Remark
V_{IL} , V_{IH}	± 15 mV	
T	± 25 ns	
tr, tf	FFS	

The test equipment shall take care to avoid misinterpretation of parasitic S2 currents caused by SWIO line and UICC load capacitance.

All voltages shall be measured with respect to GND (contact C5), directly at the UICC's contacts.

In steps where it is specified that no response SWP frame is expected, the test equipment shall wait for 20 ms to check that no response frame is sent, unless otherwise specified.

4.4.2 Default conditions for DUT operation

Unless otherwise specified, the test equipment shall apply the default conditions described in the following clauses during test procedure execution.

4.4.2.1 Temperature

The ambient temperature shall be kept in a range of 25 °C \pm 3 °C.

4.4.2.2 TS 102 221 interface contacts (CLK, RST, I/O) and contact Vcc

When the TS 102 221 [2] interface is activated, the terminal simulator shall maintain the characteristics on contacts CLK, RST, I/O in following ranges.

Table 4.4: Default condition for TS 102 221 [2] contacts operation

Contact	Voltage class	Low level	High level
C2 (RST)	A	0,0 V to 0,2 V	0,9 x Vcc to Vcc
C3 (CLK)		0,0 V to 0,2 V	0,9 x Vcc to Vcc
C7 (I/O), UICC input		0,0 V to 0,2 V	0,9 x Vcc to Vcc
C2 (RST)	B	0,0 V to 0,07 x Vcc	0,9 x Vcc to Vcc
C3 (CLK)		0,0 V to 0,07 x Vcc	0,9 x Vcc to Vcc
C7 (I/O), UICC input		0,0 V to 0,07 x Vcc	0,9 x Vcc to Vcc
C2 (RST)	C	0,0 V to 0,1 x Vcc	0,9 x Vcc to Vcc
C3 (CLK)		0,0 V to 0,1 x Vcc	0,9 x Vcc to Vcc
C7 (I/O), UICC input		0,0 V to 0,1 x Vcc	0,9 x Vcc to Vcc

In case these interface contacts are not active (i.e. Vcc is powered, but the TS 102 221 [2] interface is not activated), the terminal simulator shall maintain contacts CLK, RST, I/O between 0,0 V and 0,1 V.

The terminal simulator shall maintain the voltage on Vcc for each voltage class in the following ranges:

- When activated in voltage class A:
 - A range of 4,90 V to 5,10 V.
- When activated in voltage class B
 - A range of: 2,90 V to 3,10 V.
- When activated in voltage class C:
 - A range of 1,75 V to 1,85 V.

4.4.2.3 TS 102 600 interface contacts (IC_DP, IC_DM)

When the TS 102 600 [3] interface is activated, the terminal simulator shall maintain the characteristics on these contacts in following ranges:

Table 4.5: Default condition for TS 102 600 [3] contacts operation

Contact	Voltage class	Low level	High level
C4/ C8 (IC_DP / IC_DM), UICC input	1,8 V	0 V to 0,6 V	1,2 V to 2,1 V
C4/ C8 (IC_DP / IC_DM), UICC input	3,0 V	0 V to 0,5 V	2,0 V to 3,3 V

All tests shall be performed in the J-state, i.e. contact C4 shall be maintained in high level range and C8 in low level range.

In case these interface contacts are not active (i.e. Vcc is powered, but the TS 102 600 [3] interface is not activated), the terminal simulator shall handle contacts IC_DP and IC_DM as follows:

- For UICCs supporting the TS 102 600 [3] interface, these contacts shall be maintained between 0,0 V and 0,1 V.
- For UICCs not supporting the TS 102 600 [3] interface, these contacts shall be maintained between 0,0 V and 0,1 V.

4.4.2.4 TS 102 613 interface contact (SWIO)

When the SWIO contact is activated, the terminal simulator shall maintain the characteristics on this contact in following range:

- SWP bit duration T between 1,1 μs and 4,9 μs :
 - The variation of T between two consecutive bits shall not exceed 5 % of T of the first bit.
- S1 signal waveshape applied:
 - For a logical 1: $T_{H1} = 75\%$ of T .
 - For a logical 0: $T_{H0} = 25\%$ of T .
 - For a transition sequence: $T - T_{H0}$, with $T_{H0} = 25\%$ of T .
 - Rise and fall time between 5 ns and 0,02 % of T .
- S1 signal levels applied for voltage class B:
 - State L between 0,0 V and 0,3 V.
 - State H between 1,40 V and 1,98 V.
- S1 signal levels applied for voltage class C:
 - State L between 0,0 V and 0,15 x V_{CC} .
 - State H between 0,85 x V_{CC} and V_{CC} .

The P4 time shall be 100 μs minimum.

4.4.2.5 Status of UICC interfaces

The terminal simulator may activate the contacts CLK, RST, I/O of the TS 102 221 [2] interface and exchange data over this interface at any time after activation of contact V_{CC} .

NOTE: In low power mode, the contacts CLK, RST, I/O of the TS 102 221 [2] interface will never be activated.

The terminal simulator shall not activate the TS 102 600 [3] interface.

4.4.2.6 Characteristics of LLC's

4.4.2.6.1 ACT LLC

In ACT_POWER_MODE frames, the FR bit shall be set to 0.

4.4.2.6.2 SHDLC LLC

For SHDLC link establishment, the terminal simulator shall send RSET().

I-frames sent by the terminal simulator shall contain at least 1 byte and shall contain valid values according to the upper layer, if applicable.

4.4.2.6.3 CLT LLC

Void.

4.4.3 Minimum/maximum conditions for DUT operation

Unless otherwise specified, the test equipment shall apply the minimum/maximum conditions as described in the following clauses during test procedure execution.

4.4.3.1 Temperature

- Minimum ambient temperature: A range of -25 °C to -23 °C.
- Maximum ambient temperature: A range of +83 °C to +85 °C.

4.4.3.2 Contact Vcc

When activated in voltage class B:

- Minimum: A range of 2,70 V to 2,80 V.
- Maximum: A range of 3,20 V to 3,30 V.

When activated in voltage class C:

- Minimum: A range of 1,62 V to 1,67 V.
- Maximum: A range of 1,93 V to 1,98 V.

4.5 Test execution

4.5.1 Parameter variations

Unless otherwise specified, all tests shall be carried out once for each of following parameter variations in addition to the parameter variations specified individually for each test case.

Table 4.5.1: Global parameter variations

Voltage class and power mode	Vcc
B	Default
	Minimum
	Maximum
C, full power	Default
	Minimum
	Maximum
C, low power	Default
	Minimum
	Maximum

4.6 Pass criterion

A test shall only be considered only as successful, if the test procedure was carried out successfully under all parameter variations with the DUT respecting all conformance requirements referenced in the test procedure.

NOTE: Within the test procedures, the RQs are referenced in the step where they are observable. In some cases, this is different from the step where they occur with respect to the DUT.

5 Test cases

5.1 Principle of the Single Wire Protocol

Reference: TS 102 613 [1], clause 4.

There are no conformance requirements for the UICC for the referenced clause.

5.2 System architecture

5.2.1 General overview

Reference: TS 102 613 [1], clause 5.1.

There are no conformance requirements for the UICC for the referenced clause.

5.2.2 TS 102 221 support

5.2.2.1 Conformance requirements

Reference: TS 102 613 [1], clause 5.2.

RQ1	A UICC supporting the SWP interface shall remain compliant with TS 102 221 [2].
-----	---

NOTE: Test cases for RQ1 are out of scope of the present document. The compliancy to TS 102 221 [2] might be validated by executing tests given in test specifications related to TS 102 221 [2].

5.2.3 Configurations

5.2.3.1 Conformance requirements

Reference: TS 102 613 [1], clause 5.3.

RQ1	The UICC shall indicate support of SWP interface in the Global Interface bytes of the ATR as defined in TS 102 221 [2].
RQ2	If the SWP interface is activated while a session on the TS 102 600 [3] interface is in progress, actions on the SWP interface shall not disturb the terminal-UICC exchange on the TS 102 600 [3] interface.
RQ3	If the SWP interface is activated while a session on the TS 102 600 [3] interface is in progress, actions on the TS 102 600 [3] interface shall not disturb the terminal-UICC exchange on the SWP interface.
RQ4	If the SWP interface is activated while a session on the TS 102 221 [2] interface is in progress, actions on the SWP interface shall not disturb the terminal-UICC exchange on the TS 102 221 [2] interface.
RQ5	If the SWP interface is activated while a session on the TS 102 221 [2] interface is in progress, actions on the TS 102 221 [2] interface shall not disturb the terminal-UICC exchange on the SWP interface.

NOTE 1: Development of test cases involving the TS 102 600 [3] interface are FFS.

NOTE 2: In RQ4 and RQ5, the term "session" is interpreted as "card session" as per TS 102 221 [2].

5.2.3.2 Test case 1: Global Interface bytes of the ATR

5.2.3.2.1 Test execution

The test procedure shall only be executed in voltage class B and voltage class C, full power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test case-specific parameters for this test case.

5.2.3.2.2 Initial conditions

- None of the UICC contacts is activated.

5.2.3.2.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate contacts Vcc, CLK, RST, I/O as per TS 102 221 [2] and apply a cold reset.	
2	UICC → T	Send ATR.	RQ1

5.2.3.3 Test case 2: interaction with TS 102 221 interface - SWP activation while the UICC receives data

5.2.3.3.1 Test execution

The test procedure shall only be executed in voltage class B and voltage class C, full power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test case-specific parameters for this test case.

5.2.3.3.2 Initial conditions

- None of the UICC contacts is activated.

5.2.3.3.3 Test procedure

Procedure (a), executed on TS 102 221 [2] interface.

Step	Direction	Description	RQ
1	T → UICC	Activate TS 102 221 [2] interface.	
2	UICC → T	UICC sends the ATR.	
3	T → UICC	Execute PPS procedure as per TS 102 221 [2].	
4	T → UICC	After sending 1st byte of PPS, start procedure (b).	RQ4
5	T ← → UICC	Continue PPS procedure as per TS 102 221 [2].	RQ4

Procedure (b), executed on SWP interface.

Step	Direction	Description	RQ
1	T ← → UICC	SWP interface activation.	RQ5

5.2.3.4 Test case 3: interaction with TS 102 221 interface - SWP activation while the UICC sends data

5.2.3.4.1 Test execution

This test procedure shall only be executed in voltage class B and voltage class C, full power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test case-specific parameters for this test case.

5.2.3.4.2 Initial conditions

- None of the UICC contacts is activated.

5.2.3.4.3 Test procedure

Procedure (a), executed on TS 102 221 [2] interface.

Step	Direction	Description	RQ
1	T → UICC	Activate TS 102 221 [2] interface.	
2	UICC → T	UICC starts to send the ATR.	
3	T → UICC	After receiving 1st byte of ATR, start procedure (b).	RQ4
4	UICC → T	UICC continues to send the ATR.	RQ4
5	T ↔ UICC	Execute PPS procedure as per TS 102 221 [2].	

Procedure (b), executed on SWP interface.

Step	Direction	Description	RQ
1	T ↔ UICC	SWP interface activation.	RQ5

5.2.4 Interaction with other interfaces

5.2.4.1 Conformance requirements

Reference: TS 102 613 [1], clause 5.4 and clause 5.3.

RQ1	Signalling on a contact assigned to one interface shall not affect the state of other contacts assigned to another interface. This also applies to the activation sequence of the UICC.
RQ2	Operation of the SWP interface after activation shall be independent from operation of other interfaces (e.g. the TS 102 221 [2] or TS 102 600 [3] interface) that may be implemented on the UICC.
RQ3	Any reset signalling (RST signal on contact C2 as specific to the TS 102 221 [2] interface or logical reset on TS 102 600 [3] interface) shall only affect the UICC protocol stack related to these interfaces. SWP-related processes shall not be affected by another interface reset signal.
RQ4	A logical reset signalling on the data link layer (SHDLC RSET) over the SWP interface shall not affect any of the other interfaces.
RQ5	Activation and deactivation of SWP interface shall not affect any of the other interfaces.

NOTE: Development of test cases involving the TS 102 600 [3] interface is FFS.

5.2.4.2 Test case 1: interaction with TS 102 221 interface - TS 102 221 clock stop

5.2.4.2.1 Test execution

This test procedure shall only be executed in voltage class B and voltage class C, full power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test case-specific parameters for this test case.

5.2.4.2.2 Initial conditions

- The TS 102 221 [2] interface is activated, ATR is sent and PPS is successfully completed.
- The SHDLC link is established.

5.2.4.2.3 Test procedure

Step	Direction	Description	RQ
1	T ← → UICC	Run the representative SWP frame exchange procedure during all steps.	
2	T ← → UICC	At reception of the first I-frame, suspend the clock signal on the TS 102 221 [2] interface.	RQ1
3	T ← → UICC	Continue the representative SWP frame exchange procedure.	RQ1
4	T ← → UICC	At reception of the fifth I-frame of the representative SWP frame exchange procedure, restart the clock signal on the TS 102 221 [2] interface.	RQ1
5	T ← → UICC	Finish the representative SWP frame exchange procedure.	RQ1

5.2.4.3 Test case 2: interaction with TS 102 221 interface - TS 102 221 reset

5.2.4.3.1 Test execution

The test procedure shall only be executed in voltage class B and voltage class C, full power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test case-specific parameters for this test case.

5.2.4.3.2 Initial conditions

- The TS 102 221 [2] interface is activated, ATR is sent and PPS is successfully completed.
- The SHDLC link is established.

5.2.4.3.3 Test procedure

Procedure (a), executed on SWP interface.

Step	Direction	Description	RQ
1	T ← → UICC	Run the representative SWP frame exchange procedure during all steps.	
2	T ← → UICC	At reception of the first I-frame, start procedure (b).	RQ2
3	T ← → UICC	Finish the representative SWP frame exchange procedure.	RQ1, RQ3

Procedure (b), executed on TS 102 221 [2] interface.

Step	Direction	Description	RQ
1	User → UICC	Issue a warm reset on the TS 102 221 [2] interface.	
2	UICC → T	Sends ATR.	RQ3
3	T ← → UICC	Execute PPS procedure.	RQ1

5.2.4.4 Test case 3: interaction with TS 102 221 interface - SWP deactivation while the UICC receives data

5.2.4.4.1 Test execution

The test procedure shall only be executed in voltage class B and voltage class C, full power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test case-specific parameters for this test case.

5.2.4.4.2 Initial conditions

- None of the UICC contacts is activated.

5.2.4.4.3 Test procedure

Procedure (a), executed on TS 102 221 [2] interface.

Step	Direction	Description	RQ
1	T → UICC	Activate TS 102 221 [2] interface and SWP interface.	
2	UICC → T	Send the ATR.	
3	T → UICC	Execute PPS procedure as per TS 102 221 [2].	
4	T → UICC	After sending 1st byte of PPS, start procedure (b).	RQ5
5	T ↔ UICC	Continue PPS procedure as per TS 102 221 [2].	RQ5
6	T → UICC	Select EF _{DIR} on TS 102 221 [2] interface.	
7	UICC → T	Send response.	RQ5

Procedure (b), executed on SWP interface.

Step	Direction	Description	RQ
1	T → UICC	Put SWP into DEACTIVATED state.	

5.2.4.5 Test case 4: interaction with TS 102 221 interface - SWP deactivation while the UICC sends data

5.2.4.5.1 Test execution

The test procedure shall only be executed in voltage class B and voltage class C, full power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test case-specific parameters for this test case.

5.2.4.5.2 Initial conditions

- None of the UICC contacts is activated.

5.2.4.5.3 Test procedure

Procedure (a), executed on TS 102 221 [2] interface.

Step	Direction	Description	RQ
1	T → UICC	Activate TS 102 221 [2] interface and SWP interface.	
2	UICC → T	Send the ATR.	
3	T → UICC	Start executing PPS procedure as per TS 102 221 [2].	
4	T → UICC	After receiving 1st byte of PPS, start procedure (b).	RQ5
5	T ← → UICC	Continue PPS procedure as per TS 102 221 [2].	RQ5
6	T → UICC	Select EF _{DIR} on TS 102 221 [2] interface.	
7	UICC → T	Send response.	RQ5

Procedure (b), executed on SWP interface.

Step	Direction	Description	RQ
1	T → UICC	Put SWP into DEACTIVATED state.	

5.2.4.6 Test case 5: interaction with TS 102 221 interface - reset SWP while the UICC receives data

5.2.4.6.1 Test execution

The test procedure shall only be executed in voltage class B and voltage class C, full power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test case-specific parameters for this test case.

5.2.4.6.2 Initial conditions

- None of the UICC contacts is activated.

5.2.4.6.3 Test procedure

Procedure (a), executed on TS 102 221 [2] interface.

Step	Direction	Description	RQ
1	T → UICC	Activate TS 102 221 [2] interface and SWP interface.	
2	UICC → T	Send the ATR.	
3	T → UICC	Execute PPS procedure as per TS 102 221 [2].	
4	T → UICC	After sending 1st byte of PPS, start procedure (b).	RQ4
5	T ← → UICC	Continue PPS procedure as per TS 102 221 [2].	RQ4

Procedure (b), executed on SWP interface.

Step	Direction	Description	RQ
1	T → UICC	Send RSET.	RQ4

5.2.4.7 Test case 6: interaction with TS 102 221 interface - reset SWP while the UICC sends data

5.2.4.7.1 Test execution

The test procedure shall only be executed in voltage class B and voltage class C, full power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test case-specific parameters for this test case.

5.2.4.7.2 Initial conditions

- None of the UICC contacts is activated.

5.2.4.7.3 Test procedure

Procedure (a), executed on TS 102 221 [2] interface.

Step	Direction	Description	RQ
1	T → UICC	Activate TS 102 221 [2] interface and SWP interface.	
2	UICC → T	Send the ATR.	
3	T → UICC	Start executing PPS procedure as per TS 102 221 [2].	
4	T → UICC	After receiving 1st byte of PPS, start procedure (b).	RQ4
5	T ← → UICC	Continue PPS procedure as per TS 102 221 [2].	RQ4

Procedure (b), executed on SWP interface.

Step	Direction	Description	RQ
1	T → UICC	Send RSET.	RQ4

5.3 Physical characteristics

5.3.1 Temperature range for card operations

5.3.1.1 Conformance requirements

Reference: TS 102 613 [1], clause 6.1.

RQ1	All parameter values for the SWP interface shall apply for the standard temperature range for storage and full operation as defined in TS 102 221 [2].
-----	--

NOTE 1: Tests for RQ1, SWP operation, with the parameter temperature are carried out by a selected number of test procedures in other clauses, where the variation of the temperature parameter is explicitly stated in the test execution.

NOTE 2: Tests for RQ1, storage temperature, are out of scope of the present document.

5.3.2 Contacts

5.3.2.1 Provision of contacts

5.3.2.1.1 Conformance requirements

Reference: TS 102 613 [1], clause 6.2.1.

RQ1	The UICC shall use SWIO (contact C6) for data exchange (i.e. SWP) between UICC and the CLF.
-----	---

NOTE: Tests for SWP interface operation with SWIO (contact C6) are carried out within all test procedures which perform communication over SWIO.

5.3.2.2 Contact activation and deactivation

5.3.2.2.1 Conformance requirements

Reference: TS 102 613 [1], clause 6.2.2.

There are no conformance requirements for the UICC for the referenced clause.

5.3.2.3 Interface activation

5.3.2.3.1 Conformance requirements

Reference: TS 102 613 [1], clauses 6.2.3 and 9.3.1.

The following conformance requirements apply to initial SWP interface activation:

RQ1	6.2.3	The UICC shall indicate that it is ready to exchange data via SWP by resuming SWP.
RQ2	6.2.3	In case the UICC does not detect the SWP ACTIVATED state, the UICC shall set S2 to state L not later than T _{S2_INHIBIT} after the UICC has put S2 in state H.
RQ3	6.2.3	If the action in RQ2 is taken, the UICC shall not respond to further attempts from the CLF to communicate via SWP and shall wait for UICC deactivation or shall retrieve information about SWP capability of the terminal via any other UICC interface.
RQ4	6.2.3	The UICC shall send the first ACT_SYNC frame and wait for the first frame from the CLF.
RQ5	6.2.3	When the UICC has received an ACT_POWER_MODE frame from the CLF, the UICC shall take the following action: If the UICC has received a correct ACT_POWER_MODE and the FR bit of this frame is 1, then the UICC shall repeat the last ACT frame it had sent.
RQ6	6.2.3	When the UICC has received an ACT_POWER_MODE frame from the CLF, the UICC shall take the following action: If the UICC has received a correct ACT_POWER_MODE and the FR bit of this frame is 0 then the UICC shall respond with an ACT_READY frame.
RQ7	6.2.3	If the UICC has received a corrupted frame, the UICC shall not respond.

The following conformance requirements apply to subsequent SWP interface activation:

RQ8	6.2.3	The initial interface activation sequence as specified in RQ1 to RQ7 shall also be applied after the transition of S1 to state H from the state DEACTIVATED.
RQ9	6.2.3	The UICC shall not send an ACT_INFORMATION field in any of the ACT frames.

The following conformance requirements apply to initial and/or subsequent SWP interface activation as specified:

RQ10	6.2.3	For initial interface activation, the UICC shall resume SWP for sending 1st ACT_SYNC frame within a maximum of 700 μ s ($T_{S2_ACT_RES_V}$).
RQ11	6.2.3	The UICC responds to ACT_POWER_MODE frames (calculated from last bit of EOF to SWP resume) within a maximum of 2 000 μ s ($T_{S2_ACT_FRP}$).
RQ12	6.2.3	The UICC re-enters SUSPENDED in case the CLF did not respond to resume within a maximum of 100 μ s ($T_{S2_INHIBIT}$).
RQ13	6.2.3	For subsequent interface activation, the UICC shall resume SWP for sending 1st ACT_SYNC frame within 500 μ s ($T_{S2_ACT_RES_D}$).

The following conformance requirements apply to initial and/or subsequent SWP interface activation as specified:

RQ14	6.2.3	If the UICC was activated according to TS 102 221 [2], an additional activation of the SWP interface shall be considered as selected application on the UICC.
RQ15	9.3.1	After successful activation of the SWP interface, the UICC shall support the establishment of the SHDLC link by the CLF.

5.3.2.3.2 Test case 1: initial activation in low power mode

5.3.2.3.2.1 Test execution

The test procedure shall only be executed in low power mode.

The test procedure shall be executed once for each of following parameters:

- $T_{S1_HIGH_V}$: (1) Between 1 000 μ s and 1 020 μ s; and (2) between 5 000 μ s and 5 050 μ s.

5.3.2.3.2.2 Initial conditions

- None of the UICC contacts is activated.

5.3.2.3.2.3 Test procedure

Step	Direction	Description	RQ
1	T \rightarrow UICC	Activate Vcc (contact C1).	
2	T \rightarrow UICC	Activate SWIO (contact C6) (see note).	
3	UICC \rightarrow T	Resume SWP.	RQ1, RQ10
4	T \rightarrow UICC	Put the SWP into ACTIVATED state.	
5	UICC \rightarrow T	Send ACT_SYNC frame.	RQ4
6	T \leftarrow UICC	Perform SHDLC link establishment.	RQ15

NOTE: SWP in **SUSPENDED** state.

5.3.2.3.3 Test case 2: initial activation in low power mode with corrupted frames

5.3.2.3.3.1 Test execution

The test procedure shall only be executed in low power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test case-specific parameters for this test case.

5.3.2.3.3.2 Initial conditions

- None of the UICC contacts is activated.

5.3.2.3.3.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate Vcc (contact C1).	
2	T → UICC	Activate SWIO (contact C6) (see note).	
3	UICC → T	Resume SWP.	RQ1, RQ10
4	T → UICC	Put the SWP Interface into ACTIVATED state.	
5	UICC → T	Send ACT_SYNC frame.	RQ4
6	T → UICC	Send corrupted frame.	
7	UICC	No response.	RQ7
8	T ← → UICC	Perform SHDLC link establishment.	RQ15
NOTE: SWP interface in SUSPENDED state.			

5.3.2.3.4 Test case 3: no activation

5.3.2.3.4.1 Test execution

The test procedure shall be executed once for each of following parameters:

- There are no test case-specific parameters for this test case.

5.3.2.3.4.2 Initial conditions

- None of the UICC contacts is activated.

5.3.2.3.4.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate Vcc (contact C1).	
2	T → UICC	Activate SWIO (contact C6) (see note).	
3	UICC → T	Resume SWP.	RQ1, RQ10
4	T → UICC	Keep the SWP in SUSPENDED state.	
5	UICC → T	Set S2 to state L.	RQ2, RQ12
NOTE: SWP in SUSPENDED state.			

5.3.2.3.5 Void

5.3.2.3.6 Test case 5: full power mode activation

5.3.2.3.6.1 Test execution

The test procedure shall only be executed in voltage class B and voltage class C, full power mode.

The test procedure shall be executed once for the parameters in each row of the following table:

Activate TS 102 221 [2] interface in step 2
No
Yes

5.3.2.3.6.2 Initial conditions

- None of the UICC contacts is activated.

5.3.2.3.6.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate Vcc (contact C1).	
2	T ↔ UICC conditional	If Test execution clause indicates to do so, activate TS 102 221 [2] interface.	
3	T → UICC	Activate SWIO (contact C6) (see note).	
4	UICC → T	Resume SWP.	RQ1, RQ10
5	T → UICC	Put the SWP into ACTIVATED state.	
65	UICC → T	Send ACT_SYNC frame.	RQ4
7	T → UICC	Send ACT_POWER_MODE frame.	
8	UICC → T	Send ACT_READY frame.	RQ6, RQ11
9	T ↔ UICC	Perform SHDLC link establishment.	RQXX
NOTE: SWP in SUSPENDED state.			

5.3.2.3.7 Test case 6: low power mode activation with re-transmission of ACT_SYNC

5.3.2.3.7.1 Test execution

The test procedure shall only be executed in low power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test case-specific parameters for this test case.

5.3.2.3.7.2 Initial conditions

- None of the UICC contacts is activated.

5.3.2.3.7.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate Vcc (contact C1).	
2	T → UICC	Activate SWIO (contact C6) (see note).	
3	UICC → T	Resume SWP.	RQ1, RQ10
4	T → UICC	Put the SWP into ACTIVATED state.	
5	UICC → T	Send ACT_SYNC frame.	RQ4
6	T → UICC	Send ACT_POWER_MODE frame with FR=1 and low power mode indication.	
7	UICC → T	Send ACT_SYNC frame.	RQ5, RQ11
8	T ↔ UICC	Perform SHDLC link establishment.	RQ15
NOTE: SWP in SUSPENDED state.			

5.3.2.3.8 Test case 7: full power mode activation with re-transmission of ACT_SYNC

5.3.2.3.8.1 Test execution

The test procedure shall only be executed in voltage class B and voltage class C, full power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test case-specific parameters for this test case.

5.3.2.3.8.2 Initial conditions

- None of the UICC contacts is activated.

5.3.2.3.8.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate Vcc (contact C1).	
2	T → UICC	Activate SWIO (contact C6) (see note).	
3	UICC → T	Resume SWP.	RQ1, RQ10
4	T → UICC	Put the SWP into ACTIVATED state.	
5	UICC → T	Send ACT_SYNC frame.	RQ4
6	T → UICC	Sends ACT_POWER_MODE frame with FR=1 and full power mode indication.	
7	UICC → T	Send ACT_SYNC frame.	RQ5, RQ11
8	T ← → UICC	Perform SHDLC link establishment.	RQ15

NOTE: SWP in **SUSPENDED** state.

5.3.2.3.9 Void

5.3.2.3.10 Test case 9: low power mode activation with multiple re-transmission of ACT_SYNC

5.3.2.3.10.1 Test execution

The test procedure shall only be executed in low power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test case-specific parameters for this test case.

5.3.2.3.10.2 Initial conditions

- None of the UICC contacts is activated.

5.3.2.3.10.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate Vcc (contact C1).	
2	T → UICC	Activate SWIO (contact C6) (see note).	
3	UICC → T	Resume SWP.	RQ1, RQ10
4	T → UICC	Put the SWP into ACTIVATED state.	
5	UICC → T	Send ACT_SYNC frame.	RQ4
6	T → UICC	Sends ACT_POWER_MODE frame with FR=1 and low power mode indication.	
7	UICC → T	Send ACT_SYNC frame.	RQ5, RQ11
8	T → UICC	Sends ACT_POWER_MODE frame with FR=1 and low power mode indication.	
9	UICC → T	Send an ACT_SYNC frame.	RQ5, RQ11
10	T ← → UICC	Perform SHDLC link establishment.	RQ15

NOTE: SWP in **SUSPENDED** state.

5.3.2.3.11 Test case 10: full power mode activation with re-transmission of ACT_READY

5.3.2.3.11.1 Test execution

The test procedure shall only be executed in voltage class B and voltage class C, full power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test case-specific parameters for this test case.

5.3.2.3.11.2 Initial conditions

- None of the UICC contacts is activated.

5.3.2.3.11.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate Vcc (contact C1).	
2	T → UICC	Activate SWIO (contact C6) (see note).	
3	UICC → T	Resume SWP.	RQ1, RQ10
4	T → UICC	Put the SWP into ACTIVATED state.	
5	UICC → T	Send ACT_SYNC frame.	RQ4
6	T → UICC	Sends ACT_POWER_MODE frame with FR=0 and full power mode indication.	
7	UICC → T	Send ACT_READY frame.	RQ6, RQ11
8	T → UICC	Send ACT_POWER_MODE frame with FR=1 and full power mode indication.	
9	UICC → T	Send ACT_READY frame.	RQ5, RQ11
10	T ← → UICC	Perform SHDLIC link establishment.	RQ15

NOTE: SWP in **SUSPENDED** state.

5.3.2.3.12 Test case 11: full power mode activation with multiple re-transmission of ACT_SYNC

5.3.2.3.12.1 Test execution

The test procedure shall only be executed in voltage class B and voltage class C, full power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test case-specific parameters for this test case.

5.3.2.3.12.2 Initial conditions

- None of the UICC contacts is activated.

5.3.2.3.12.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate Vcc (contact C1).	
2	T → UICC	Activate SWIO (contact C6) (see note).	
3	UICC → T	Resume SWP.	RQ1, RQ10
4	T → UICC	Put the SWP into ACTIVATED state.	
5	UICC → T	Send ACT_SYNC frame.	RQ4
6	T → UICC	Send ACT_POWER_MODE frame with FR=1 and full power mode indication.	
7	UICC → T	Send ACT_SYNC frame.	RQ5, RQ11
8	T → UICC	Send ACT_POWER_MODE frame with FR=1 and full power mode indication.	
9	UICC → T	Send ACT_SYNC frame.	RQ5, RQ11
10	T ← → UICC	Perform SHDLIC link establishment.	RQ15

NOTE: SWP in **SUSPENDED** state.

5.3.2.3.13 Test case 12: subsequent activation in low power mode

5.3.2.3.13.1 Test execution

The test procedure shall only be executed in low power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test case-specific parameters for this test case.

5.3.2.3.13.2 Initial conditions

- SWP resides in **DEACTIVATED** state, and previously an initial SWP interface activation in low power mode has been successful.

5.3.2.3.13.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Initiate subsequent SWP interface activation (see note).	
2	UICC → T	Resume SWP.	RQ13
3	T → UICC	Put the SWP into ACTIVATED state.	
4	UICC → T	Send ACT_SYNC frame.	RQ4 RQ9
5	T ← → UICC	Perform SHDLC link establishment.	RQ15
NOTE: SWP in SUSPENDED state.			

5.3.2.3.14 Test case 13: subsequent activation in full power mode

5.3.2.3.14.1 Test execution

The test procedure shall only be executed in voltage class B and voltage class C, full power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test case-specific parameters for this test case.

5.3.2.3.14.2 Initial conditions

- SWP resides in **DEACTIVATED** state, and previously an initial SWP interface activation in full power mode has been successful.

5.3.2.3.14.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Initiate subsequent SWP interface activation (see note).	
2	UICC → T	Resume SWP.	RQ13
3	T → UICC	Put the SWP into ACTIVATED state.	
4	UICC → T	Send ACT_SYNC frame.	RQ4 RQ9
5	T ← → UICC	Perform SHDLC link establishment.	RQ15
NOTE: SWP in SUSPENDED state.			

5.3.2.3.15 Void

5.3.2.4 Behaviour of a UICC in a terminal not supporting SWP

5.3.2.4.1 Conformance requirements

Reference: TS 102 613 [1], clause 6.2.4.

RQ1	When the UICC detects that the contact C6 is not connected to Vcc it shall connect the C6 contact with a low impedance to Gnd within 2 s after detecting that the terminal does not indicate the support of SWP interface.
-----	--

5.3.2.4.2 Test case 1: detect terminal not supporting SWP by TERMINAL CAPABILITIES, classes B and C

5.3.2.4.2.1 Test execution

The test procedure shall be executed only in voltage class B, and voltage class C, full power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test case-specific parameters for this test case.

The test equipment shall provide an "electrically isolated" condition on SWIO (contact C6). This shall be achieved by connecting a high impedance to Gnd, providing V_{IL} conditions.

5.3.2.4.2.2 Initial conditions

- None of the UICC contacts is activated.

5.3.2.4.2.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate the TS 102 221 [2] interface.	
2	UICC → T	Send ATR.	
3	T → UICC	Send TERMINAL CAPABILITY command as per TS 102 221 [2], not indicating the support of the UICC-CLF interface according to TS 102 613 [1].	
4	UICC	Connect SWIO (contact C6) with a low impedance to Gnd.	RQ1

NOTE: The value of "low impedance" is not specified in TS 102 613 [1].

5.3.2.4.3 Test case 2: detect terminal not supporting SWP by TERMINAL CAPABILITIES, class A

5.3.2.4.3.1 Test execution

The test procedure shall be executed only in voltage class A.

The test procedure shall be executed once for each of following parameters:

- There are no test case-specific parameters for this test case.

The test equipment shall provide an "electrically isolated" condition on SWIO (contact C6). This shall be achieved by connecting a high impedance to Gnd, providing voltage class B V_{IL} conditions.

NOTE: For voltage class A, V_{IL} is not specified.

5.3.2.4.3.2 Initial conditions

- None of the UICC contacts is activated.

5.3.2.4.3.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate the TS 102 221 [2] interface.	
2	UICC → T	Send ATR.	
3	T → UICC	Send TERMINAL CAPABILITY command as per TS 102 221 [2], not indicating the support of the UICC-CLF interface according to TS 102 613 [1].	
4	UICC	Connect SWIO (contact C6) with a low impedance to Gnd.	RQ1

NOTE: The value of "low impedance" is not specified in TS 102 613 [1].

5.3.2.5 Behaviour of a terminal connected to a UICC not supporting SWP

Reference: TS 102 613 [1], clause 6.2.5.

There are no conformance requirements for the UICC for the referenced clause.

5.3.2.6 Inactive contacts

Reference: TS 102 613 [1], clause 6.2.6.

There are no conformance requirements for the UICC for the referenced clause.

5.4 Electrical characteristics

5.4.1 Operating conditions

5.4.1.1 Operating conditions

Reference: TS 102 613 [1], clause 7.1.

There are no conformance requirements for the UICC for the referenced clause.

5.4.1.2 Supply voltage classes

5.4.1.2.1 Conformance requirements

Reference: TS 102 613 [1], clause 7.1.1.

RQ1	The UICC shall support the voltage classes B and C, as defined in TS 102 221 [2].
-----	---

5.4.1.2.2 Test case 1: TS 102 221 voltage classes B and C support

5.4.1.2.2.1 Test execution

The test procedure shall only be executed in voltage class B and voltage class C, full power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test case-specific parameters for this test case.

5.4.1.2.2.2 Initial conditions

- None of the UICC contacts is activated.

5.4.1.2.2.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate TS 102 221 [2] interface.	
2	UICC → T	Send ATR. If the first TA for T=15 is present in the ATR, it shall indicate support of at least voltage classes B and C.	RQ1
3	T → UICC	Activate contact SWIO.	
4	UICC → T	Send ACT_SYNC frame.	RQ1

5.4.1.3 Vcc (C1) low power mode definition

5.4.1.3.1 Conformance requirements

Reference: TS 102 613 [1], clause 7.1.2.

RQ1	When operating in low power mode, the UICC shall not draw more than 5 mA from Vcc, averaged over 1 ms.
RQ2	In low power mode, the UICC shall operate with Vcc in the range of 1,62 V to 1,98 V.

5.4.1.3.2 Test case 1: operation in low power mode

5.4.1.3.2.1 Test execution

The test procedure shall only be executed in voltage class C, low power mode.

The test procedure shall be executed at default, minimum, and maximum ambient temperature.

The test procedure shall be executed once for each of following parameters:

- There are no test case-specific parameters for this test case.

5.4.1.3.2.2 Initial conditions

- None of the UICC contacts is activated.

5.4.1.3.3.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate Vcc (contact C1).	
2	T → UICC	Activate SWIO (contact C6).	
3	UICC → T	Send ACT_SYNC frame.	RQ1
4	T ← → UICC	Perform SHDLC link establishment and run the representative SWP frame exchange procedure.	RQ1, RQ2
5	T → UICC	Put SWP into DEACTIVATED state.	RQ1
6	T → UICC	Maintain DEACTIVATED state for at least 10 ms.	RQ1
7	T ← → UICC	Perform subsequent SWP interface activation.	RQ1, RQ2

5.4.1.4 Signal S1

5.4.1.4.1 Conformance requirements

Reference: TS 102 613 [1], clause 7.1.3.

RQ1	In voltage class B the UICC shall consider S1 to be in state H when S1 is in the range between 1,13 V and 2,28 V.
RQ2	In voltage class B the UICC shall consider S1 to be in state L when S1 is in the range between -0,3 V and 0,48 V.
RQ3	In voltage class C the UICC shall consider S1 to be in state H when S1 is in the range between $0,7 \times V_{cc}$ and $V_{cc} + 0,3$ V.
RQ4	In voltage class C the UICC shall consider S1 to be in state L when S1 is in the range between -0,3 and $0,25 \times V_{cc}$.

5.4.1.4.2 Test case 1: S1 communication in voltage class B

5.4.1.4.2.1 Test execution

The test procedure shall only be executed in voltage class B.

The test procedure shall be executed at default, minimum, and maximum ambient temperature.

The test procedure shall be executed once for each of following parameters:

- V_{cc} at default, and S1 signal applied with:
 - $V_{IL} = 0,15$ V and $V_{IH} = 1,70$ V;
 - $V_{IL} = V_{ILmin}$ and $V_{IH} = 1,70$ V;
 - $V_{IL} = V_{ILmax}$ and $V_{IH} = 1,70$ V;
 - $V_{IL} = 0,15$ V and $V_{IH} = V_{IHmin}$;
 - $V_{IL} = 0,15$ V and $V_{IH} = V_{IHmax}$.
- V_{cc} at minimum, and S1 signal applied with:
 - $V_{IL} = 0,15$ V and $V_{IH} = 1,70$ V;
 - $V_{IL} = V_{ILmin}$ and $V_{IH} = 1,70$ V;
 - $V_{IL} = V_{ILmax}$ and $V_{IH} = 1,70$ V;
 - $V_{IL} = 0,15$ V and $V_{IH} = V_{IHmin}$;
 - $V_{IL} = 0,15$ V and $V_{IH} = V_{IHmax}$.
- V_{cc} at maximum, and S1 signal applied with:
 - $V_{IL} = 0,15$ V and $V_{IH} = 1,70$ V;
 - $V_{IL} = V_{ILmin}$ and $V_{IH} = 1,70$ V;
 - $V_{IL} = V_{ILmax}$ and $V_{IH} = 1,70$ V;
 - $V_{IL} = 0,15$ V and $V_{IH} = V_{IHmin}$;
 - $V_{IL} = 0,15$ V and $V_{IH} = V_{IHmax}$.

5.4.1.4.2.2 Initial conditions

- None of the UICC contacts is activated.

5.4.1.4.2.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate Vcc (contact C1).	
2	T → UICC	Activate SWIO (contact C6).	
3	UICC → T	Send ACT_SYNC frame.	RQ1, RQ2
4	T → UICC	Send ACT_POWER_MODE frame.	RQ1, RQ2
5	UICC → T	Respond ACT_READY frame.	RQ1, RQ2
6	T ↔ UICC	Perform SHDLC link establishment.	RQ1, RQ2

5.4.1.4.3 Test case 2: S1 communication in voltage class C, full power mode

5.4.1.4.3.1 Test execution

The test procedure shall only be executed in voltage class C, full power mode.

The test procedure shall be executed at default, minimum, and maximum ambient temperature.

The test procedure shall be executed once for each of following parameters:

- Vcc at default, and S1 signal applied with:
 - $V_{IL} = 0,10 \times V_{cc}$ and $V_{IH} = 0,85 \times V_{cc}$;
 - $V_{IL} = V_{ILmin}$ and $V_{IH} = 0,85 \times V_{cc}$;
 - $V_{IL} = V_{ILmax}$ and $V_{IH} = 0,85 \times V_{cc}$;
 - $V_{IL} = 0,10 \times V_{cc}$ and $V_{IH} = V_{IHmin}$;
 - $V_{IL} = 0,10 \times V_{cc}$ and $V_{IH} = V_{IHmax}$;
- Vcc at minimum, and S1 signal applied with:
 - $V_{IL} = 0,10 \times V_{cc}$ and $V_{IH} = 0,85 \times V_{cc}$;
 - $V_{IL} = V_{ILmin}$ and $V_{IH} = 0,85 \times V_{cc}$;
 - $V_{IL} = V_{ILmax}$ and $V_{IH} = 0,85 \times V_{cc}$;
 - $V_{IL} = 0,10 \times V_{cc}$ and $V_{IH} = V_{IHmin}$;
 - $V_{IL} = 0,10 \times V_{cc}$ and $V_{IH} = V_{IHmax}$.
- Vcc at maximum, and S1 signal applied with:
 - $V_{IL} = 0,10 \times V_{cc}$ and $V_{IH} = 0,85 \times V_{cc}$;
 - $V_{IL} = V_{ILmin}$ and $V_{IH} = 0,85 \times V_{cc}$;
 - $V_{IL} = V_{ILmax}$ and $V_{IH} = 0,85 \times V_{cc}$;
 - $V_{IL} = 0,10 \times V_{cc}$ and $V_{IH} = V_{IHmin}$;

- $V_{IL} = 0,10 \times V_{CC}$ and $V_{IH} = V_{IHmax}$.

5.4.1.4.3.2 Initial conditions

- None of the UICC contacts is activated.

5.4.1.4.3.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate Vcc (contact C1).	
2	T → UICC	Activate SWIO (contact C6).	
3	UICC → T	Send ACT_SYNC frame.	RQ3, RQ4
4	T → UICC	Send ACT_POWER_MODE frame indicating full power mode.	RQ3, RQ4
5	UICC → T	Respond ACT_READY frame.	RQ3, RQ4
6	T ↔ UICC	Perform SHDLIC link establishment.	RQ3, RQ4

5.4.1.4.4 Test case 3: S1 communication in low power mode

5.4.1.4.4.1 Test execution

The test procedure shall only be executed in voltage class C, low power mode.

The test procedure shall be executed at default, minimum, and maximum ambient temperature.

The test procedure shall be executed once for each of following parameters:

- Vcc at default, and S1 signal applied with:
 - $V_{IL} = 0,10 \times V_{CC}$ and $V_{IH} = 0,85 \times V_{CC}$;
 - $V_{IL} = V_{ILmin}$ and $V_{IH} = 0,85 \times V_{CC}$;
 - $V_{IL} = V_{ILmax}$ and $V_{IH} = 0,85 \times V_{CC}$;
 - $V_{IL} = 0,10 \times V_{CC}$ and $V_{IH} = V_{IHmin}$;
 - $V_{IL} = 0,10 \times V_{CC}$ and $V_{IH} = V_{IHmax}$;
- Vcc at minimum, and S1 signal applied with:
 - $V_{IL} = 0,10 \times V_{CC}$ and $V_{IH} = 0,85 \times V_{CC}$;
 - $V_{IL} = V_{ILmin}$ and $V_{IH} = 0,85 \times V_{CC}$;
 - $V_{IL} = V_{ILmax}$ and $V_{IH} = 0,85 \times V_{CC}$;
 - $V_{IL} = 0,10 \times V_{CC}$ and $V_{IH} = V_{IHmin}$;
 - $V_{IL} = 0,10 \times V_{CC}$ and $V_{IH} = V_{IHmax}$;

- Vcc at maximum, and S1 signal applied with:
 - $V_{IL} = 0,10 \times V_{cc}$ and $V_{IH} = 0,85 \times V_{cc}$;
 - $V_{IL} = V_{ILmin}$ and $V_{IH} = 0,85 \times V_{cc}$;
 - $V_{IL} = V_{ILmax}$ and $V_{IH} = 0,85 \times V_{cc}$;
 - $V_{IL} = 0,10 \times V_{cc}$ and $V_{IH} = V_{IHmin}$;
 - $V_{IL} = 0,10 \times V_{cc}$ and $V_{IH} = V_{IHmax}$.

5.4.1.4.4.2 Initial conditions

- None of the UICC contacts is activated.

5.4.1.4.4.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate Vcc (contact C1).	
2	T → UICC	Activate SWIO (contact C6).	
3	UICC → T	Send ACT_SYNC frame.	RQ3, RQ4
4	T ↔ UICC	Perform SHDLC link establishment.	RQ3, RQ4

5.4.1.5 Signal S2

5.4.1.5.1 Signal S2

Reference: TS 102 613 [1], clause 7.1.4.

There are no conformance requirements for the UICC for the referenced clause.

5.4.1.5.2 Operating current for S2

5.4.1.5.2.1 Conformance requirements

Reference: TS 102 613 [1], clause 7.1.4.1.

RQ1	For supply voltage class B, when transmitting state L on S2, the UICC shall not draw less current than 0 μ A and not draw more current than 20 μ A from SWIO, with S1 measured on the UICC contacts between 1,13 V and 2,28 V.
RQ2	For supply voltage class B, when transmitting state H on S2, the UICC shall not draw less current than 600 μ A and not draw more current than 1 000 μ A from SWIO, with S1 measured on the UICC contacts between 1,13 V and 2,28 V.
RQ3	For supply voltage class C, when transmitting state L on S2, the UICC shall not draw less current than 0 μ A and not draw more current than 20 μ A from SWIO, with S1 measured on the UICC contacts between 0,7 x Vcc and Vcc + 0,3 V.
RQ4	For supply voltage class C, when transmitting state H on S2, the UICC shall not draw less current than 600 μ A and not draw more current than 1 000 μ A from SWIO, with S1 measured on the UICC contacts between 0,7 x Vcc and Vcc + 0,3 V.

5.4.1.5.2.2 Test case 1: S2 communication in voltage class B

5.4.1.5.2.2.1 Test execution

The test procedure shall only be executed in voltage class B.

The test procedure shall be executed at default, minimum, and maximum ambient temperature.

The test procedure shall be executed once for each of following parameters:

- Vcc at default, and S1 signal applied with:
 - $V_{IL} = 0,15 \text{ V}$ and $V_{IH} = 1,70 \text{ V}$;
 - $V_{IL} = 0,15 \text{ V}$ and $V_{IH} = V_{IHmin}$;
 - $V_{IL} = 0,15 \text{ V}$ and $V_{IH} = V_{IHmax}$;
- Vcc at minimum, and S1 signal applied with:
 - $V_{IL} = 0,15 \text{ V}$ and $V_{IH} = 1,70 \text{ V}$;
 - $V_{IL} = 0,15 \text{ V}$ and $V_{IH} = V_{IHmin}$;
 - $V_{IL} = 0,15 \text{ V}$ and $V_{IH} = V_{IHmax}$;
- Vcc at maximum, and S1 signal applied with:
 - $V_{IL} = 0,15 \text{ V}$ and $V_{IH} = 1,70 \text{ V}$;
 - $V_{IL} = 0,15 \text{ V}$ and $V_{IH} = V_{IHmin}$;
 - $V_{IL} = 0,15 \text{ V}$ and $V_{IH} = V_{IHmax}$.

5.4.1.5.2.2.2 Initial conditions

- None of the UICC contacts is activated.

5.4.1.5.2.2.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate Vcc (contact C1).	
2	T → UICC	Activate SWIO (contact C6).	
3	UICC → T	Send ACT_SYNC frame.	RQ1, RQ2
4	T → UICC	Send ACT_POWER_MODE frame.	RQ1
5	UICC → T	Respond ACT_READY frame.	RQ1, RQ2
6	T → UICC	Put SWP in SUSPENDED state.	RQ1
7	T → UICC	Maintain SUSPENDED state for at least 2 ms.	RQ1
8	T ↔ UICC	Perform SHDLC link establishment.	RQ1, RQ2

5.4.1.5.2.3 Test case 2: S2 communication in voltage class C, full power mode

5.4.1.5.2.3.1 Test execution

The test procedure shall only be executed in voltage class C, full power mode.

The test procedure shall be executed at default, minimum, and maximum ambient temperature.

The test procedure shall be executed once for each of following parameters:

- Vcc at default, and S1 signal applied with:
 - $V_{IL} = 0,10 \times V_{CC}$ and $V_{IH} = 0,85 \times V_{CC}$;
 - $V_{IL} = 0,10 \times V_{CC}$ and $V_{IH} = V_{IHmin}$;
 - $V_{IL} = 0,10 \times V_{CC}$ and $V_{IH} = V_{IHmax}$.
- Vcc at minimum, and S1 signal applied with:
 - $V_{IL} = 0,10 \times V_{CC}$ and $V_{IH} = 0,85 \times V_{CC}$;
 - $V_{IL} = 0,10 \times V_{CC}$ and $V_{IH} = V_{IHmin}$;
 - $V_{IL} = 0,10 \times V_{CC}$ and $V_{IH} = V_{IHmax}$.
- Vcc at maximum, and S1 signal applied with:
 - $V_{IL} = 0,10 \times V_{CC}$ and $V_{IH} = 0,85 \times V_{CC}$;
 - $V_{IL} = 0,10 \times V_{CC}$ and $V_{IH} = V_{IHmin}$;
 - $V_{IL} = 0,10 \times V_{CC}$ and $V_{IH} = V_{IHmax}$.

5.4.1.5.2.3.2 Initial conditions

- None of the UICC contacts is activated.

5.4.1.5.2.3.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate Vcc (contact C1).	
2	T → UICC	Activate SWIO (contact C6).	
3	UICC → T	Send ACT_SYNC frame.	RQ3, RQ4
4	T → UICC	Send ACT_POWER_MODE frame indicating full power mode.	RQ3
5	UICC → T	Respond ACT_READY frame.	RQ3, RQ4
6	T → UICC	Put SWP in SUSPENDED state.	RQ3
7	T → UICC	Maintain SUSPENDED state for at least 2 ms.	RQ3
8	T ↔ UICC	Perform SHDLC link establishment.	RQ3, RQ4

5.4.1.5.2.4 Test case 3: S2 communication in low power mode

5.4.1.5.2.4.1 Test execution

The test procedure shall only be executed in voltage class C, low power mode.

The test procedure shall be executed at default, minimum, and maximum ambient temperature.

The test procedure shall be executed once for each of following parameters:

- Vcc at default, and S1 signal applied with:
 - $V_{IL} = 0,10 \times V_{CC}$ and $V_{IH} = 0,85 \times V_{CC}$;
 - $V_{IL} = 0,10 \times V_{CC}$ and $V_{IH} = V_{IHmin}$;
 - $V_{IL} = 0,10 \times V_{CC}$ and $V_{IH} = V_{IHmax}$.
- Vcc at minimum, and S1 signal applied with:
 - $V_{IL} = 0,10 \times V_{CC}$ and $V_{IH} = 0,85 \times V_{CC}$;
 - $V_{IL} = 0,10 \times V_{CC}$ and $V_{IH} = V_{IHmin}$;
 - $V_{IL} = 0,10 \times V_{CC}$ and $V_{IH} = V_{IHmax}$.
- Vcc at maximum, and S1 signal applied with:
 - $V_{IL} = 0,10 \times V_{CC}$ and $V_{IH} = 0,85 \times V_{CC}$;
 - $V_{IL} = 0,10 \times V_{CC}$ and $V_{IH} = V_{IHmin}$;
 - $V_{IL} = 0,10 \times V_{CC}$ and $V_{IH} = V_{IHmax}$.

5.4.1.5.2.4.2 Initial conditions

- None of the UICC contacts is activated.

5.4.1.5.2.4.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate Vcc (contact C1).	
2	T → UICC	Activate SWIO (contact C6).	
3	UICC → T	Send ACT_SYNC frame.	RQ3, RQ4
4	T → UICC	Put SWP in SUSPENDED state.	RQ3
5	T → UICC	Maintain SUSPENDED state for at least 2 ms.	RQ3
6	T ↔ UICC	Perform SHDLC link establishment.	RQ3, RQ4

5.5 Physical transmission layer

5.5.1 S1 Bit coding and sampling time

5.5.1.1 Conformance requirements

Reference: TS 102 613 [1], clause 8.1.

RQ1	The UICC shall interpret a signal waveform received on S1 having a duration T constituted by two sequential rising edges with the state H for a time T_{H1} between $0,70 \times T$ and $0,80 \times T$ as bit with the logical value 1. The timing reference point for T and T_{H1} shall be 50 % of the S1 signal amplitude.
RQ2	The UICC shall interpret a signal waveform received on S1 having a duration T constituted by two sequential rising edges with the state H for a time T_{H0} from $0,20 \times T$ to $0,30 \times T$ as bit with the logical value 0. The timing reference point for T and T_{H0} shall be 50 % of the S1 signal amplitude.
RQ3	For the signal waveforms as per RQ1 and RQ2, the UICC shall accept signal edges with a fall time (tf) between 5 ns and $0,05 \times T$ with $T \leq 5\,000$ ns and between 5 ns and 250 ns with $T > 5\,000$ ns, where the timing reference points for the fall time are 10 % and 90 % of the S1 signal amplitude.
RQ4	For the signal waveforms as per RQ1 and RQ2, the UICC shall accept signal edges with a rise time (tr) between 5 ns and $0,05 \times T$ with $T \leq 5\,000$ ns and between 5 ns and 250 ns with $T > 5\,000$ ns, where the timing reference points for the rise time are 10 % and 90 % of the S1 signal amplitude.
RQ5	The UICC shall be capable to communicate with bit rates varying with each bit transmitted on S1 between the minimum and maximum bit duration supported (see also RQ7 and RQ8).
RQ6	The input capacitance of the UICC (C_{LOAD}) on the contact C6 shall not exceed 10 pF.
RQ7	The UICC shall interpret bits with a duration T between 1 μ s and 5 μ s.
RQ8	The UICC shall interpret bits with extended bit durations in the indicated range (see clause 9.4).
RQ9	For a transition from DEACTIVATED state or for SWIO contact activation (preceding the SWP interface activation procedure), the UICC shall accept a rise time tr of the signal S1 in the range of 5 ns to 250 ns.
RQ10	For a transition to DEACTIVATED state, the UICC shall accept a fall time tf of the signal S1 in the range of 5 ns to 250 ns.
RQ11	The UICC shall accept a transition sequence, consisting of the falling edge, the state L period and the rising edge of an idle bit (see RQ2). The value of T shall result from the length of the state L period, where the timing reference point shall be 50 % of the S1 signal amplitude.
RQ12	The UICC shall accept a transition sequence as described in RQ11 with the definitions as described in RQ3 and RQ4 for the fall time tf for the leading edge and the rise time tr for the trailing edge.

5.5.1.2 Test case 1: communication with timing variation, default bit duration

5.5.1.2.1 Test execution

The test procedure shall be executed at default, minimum, and maximum ambient temperature.

The test procedure shall be executed once for each of following parameter sets:

T	T_{H1}	T_{H0}
3 μ s	75 %	25 %
1 μ s	70 %	30 %
	80 %	20 %
	75 %	25 %
5 μ s	70 %	30 %
	80 %	20 %
	75 %	25 %

5.5.1.2.2 Initial conditions

- None of the UICC contacts is activated.

5.5.1.2.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate Vcc (contact C1).	
2	T → UICC	Activate SWIO (contact C6).	
3	UICC → T	Resume SWP.	
4	T → UICC	Send a transition sequence.	
5	UICC → T	Send ACT_SYNC frame.	RQ11
6	T → UICC UICC → T	If the terminal performs initial SWP interface activation in full power mode, complete initial SWP interface activation.	RQ1, RQ2, RQ7
7	T → UICC UICC → T	Establish SHDLC link.	RQ1, RQ2, RQ7
8	T → UICC UICC → T	Run the representative SWP frame exchange procedure. The frame exchange shall be performed in such a way, that the referenced RQs can be fully validated.	RQ1, RQ2, RQ7

5.5.1.3 Test case 2: communication with timing variation, extended bit duration

5.5.1.3.1 Test execution

The test procedure shall be executed at default, minimum, and maximum ambient temperature.

If the DUT supports bit durations down to 0,590 μ s and up to 5 μ s, the test procedure shall be executed once for each of the following parameter sets:

T	T _{H1}	T _{H0}
0,590 μ s	70 %	30 %
	80 %	20 %
	75 %	25 %

If the DUT supports bit durations down to 1 μ s and up to 10 μ s, the test procedure shall be executed once for each of the following parameter sets:

T	T _{H1}	T _{H0}
10 μ s	70 %	30 %
	80 %	20 %
	75 %	25 %

If the DUT supports bit durations down to 0.590 μ s and up to 10 μ s, the test procedure shall be executed once for each of the following parameter sets:

T	T _{H1}	T _{H0}
0,590 μ s	70 %	30 %
	80 %	20 %
	75 %	25 %
10 μ s	70 %	30 %
	80 %	20 %
	75 %	25 %

5.5.1.3.2 Initial conditions

- None of the UICC contacts is activated.

5.5.1.3.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate Vcc (contact C1).	
2	T → UICC	Activate SWIO (contact C6).	
3	UICC → T	Resume SWP.	
4	T → UICC	Send a transition sequence.	
5	UICC → T	Send ACT_SYNC frame.	RQ11
6	T → UICC UICC → T	If the terminal performs initial SWP interface activation in full power mode, complete initial SWP interface activation.	RQ1, RQ2, RQ7, RQ8
7	T → UICC UICC → T	Establish SHDLC link	RQ1, RQ2, RQ7, RQ8
8	T → UICC UICC → T	Run the representative SWP frame exchange procedure. The frame exchange shall be performed in such a way, that the referenced RQs can be fully validated.	RQ1, RQ2, RQ7, RQ8

5.5.1.4 Test case 3: S1 rise and fall time

5.5.1.4.1 Test execution

The test procedure shall only be executed in voltage class B and voltage class C, full power mode.

The test procedure shall be executed once for each of following parameter sets:

T	tr	tf
3 μs	78 ns	78 ns
1 μs	28 ns	28 ns
	5 ns	28 ns
	28 ns	5 ns
	50 ns	28 ns
	28 ns	50 ns
5 μs	128 ns	128 ns
	5 ns	128 ns
	128 ns	5 ns
	250 ns	128 ns
	128 ns	250 ns

5.5.1.4.2 Initial conditions

- None of the UICC contacts is activated.

5.5.1.4.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate Vcc (contact C1).	
2	T → UICC	Activate SWIO (contact C6).	
3	UICC → T	Resume SWP.	RQ9
4	T → UICC	Send a transition sequence.	
5	UICC → T	Send ACT_SYNC frame.	RQ12
6	T → UICC UICC ← T	Complete initial SWP interface activation.	RQ3, RQ4
7	T → UICC UICC → T	Perform SHDLC link establishment.	RQ3, RQ4
8	T → UICC	Put SWP into DEACTIVATED state.	
9	T → UICC	Initiate subsequent interface activation.	
10	UICC → T	Resume SWP.	RQ9, RQ10

5.5.1.5 Test case 4: measurement of C6 input capacitance

5.5.1.5.1 Test execution

The test procedure shall be executed once for each of following parameters:

- There are no test case-specific parameters for this test case.

5.5.1.5.2 Initial conditions

- None of the UICC contacts is activated.

5.5.1.5.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate Vcc (contact C1).	
2		Measure C_{LOAD} .	RQ6

NOTE: Clause 5.5.1.5.4 gives an example for the implementation of this test.

5.5.1.5.4 Example for C6 input capacitance test implementation (informative)

In this example, the test equipment provides means for capacitance measurement, e.g. by connecting temporarily an LCR-meter instead of the terminal simulator. But regardless, the test equipment has to act as valid terminal.

The capacitance measurement is done at several settings for the frequency of the AC signal (sine wave), e.g. 4 MHz, 16 MHz, 28 MHz.

With the initial condition: "None of the UICC contacts is activated", the test procedure is as follows:

Step	Direction	Description	RQ
1	T → UICC	Activate Vcc (contact C1).	
2	T → UICC	Activate SWIO (contact C6).	
3	UICC → T	Send ACT_SYNC frame.	
4		Wait for at least 1 ms.	
5		Measure the capacitance C_{LOAD} on SWIO (contact C6), with an AC signal (sine wave) applied having a signal range between V_{IHmin} and V_{IHmax} .	RQ6
6	T → UICC	Put SWP into DEACTIVATED state.	
7		Wait for at least 1 ms.	
8		Measure the capacitance C_{LOAD} on SWIO (contact C6), with an AC signal (sine wave) applied having a signal range between 0 V and V_{ILmax} .	RQ6

5.5.1.6 Test case y: communication with variation in bit duration

5.5.1.6.1 Test execution

The bit duration between bits transmitted on S1 shall be varied such that RQ5 can be fully validated, including extended bit duration if supported by the UICC.

5.5.1.6.2 Initial conditions

- None of the UICC contacts is activated.

5.5.1.6.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate Vcc (contact C1).	
2	T → UICC	Activate SWIO (contact C6).	
3	UICC → T	Resume SWP.	
4	T → UICC	Send a transition sequence.	
5	UICC → T	Send ACT_SYNC frame.	RQ5
6	T → UICC UICC → T	If the terminal performs initial SWP interface activation in full power mode, complete initial SWP interface activation.	RQ5
7	T → UICC UICC → T	Establish SHDLC link	RQ5
8	T → UICC	Send I-frame	
9	UICC → T	Acknowledge the received I-frame	RQ5

5.5.2 S2 switching management

5.5.2.1 Conformance requirements

Reference: TS 102 613 [1], clause 8.2.

RQ1	The UICC shall only perform switching of S2 when S1 is in state L, or when resuming SWP.
-----	--

5.5.2.2 Test case 1: S2 switching management

5.5.2.2.1 Test execution

The test procedure shall be executed once for each of following parameters:

- There are no test case-specific parameters for this test case.

5.5.2.2.2 Initial conditions

- The SHDLC link is established.

5.5.2.2.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC UICC → T	Run the representative SWP frame exchange procedure. The frame exchange shall be performed in such a way, that the referenced RQ can be fully validated.	RQ1

5.5.3 SWP interface states management

5.5.3.1 Conformance requirements

Reference: TS 102 613 [1], clause 8.3.

RQ1	For a transition from SWP SUSPENDED state to SWP ACTIVATED state initiated by the UICC, the UICC shall draw a current (S2 in state H). (The slave resumes by drawing a current).
RQ2	In case the state transition from SWP SUSPENDED state to SWP ACTIVATED state was initiated by the UICC, the delay after the transition sequence until the 1 st bit of the SOF is sent by the UICC shall not exceed 4 bits.
RQ3	The UICC shall be capable of receiving frames in the ACTIVATED state.

5.5.3.2 Test case 1: SWP interface states management by the UICC

5.5.3.2.1 Test execution

The test procedure shall only be executed in voltage class B and voltage class C, full power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test case-specific parameters for this test case.

5.5.3.2.2 Initial conditions

- None of the UICC contacts is activated.

5.5.3.2.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate Vcc (contact C1).	
2	T → UICC	Activate SWIO (contact C6).	
3	UICC → T	Resume SWP.	RQ1
4	T → UICC	Send a transition sequence.	
5	UICC → T	Send ACT_SYNC frame.	RQ2
6	T → UICC	Send ACT_POWER_MODE frame.	
7	UICC → T	Send ACT_READY frame.	RQ3

5.5.4 Power mode states/transitions and Power saving mode

5.5.4.1 Conformance requirements

Reference: TS 102 613 [1], clause 8.4.

RQ1	When the terminal activates Vcc (contact C1) the UICC shall enter the initial power state with the current consumption of the UICC complying with the value in TS 102 221 [2] for "power consumption of the UICC during ATR at 4 MHz external clock frequency".
RQ2	The UICC shall enter low power mode when this mode is indicated in a power mode frame during initial SWP interface activation or when the UICC receives the first non-ACT frame without having received a power mode frame during initial SWP interface activation.
RQ3	The UICC shall enter full power mode when this mode is indicated in a power mode frame during initial SWP interface activation, or if the conditions for full power mode on another interface are fulfilled.
RQ4	During the initial power state, the UICC may already increase its current consumption to the value defined for low power mode as soon as it detects the SWP ACTIVATED state.
RQ5	The UICC shall enter the power saving mode when all of the following conditions for activated interfaces are given: <ul style="list-style-type: none"> • clock stop mode according to TS 102 221 [2] if this interface is activated (if UICC is in full power mode); • suspend mode according to TS 102 600 [3] if this interface is activated (if UICC is in full power mode); • SWP contact deactivated (if UICC is in full power mode or in low power mode). The UICC shall enter the power saving mode no later than 10 ms after the SWP is in state DEACTIVATED.
RQ6	When the UICC is in power saving mode it shall not exceed the current defined for clock stop mode in TS 102 221 [2] or the limit given for suspend mode in TS 102 600 [3] whatever the interface is activated.
RQ7	The UICC shall exit the power saving mode when at least one of the UICC interfaces is resumed from these conditions.

5.5.4.2 Test case 1: power states in low power mode (ACT_POWER_MODE)

5.5.4.2.1 Test execution

The test procedure shall only be executed voltage class C, low power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test case-specific parameters for this test case.

5.5.4.2.2 Initial conditions

- None of the UICC contacts is activated.

5.5.4.2.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate Vcc (contact C1).	RQ1
2	T → UICC	Activate SWIO (contact C6).	RQ4
3	UICC → T	Send ACT_SYNC frame.	RQ4
4	T → UICC	Send ACT_POWER_MODE frame indicating low power mode with FR bit set to 1	RQ2
5	UICC → T	Send ACT_SYNC frame.	RQ2

5.5.4.3 Test case 2: power states in low power mode (non-ACT)

5.5.4.3.1 Test execution

The test procedure shall only be executed in voltage class C, low power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test case-specific parameters for this test case.

5.5.4.3.2 Initial conditions

- None of the UICC contacts is activated.

5.5.4.3.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate Vcc (contact C1)	RQ1
2	T → UICC	Activate SWIO (contact C6)	RQ4
3	UICC → T	Send ACT_SYNC frame	RQ4
4	T → UICC	Send RSET() frame	RQ2
5	UICC → T	Send UA or RSET frame	RQ2

5.5.4.4 Test case 3: power states in full power mode, without TS 102 221

5.5.4.4.1 Test execution

The test procedure shall only be executed in voltage class B and voltage class C, full power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test case-specific parameters for this test case.

The contacts CLK, RST, I/O of the TS 102 221 [2] interface shall not be activated.

5.5.4.4.2 Initial conditions

- None of the UICC contacts is activated

5.5.4.4.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate Vcc (contact C1).	RQ1
2	T → UICC	Activate SWIO (contact C6).	RQ4
3	UICC → T	Send ACT_SYNC frame.	RQ4
4	T → UICC	Send ACT_POWER_MODE frame.	RQ3
5	UICC → T	Send ACT_READY frame.	RQ3

5.5.4.5 Test case 4: power saving mode with TS 102 221 interface - restart TS 102 221 interface first

5.5.4.5.1 Test execution

The test procedure shall only be executed in voltage class B and voltage class C, full power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test case-specific parameters for this test case.

5.5.4.5.2 Initial conditions

- The SHDLC link is established.
- The TS 102 221 [2] interface is activated.

5.5.4.5.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	On the TS 102 221 [2] interface, stop the clock when TS 102 221 [2] interface is in idle state.	
2	T → UICC	Put SWP into DEACTIVATED state.	
3	UICC	Power saving mode.	RQ5, RQ6
4	T → UICC	On the TS 102 221 [2] interface, restart the clock.	
5	T → UICC	Send a C-APDU on the TS 102 221 [2] interface.	
6	UICC → T	Send an R-APDU on the TS 102 221 [2] interface.	RQ7
7	T → UICC	Initiate subsequent SWP interface activation.	
8	UICC → T	Send ACT_SYNC frame.	RQ7

5.5.4.6 Test case 5: power saving mode with TS 102 221 interface - restart TS 102 613 interface first

5.5.4.6.1 Test execution

The test procedure shall only be executed in voltage class B and voltage class C, full power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test case-specific parameters for this test case.

5.5.4.6.2 Initial conditions

- The SHDLIC link is established.
- The TS 102 221 [2] interface is activated.

5.5.4.6.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	On the TS 102 221 [2] interface, stop the clock when TS 102 221 [2] interface is in idle state.	
2	T → UICC	Put SWP into DEACTIVATED state.	
3	UICC	Power saving mode.	RQ5, RQ6
4	T → UICC	Initiate subsequent SWP interface activation.	
5	UICC → T	Send ACT_SYNC frame.	RQ7
6	T → UICC	On the TS 102 221 [2] interface, restart the clock.	
7	T → UICC	Send a C-APDU on the TS 102 221 [2] interface.	
8	UICC → T	Send an R-APDU on the TS 102 221 [2] interface.	RQ7

5.5.4.7 Test case 6: power saving mode with TS 102 600 interface - restart TS 102 600 interface first

5.5.4.7.1 Test execution

The test procedure shall only be executed in voltage class B and voltage class C, full power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test case-specific parameters for this test case.

5.5.4.7.2 Initial conditions

- The SHDLC link is established.
- The TS 102 600 [3] interface is activated.

5.5.4.7.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Enter Suspend state on TS 102 600 [3] interface.	
2	T → UICC	Put SWP into DEACTIVATED state.	
3	UICC	Power saving mode.	RQ5, RQ6
4	T → UICC	Resume the TS 102 600 [3] interface.	
5	T → UICC	Send a C-APDU on the TS 102 600 [3] interface.	
6	UICC → T	Send an R-APDU on the TS 102 600 [3] interface.	RQ7
7	T → UICC	Initiate subsequent SWP interface activation.	
8	UICC → T	Send ACT_SYNC frame.	RQ7

5.5.4.8 Test case 7: power saving mode with TS 102 600 interface - restart TS 102 613 interface first

5.5.4.8.1 Test execution

The test procedure shall only be executed in voltage class B and voltage class C, full power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test case-specific parameters for this test case.

5.5.4.8.2 Initial conditions

- The SHDLC link is established.
- The TS 102 600 [3] interface is activated.

5.5.4.8.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Enter Suspend state on TS 102 600 [3] interface.	
2	T → UICC	Put SWP into DEACTIVATED state.	
3	UICC	Power saving mode.	RQ5, RQ6
4	T → UICC	Initiate subsequent SWP interface activation.	
5	UICC → T	Send ACT_SYNC frame.	RQ7
6	T → UICC	Resume the TS 102 600 [3] interface.	
7	T → UICC	Send a C-APDU on the TS 102 600 [3] interface.	
8	UICC → T	Send an R-APDU on the TS 102 600 [3] interface.	RQ7

5.5.4.9 Test case 8: power states in full power mode, with TS 102 221

5.5.4.9.1 Test execution

The test procedure shall only be executed in voltage class B and voltage class C, full power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test case-specific parameters for this test case.

5.5.4.9.2 Initial conditions

- None of the UICC contacts is activated.

5.5.4.9.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate Vcc (contact C1).	RQ1
2	T → UICC	Activate SWIO (contact C6).	RQ4
3	UICC → T	Send ACT_SYNC frame.	RQ4
4	T → UICC	Activate contacts CLK, RST, I/O of the TS 102 221 [2] interface.	RQ3

5.6 Data link layer

5.6.1 Overview

Reference: TS 102 613 [1], clause 9.1.

There are no conformance requirements for the UICC for the referenced clause.

5.6.2 Medium Access Control (MAC) layer

5.6.2.1 Bit order

5.6.2.1.1 Conformance requirements

Reference: TS 102 613 [1], clause 9.2.1.

RQ1	The UICC shall send payload data with MSB first.
RQ2	The UICC shall interpret payload data received from the CLF with MSB first.

NOTE: RQ1 and RQ2 are validated implicitly in other test cases within the present document.

5.6.2.1.2 Void

5.6.2.2 Structure

5.6.2.2.1 Conformance requirements

Reference: TS 102 613 [1], clause 9.2.2.

RQ1	The UICC shall correctly interpret error free frames sent by CLF.
RQ2	Between frames, idle bits (logical value 0) are sent. There is at least one idle bit between frames.
RQ3	A wakeup sequence, consisting of a bit with logical value 1, shall be inserted before each frame sent from the slave to the master.
RQ4	The UICC shall reject incorrectly formed frames sent by CLF (this includes incorrect frame structures).
RQ5	The UICC shall send correctly formed frames to the CLF.

5.6.2.2.2 Test case 1: interpretation of incorrectly formed frames - ACT LLC

5.6.2.2.2.1 Test execution

The test procedure shall only be executed in voltage class B and voltage class C, full power mode.

The test procedure shall be executed once for each of the following parameters:

- Incorrectly formed ACT LLC frame:
 - ACT_POWER_MODE frame with wrong CRC16.
 - ACT_POWER_MODE frame, no SOF.
 - ACT LLC frame with ACT_POWER_MODE in the LLC control field, no CRC16.
 - ACT LLC frame with ACT_POWER_MODE in the LLC control field, followed by 7 bits with value 0, CRC16 calculated for a ACT_POWER_MODE frame indicating full power mode.
 - Frame with no Payload and no CRC16.

5.6.2.2.2.2 Initial conditions

- None of the UICC contacts is activated.

5.6.2.2.2.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate Vcc (contact C1).	
2	T → UICC	Activate SWIO (contact C6).	
3	UICC → T	Send ACT_SYNC frame.	RQ5.
4	T → UICC	Send incorrectly formed ACT LLC frame.	
5	UICC → T	No response.	RQ4
6	T → UICC	Send ACT_POWER_MODE frame.	
7	UICC → T	Respond with ACT_READY frame.	RQ1, RQ5.

5.6.2.2.3 Test case 2: interpretation of incorrectly formed frames - SHDLC RSET frames

5.6.2.2.3.1 Test execution

The test procedure shall be executed once for each of the following parameters.

- Incorrectly formed SHDLC LLC RSET frame:
 - RSET() frame with wrong CRC16.
 - RSET() frame, no SOF.
 - Frame with no Payload and no CRC16.

5.6.2.2.3.2 Initial conditions

- The SHDLC link is established and no further communication is expected.

5.6.2.2.3.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Send incorrectly formed SHDLC LLC RSET() frame.	
2	UICC → T	No response.	RQ4
3	T → UICC	Send RSET().	
4	T ← → UICC	Complete SHDLC link re-establishment.	RQ1, RQ5

5.6.2.2.4 Test case 3: interpretation of incorrectly formed frames - SHDLC I-frames

5.6.2.2.4.1 Test execution

The test procedure shall be executed once for each of the following parameters:

- Incorrectly formed SHDLC LLC I-frame:
 - I-Frame with wrong CRC16.
 - I-Frame, no SOF.
 - Frame with no Payload and no CRC16.

5.6.2.2.4.2 Initial conditions

- The SHDLC link is established without SREJ support, and no further communication is expected.

5.6.2.2.4.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Send corrupted frame followed immediately by I-frame (NS0_S+2,x), where NS0_S is the sequence number of the last I-frame sent by the terminal simulator which was successfully acknowledged by the UICC.	
2	UICC → T	Send REJ(NS0_S+1).	RQ4 RQ5

5.6.2.2.5 Test case 4: communication with frames - idle bits and wakeup sequence

5.6.2.2.5.1 Test execution

The test procedure shall be executed once for each of the following parameters:

- There are no test case-specific parameters for this test case.

5.6.2.2.5.2 Initial conditions

- None of the UICC contacts is activated.

5.6.2.2.5.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate Vcc (contact C1).	
2	T → UICC	Activate SWIO (contact C6).	
3	UICC → T T → UICC	Perform SWP interface activation and SHDLC link establishment.	RQ2, RQ3
4	User → UICC	Trigger the UICC to send 9 I-frames. Where possible, the UICC should be triggered in such a way that the I-frames will be sent in as close succession as possible.	
5	UICC → T T → UICC	UICC send I-Frames as indicated in step 4. Terminal simulator acknowledges these I-frames.	RQ2, RQ3

5.6.2.3 Bit stuffing

5.6.2.3.1 Conformance requirements

Reference: TS 102 613 [1], clause 9.2.3.

RQ1	Zero bit stuffing shall be employed by the transmitting entity when sending the payload and the CRC on SWP. After five consecutive bits with the logical value 1, a bit with the logical value 0 is inserted.
RQ2	If the last five bits of the CRC contain the logical value 1, then no bit with the logical value 0 shall be added.
RQ3	In a received frame, the UICC shall recognize stuffed bits and discard them.

5.6.2.3.2 Test case 1: behaviour of UICC with bit stuffing in frame

5.6.2.3.2.1 Test execution

The test procedure shall be executed once for each of the following parameters:

- There are no test case-specific parameters for this test case.

5.6.2.3.2.2 Initial conditions

- The SHDLC link is established and no further communication is expected.

5.6.2.3.2.3 Test procedure

Step	Direction	Description	RQ
1	T \leftrightarrow UICC	Run the representative SWP frame exchange procedure. Exchanged data shall be chosen in such a way that all referenced RQs can be fully validated.	RQ1 RQ2, RQ3

5.6.2.4 Error detection

5.6.2.4.1 Conformance requirements

Reference: TS 102 613 [1], clause 9.2.4.

RQ1	Frames transmitted by UICC shall use the 16 bit frame checking sequence as given in ISO/IEC 13239 [9] on bits between SOF and EOF, which are both excluded, to compute the CRCs.
RQ2	The UICC shall detect errors on received frames using the 16 bit frame checking sequence as given in ISO/IEC 13239 [9] on bits between SOF and EOF, which are both excluded.

5.6.2.4.2 Test case 1: RSET with CRC error

5.6.2.4.2.1 Test execution

The test procedure shall be executed once for each of the following parameters:

- There are no test case-specific parameters for this test case.

5.6.2.4.2.2 Initial conditions

- SWP interface is activated.

5.6.2.4.2.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Send RSET() with CRC error.	
2	UICC	No response.	RQ2
3	T → UICC	Send RSET().	
4	UICC → T	Respond UA or RSET.	RQ1

5.6.3 Supported LLC layers

5.6.3.1 Supported LLC layers

5.6.3.1.1 Conformance requirements

Reference: TS 102 613 [1], clause 9.3.

RQ1	The UICC shall support the SHDLC LLC layer.
RQ2	The UICC shall support the ACT LLC layer.
RQ3	LPDUs shall be structured according to TS 102 613 [1].

5.6.3.1.2 Test case 1: support of ACT LLC and ACT LPDU structure

5.6.3.1.2.1 Test execution

The test procedure shall only be executed in voltage class B and voltage class C, full power mode.

The test procedure shall be executed once for each of the following parameters:

- There are no test case-specific parameters for this test case.

5.6.3.1.2.2 Initial conditions

- None of the UICC contacts is activated.

5.6.3.1.2.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate Vcc (contact C1).	
2	T → UICC	Activate SWIO (contact C6).	
3	UICC → T	Send ACT_SYNC frame.	RQ2, RQ3
4	T → UICC	Send ACT_POWER_MODE frame.	
5	UICC → T	Send ACT_READY frame.	RQ2, RQ3

5.6.3.1.3 Test case 2: support of SHDLC LLC and SHDLC LPDU structure

5.6.3.1.3.1 Test execution

The test procedure shall only be executed in voltage class B and voltage class C, full power mode.

The test procedure shall be executed once for each of the following parameters:

- There are no test case-specific parameters for this test case.

5.6.3.1.3.2 Initial conditions

- The SWP interface is activated.

5.6.3.1.3.3 Test procedure

Step	Direction	Description	RQ
1	T ← → UICC	Perform SHDLC link establishment.	
2	T ← → UICC	Run the representative SWP frame exchange procedure. Exchange of I-frames and S-frames in both directions shall be included.	RQ1, RQ3

5.6.3.2 Interworking of the LLC layers

5.6.3.2.1 Conformance requirements

Reference: TS 102 613 [1], clause 9.3.1.

RQ1	After the SWIO activation or after the transition of S1 to state H from DEACTIVATED state, the ACT LLC shall be used by the UICC.
RQ2	After the UICC and the CLF have established the SHDLC link, the UICC shall not send ACT LLC frames.
RQ3	After the UICC and the CLF have opened a CLT session, the UICC shall not send ACT LLC frames.
RQ4	After the UICC and the CLF have established the SHDLC link ,the UICC shall ignore received ACT LLC frames.
RQ5	After the UICC and the CLF have opened a CLT session, the UICC shall ignore received ACT LLC frames.
RQ6	To enter the SHDLC LLC for the first time after SWP interface activation, the link establishment procedure (as described in TS 102 613 [1]) shall apply.
RQ7	Once the SHDLC link is established, a CLT session shall not invalidate the SHDLC context and the endpoint capabilities negotiated during the SHDLC link establishments.
RQ8	During a CLT session, if an SHDLC LLC frame is received by the UICC, then the UICC shall consider the CLT session as closed.
RQ9	On receiving a corrupted SWP frame, the UICC shall use the error recovery procedure defined for LLC of the last correctly received SWP frame.
RQ10	Immediately after SWIO activation or after the transition of S1 to state H from DEACTIVATED state, the error handling of the ACT LLC shall apply.

NOTE 1: RQ2 and RQ3 are non-occurrence RQs.

NOTE 2: Development of test cases for RQ2 and RQ3 is FFS.

NOTE 3: Test cases for RQ6 are given also in clause 5.7 of the present document.

NOTE 4: RQ9 is tested in clause 5.6.2.2.4 in the context of the SHDLC LLC.

5.6.3.2.2 Test case 1: error handling of ACT LLC on reception of corrupted frame, after SWIO activation

5.6.3.2.2.1 Test execution

The test procedure shall only be executed in voltage class B and voltage class C, full power mode.

The test procedure shall be executed once for each of the following parameters:

- There are no test case-specific parameters for this test case.

5.6.3.2.2.2 Initial conditions

- None of the UICC contacts is activated.

5.6.3.2.2.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate Vcc (contact C1).	
2	T → UICC	Activate SWIO (contact C6).	
3	UICC → T	Send ACT_SYNC frame.	RQ1
4	T → UICC	Send corrupted frame.	
5	UICC → T	No response.	RQ10,
6	T → UICC	Send ACT_POWER_MODE frame with FR = 0.	
7	UICC → T	Send ACT_READY frame.	
8	T → UICC	Send corrupted frame.	
9	UICC → T	No response.	RQ9
10	T → UICC	Put SWP in DEACTIVATED state.	
11	T → UICC	Initiate subsequent interface activation.	
12	UICC → T	Send ACT_SYNC frame.	RQ1
13	T → UICC	Send corrupted frame.	
14	UICC → T	No response.	RQ10
15	T ← → UICC	Perform SHDLC link establishment.	RQ10

5.6.3.2.3 Test case 2: ignore ACT LLC frame reception after the SHDLC link establishment

5.6.3.2.3.1 Test execution

The test procedure shall be executed once for each of the following parameters:

- There are no test case-specific parameters for this test case.

5.6.3.2.3.2 Initial conditions

- The SHDLC link is established and no further communication is expected.

5.6.3.2.3.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Send ACT_POWER_MODE frame.	
2	UICC	No response or response not based on ACT LLC.	RQ4
3	T → UICC	Send I-frame.	
4	UICC → T	Acknowledge I-frame.	RQ4

5.6.3.2.4 Test case 3: ignore ACT LLC frame reception in CLT session

5.6.3.2.4.1 Test execution

The test procedure shall be executed once for each of the following parameters:

- CLT LLC transporting ISO/IEC 14443-3 [6] type A data, if available, and CLT LLC transporting ISO/IEC 18092 [8] data, if available.

5.6.3.2.4.2 Initial conditions

- The CLT session is established and last frame exchange was a UICC response based on CLT LLC.

5.6.3.2.4.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Send ACT_POWER_MODE frame.	
2	UICC	No response or response not based on ACT LLC.	RQ5
3	T → UICC	Send valid CLT frame with ADMIN_FIELD = No administrative command.	
4	UICC → T	Send valid CLT response frame.	RQ5

5.6.3.2.5 Test case 4: CLT session during SHDLC communication

5.6.3.2.5.1 Test execution

The test procedure shall be executed once for each of the following parameters:

- CLT LLC transporting ISO/IEC 14443-3 [6] type A data, if available, and CLT LLC transporting ISO/IEC 18092 [8] data, if available.

5.6.3.2.5.2 Initial conditions

- The SWP interface is activated.

5.6.3.2.5.3 Test procedure

Step	Direction	Description	RQ
1	T ← → UICC	Perform SHDLC link establishment.	
2	T ← → UICC	Exchange the SHDLC frames according to upper layer, at least as needed to enter a CLT session.	
3	T	Wait until no further communication is expected over the SHDLC link.	
4	T → UICC	Send CLT frame to open a CLT session.	
5	UICC → T	Respond CLT frame.	
6	T ← → UICC	Perform further SHDLC communication using the previous SHDLC context and the endpoint capabilities negotiated during the SHDLC link establishment.	RQ7

5.6.3.2.6 Test case 5: closing condition of CLT session whereas SHDLC link has been established before CLT session

5.6.3.2.6.1 Test execution

The test procedure shall be executed once for each of the following parameters:

- CLT LLC transporting ISO/IEC 14443-3 [6] type A data, if available, and CLT LLC transporting ISO/IEC 18092 [8] data, if available.

5.6.3.2.6.2 Initial conditions

- The SHDLC link was established before opening of CLT session.
- The CLT session is established and last frame exchange was a UICC response based on CLT LLC.

5.6.3.2.6.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Send I-frame.	
2	UICC → T	Acknowledge I-frame.	
3	T → UICC	Send CLT frame which is not valid to open a CLT session.	
4	UICC → T	No response or response not based on CLT session.	RQ8

5.6.3.2.7 Test case 6: closing condition of CLT session whereas SHDLC link has not been established before CLT session

5.6.3.2.7.1 Test execution

The test procedure shall be executed once for each of the following parameters:

- CLT LLC transporting ISO/IEC 14443-3 [6] type A data, if available, and CLT LLC transporting ISO/IEC 18092 [8] data, if available.

5.6.3.2.7.2 Initial conditions

- The SHDLC link was not established before opening of CLT session.
- The CLT session is established and last frame exchange was a UICC response based on CLT LLC.

5.6.3.2.7.3 Test procedure

Step	Direction	Description	RQ
1	T ← → UICC	Perform SHDLC link establishment.	
2	T → UICC	Send CLT frame which is not valid to open a CLT session.	
3	UICC → T	No response or response not based on CLT session.	RQ8

5.6.3.2.8 Test case 7: interpretation of corrupted frames - single SHDLC frame

5.6.3.2.8.1 Test execution

The test procedure shall be executed once for each of the following parameters:

- There are no test case-specific parameters for this test case.

5.6.3.2.8.2 Initial conditions

- The SHDLC link is established and no further communication is expected.

5.6.3.2.8.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Send corrupted frame.	
2	UICC → T	No response.	RQ9
3	T → UICC	Send I-frame.	
4	UICC → T	Acknowledge I-frame.	RQ9

5.6.3.2.9 Void

5.6.3.2.10 Test case 9: interpretation of corrupted frames - CLT frames

5.6.3.2.10.1 Test execution

The test procedure shall be executed once for each of the following parameters:

- CLT LLC transporting ISO/IEC 14443-3 [6] type A data, if available, and CLT LLC transporting ISO/IEC 18092 [8] data, if available.

5.6.3.2.10.2 Initial conditions

- The CLT session is established and last frame exchange was a UICC response based on CLT LLC.

5.6.3.2.10.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Send corrupted frame.	
2	UICC → T	No response.	RQ9
3	T → UICC	Send valid CLT frame with ADMIN_FIELD = No administrative command.	
4	UICC → T	Send valid CLT response frame.	RQ9

5.6.4 ACT LLC definition

5.6.4.1 ACT LLC definition

5.6.4.1.1 Conformance requirements

Reference: TS 102 613 [1], clause 9.4.

NOTE: Test cases for conformance requirements for clause 9.4 are also given in clause 5.3.2.3.

RQ1	The ACT LPDU shall be structured according to TS 102 613 [1].
RQ2	When a UICC receives an ACT frame, it shall ignore the INF bit.
RQ3	A frame sent from the UICC to the CLF shall have the FR bit set to 0.
RQ4	ACT_READY frames shall have an ACT_DATA field length of zero bytes.
RQ5	ACT_SYNC frames shall have an ACT_DATA field length of two bytes.
RQ6	The UICC shall not use RFU values in the ACT_CTRL field when transmitting frames.
RQ7	Bits b8 to b3 of ACT_INFORMATION field shall all have the value 0.
RQ8	Extended SWP bit duration down to 0,590 μ s shall be supported if b2 of ACT_INFORMATION field is 1.
RQ9	Extended SWP bit durations up to 10 μ s shall be supported if b1 of ACT_INFORMATION field is 1.

5.6.4.1.2 Test case 1: structure of ACT LPDU - full power mode

5.6.4.1.2.1 Test execution

The test procedure shall only be executed in voltage class B and voltage class C, full power mode.

The test procedure shall be executed once for each of the following parameters:

- There are no test case-specific parameters for this test case.

5.6.4.1.2.2 Initial conditions

- None of the UICC contacts is activated.

5.6.4.1.2.3 Test procedure

Step	Direction	Description	RQ
1	T \rightarrow UICC	Activate Vcc (contact C1).	
2	T \rightarrow UICC	Activate SWIO (contact C6).	
3	UICC \rightarrow T	Send ACT_SYNC frame.	RQ1, RQ3, RQ5, RQ6.
4	T \rightarrow UICC	Send ACT_POWER_MODE frame.	
5	UICC \rightarrow T	Send ACT_READY frame.	RQ1, RQ3, RQ4, RQ6

5.6.4.1.3 Test case 2: structure of ACT LPDU - low power mode

5.6.4.1.3.1 Test execution

The test procedure shall only be executed in voltage class C, low power mode.

The test procedure shall be executed once for each of the following parameters:

- There are no test case-specific parameters for this test case.

5.6.4.1.3.2 Initial conditions

- None of the UICC contacts is activated.

5.6.4.1.3.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate Vcc (contact C1).	
2	T → UICC	Activate SWIO (contact C6).	
3	UICC → T	Send ACT_SYNC frame.	RQ1, RQ3, RQ5, RQ6
4	T → UICC	Send ACT_POWER_MODE frame with FR =1.	
5	UICC → T	Send ACT_SYNC frame.	RQ1, RQ3, RQ5, RQ6

5.6.4.1.4 Test case 3: behaviour of UICC on reception of ACT frames - values of INF bit

5.6.4.1.4.1 Test execution

The test procedure shall only be executed in voltage class B and in voltage class C, full power mode.

The test procedure shall be executed once for each of the following parameters.

- ACT_POWER_MODE frame:
 - INF =0;
 - INF =1.

5.6.4.1.4.2 Initial conditions

- None of the UICC contacts is activated.

5.6.4.1.4.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate Vcc (contact C1).	
2	T → UICC	Activate SWIO (contact C6).	
3	UICC → T	Send ACT_SYNC frame.	
4	T → UICC	Send ACT_POWER_MODE frame.	
5	UICC → T	Send ACT_READY frame.	RQ2

5.6.4.1.5 Test case 4: RFU values in ACT_INFORMATION field

5.6.4.1.5.1 Test execution

The test procedure shall be executed once for each of the following parameters.

- There are no test case-specific parameters for this test case.

5.6.4.1.5.2 Initial conditions

- None of the UICC contacts is activated.

5.6.4.1.5.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate Vcc (contact C1).	
2	T → UICC	Activate SWIO (contact C6).	
3	UICC → T	Send ACT_SYNC frame (with ACT_INFORMATION field).	RQ7

5.6.4.1.6 Test case 5: extended bit durations as per ACT_INFORMATION field

5.6.4.1.6.1 Test execution

The test procedure shall only be executed in voltage class B and in voltage class C, full power mode.

The test procedure shall be executed once for each of the following parameters:

- For ACT_POWER_MODE and ACT_READY, apply the following bit duration:
 - If ACT_INFORMATION field bit 2 set to 0 and bit 1 is set to 1:
 - 10 μs.
 - If ACT_INFORMATION field bit 2 set to 1 and bit 1 is set to 0:
 - 0,590 μs.
 - If ACT_INFORMATION field bit 2 set to 1 and bit 1 is set to 1:
 - 10 μs and 0,590 μs.

5.6.4.1.6.2 Initial conditions

- None of the UICC contacts is activated.

5.6.4.1.6.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Activate Vcc (contact C1).	
2	T → UICC	Activate SWIO (contact C6).	
3	UICC → T	Send ACT_SYNC frame (with ACT_INFORMATION field).	
4	T → UICC	Send ACT_POWER_MODE frame.	
5	UICC → T	Send ACT_READY frame.	RQ8, RQ9

5.6.4.2 SYNC_ID verification process

5.6.4.2.1 Conformance requirements

Reference: TS 102 613 [1], clause 9.4.1.

RQ1	The UICC shall send an ACT_SYNC frame containing 'verification data' when the SWP interface is activated.
-----	---

NOTE: For RQ1, the presence of the SYNC_ID is covered by RQ5 in clause 5.6.4.1. Further use of verification data is up to upper layer and is out of scope of the present document.

5.7 SHDLC LLC definition

5.7.1 SHDLC overview

5.7.1.1 Conformance requirements

Reference: TS 102 613 [1], clause 10.1.

RQ1	The SHDLC layer in an endpoint shall ensure that data passed up to the next layer has been received exactly as transmitted (i.e. error free, without loss and in the correct order).
RQ2	If an endpoint receives a corrupted frame, it shall discard the frame.

5.7.1.2 Test Case 1: data passed up to the next layer

5.7.1.2.1 Test execution

The test procedure shall be executed once for each of following parameters:

- There are no test-case specific parameters for this test.

The data sent by the ES shall have the following characteristics:

- The message in the EVT_POST_DATA shall be fragmented into 9 I-frames

5.7.1.2.2 Initial conditions

- SHDLC link is established.
- A pipe (PIPE_LOOP_BACK) has been created to the HCI host's loopback gate, and is currently open.

5.7.1.2.3 Test procedure

Step	Direction	Description	RQ
1	ES \leftarrow \rightarrow EUT	Send from the ES an EVT_POST_DATA message containing referenced sent data on PIPE_LOOP_BACK Send back from the EUT a corresponding EVT_POST_DATA message containing the referenced data on PIPE_LOOP_BACK in the expected order.	RQ1

5.7.1.3 Test Case 2: error management, EUT sending I-Frame

5.7.1.3.1 Test execution

The test procedure shall only be executed in voltage class B and in voltage class C, full power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test-case specific parameters for this test.

5.7.1.3.2 Initial Conditions

- SHDLC link is established and idle, i.e. no further communication is expected.

5.7.1.3.3 Test procedure

Step	Direction	Description	RQ
1	ES → EUT	Send a corrupted RNR frame.	
2	User → EUT	Trigger the EUT to send an I-frame.	
3	EUT → ES	Send I(NS0_T,x).	RQ2
4	ES → EUT	Send a corrupted RR(NS0_T+1) frame.	
5	ES	Wait at least T2 time and does not acknowledge the received frame.	
6	EUT → ES	Send I(NS0,x).	RQ2

5.7.1.4 Test Case 3: error management

5.7.1.4.1 Test execution

The test procedure shall be executed once for each of following parameters:

- There are no test-case specific parameters for this test.

5.7.1.4.2 Initial Conditions

- SHDLC link is established and idle, i.e. no further communication is expected

5.7.1.4.3 Test procedure

Step	Direction	Description	RQ
1	ES → EUT	Send a corrupted I-frame.	
2	ES ← → EUT	ES waits at least 20ms and don't retransmit it. The EUT does not send any frame.	RQ2
3	ES → EUT	Send a corrupted RSET frame.	
4	ES ← → EUT	ES waits at least T3 time and don't retransmit it. EUT does not send any frame.	RQ2

5.7.2 Endpoints

5.7.2.1 Conformance requirements

Reference: TS 102 613 [1], clause 10.2.

There are no conformance requirements for the EUT for the referenced clause.

5.7.3 SHDLC frames types

5.7.3.1 Conformance requirements

Reference: TS 102 613 [1], clause 10.3.

There are no conformance requirements for the EUT for the referenced clause.

5.7.4 Control Field

5.7.4.1 Conformance requirements

Reference: TS 102 613 [1], clause 10.4.

All conformance requirements for the referenced clause are included in clause 5.7.7.3.1 of the present document.

5.7.4.2 I-Frames coding

5.7.4.2.1 Conformance requirements

Reference: TS 102 613 [1], clause 10.4.1.

There are no conformance requirements for the EUT for the referenced clause.

5.7.4.3 S-Frames coding

5.7.4.3.1 Conformance requirements

Reference: TS 102 613 [1], clause 10.4.2.

RQ1	Optional type of frame shall not be used before capability negotiation is defined during initialization.
RQ2	Only one SREJ shall remain outstanding on each link direction at any one time.
RQ3	An endpoint shall not send a S-frame with an information field.
RQ4	An SREJ shall be transmitted for each erroneous frame; each frame is treated as a separate error.

NOTE 1: RQ1, RQ2 and RQ4 for the referenced clause are included in clause 5.7.7.9.1 of the present document.

NOTE 2: RQ3 is a non-occurrence RQ.

5.7.4.4 U-Frames coding

5.7.4.4.1 Conformance requirements

Reference: TS 102 613 [1], clause 10.4.3.

RQ1	An endpoint shall only send U-Frames using modifiers specified in TS 102 613 [1].
-----	---

NOTE: RQ1 is not tested, as it is a non-occurrence RQ.

5.7.5 Changing sliding window size and endpoint capabilities

5.7.5.1 Conformance requirements

Reference: TS 102 613 [1], clause 10.5.

All conformance requirements for the referenced clause are included in clause 5.7.7.3.1 of the present document.

5.7.5.2 RSET frame payload

5.7.5.2.1 Conformance requirements

Reference: TS 102 613 [1], clause 10.5.1.

All conformance requirements for the referenced clause are included in clause 5.7.7.3.1 of the present document.

5.7.5.3 UA frame payload

5.7.5.3.1 Conformance requirements

Reference: TS 102 613 [1], clause 10.5.2.

All conformance requirements for the referenced clause are included in clause 5.7.7.3.1 of the present document.

5.7.5.3.2 Void

5.7.6 SHDLC context

5.7.6.1 Conformance requirements

Reference: TS 102 613 [1], clause 10.6.

There are no conformance requirements for the EUT for the referenced clause.

5.7.6.2 Constants

5.7.6.2.1 Conformance requirements

Reference: TS 102 613 [1], clause 10.6.1.

RQ1	I-frames shall be acknowledged within T1.
RQ2	If the I-frames are not acknowledged, an endpoint shall retransmit these frames not sooner than T2.
RQ3	An endpoint shall retry to setup link if the targeted endpoint did not answer with a UA or a RSET frame to a RSET frame within T3 (5 ms).

NOTE 1: RQ1 for the referenced clause is included in clause 5.7.7.5.1 of the present document.

NOTE 2: RQ2 for the referenced clause is included in clause 5.7.7.7.1 of the present document.

NOTE 3: RQ3 for the referenced clause is included in clause 5.7.7.3.1 of the present document.

5.7.6.3 Variables

5.7.6.3.1 Conformance requirements

Reference: TS 102 613 [1], clause 10.6.2.

All conformance requirements for the referenced clause are included in clause 5.7.7.5.1 of the present document.

5.7.6.4 Initial Reset state

5.7.6.4.1 Conformance requirements

Reference: TS 102 613 [1], clause 10.6.3.

RQ1	The following initial states shall apply in every endpoint after successful link establishment: $N(S) = N(R) = DN(R) = 0$.
-----	--

5.7.6.4.2 Test case 1: initial state at link reset - reset by the EUT

5.7.6.4.2.1 Test execution

The test procedure shall only be executed in voltage class B and in voltage class C, full power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test-case specific parameters for this test.

5.7.6.4.2.2 Initial conditions

- SHDLC link is established and idle, i.e. no further communication is expected.

5.7.6.4.2.3 Test procedure

Step	Direction	Description	RQ
1	User → EUT	Trigger the EUT to reset the SHDLC link.	
2	EUT → ES	Send RSET.	
3	ES → EUT	Send UA.	
4	Conditional	If the EUT does not immediately send I-frames after SHDLC link establishment, trigger the EUT to send an I-frame.	
5	EUT → ES	Send I-frame(0,0).	RQ1
6	ES → EUT	Send RR(1).	
7	Conditional	If the EUT continue to send I-frames, acknowledge them.	
8	ES → EUT	Send I-frame(0,NR).	
9	EUT → ES	acknowledge the previously sent I-frame.	RQ1

5.7.6.4.3 Test case 2: initial state at link reset - reset by the ES

5.7.6.4.3.1 Test execution

The test procedure shall only be executed in voltage class B and in voltage class C, full power mode.

Run this test procedure with each of the following initial conditions:

- The SWP interface is activated and SHDLC link is not established.
- SHDLC link is established and idle, i.e. no further communication is expected.

5.7.6.4.3.2 Initial conditions

The initial conditions shall be established as specified in the test execution clause.

5.7.6.4.3.3 Test procedure

Step	Direction	Description	RQ
1	ES → EUT	Send RSET($W_s=2$, $SREJ=0$).	
2	EUT → ES	Send UA.	
3	Conditional User → EUT	If the EUT does not immediately send I-frames after SHDLC link establishment, trigger the EUT to send an I-frame.	
4	EUT → ES	Send I-frame(0,0).	RQ1
5	ES → EUT	Send RR(1).	
6	Conditional	If the EUT continue to send I-frames, acknowledge them.	
7	ES → EUT	Send I-frame(0,NR).	
8	EUT → ES	Acknowledge the previously sent I-frame.	RQ1

5.7.7 SHDLC sequence of frames

5.7.7.1 Conformance requirements

Reference: TS 102 613 [1], clause 10.7.

There are no conformance requirements for the EUT for the referenced clause.

5.7.7.2 Nomenclature

5.7.7.2.1 Conformance requirements

Reference: TS 102 613 [1], clause 10.7.1.

There are no conformance requirements for the EUT for the referenced clause.

5.7.7.3 Link establishment with default sliding window size

5.7.7.3.1 Conformance requirements

Reference: TS 102 613 [1], clauses 10.7.2, 10.7.4, 10.4, 10.5, 10.1 and 10.5.2.

RQ1	10.7.2	An endpoint establishing an SHDLC link shall initiate link establishment by sending a RSET frame.
RQ2	10.7.2	If an endpoint supports the sliding window size and SREJ value in the RSET frame, it shall acknowledge that frame with a UA frame.
RQ3	10.7.2	An endpoint receiving a RSET frame without window size and/or endpoint capabilities field shall interpret the RSET frame as if it contained the default values.
RQ4	10.7.2	Before link establishment, all SHDLC frames except RSET from other endpoint shall be discarded.
RQ5	10.7.2	If the link is re-established, all buffered frames (received out of order or stored in the retransmission queue) shall be discarded.
RQ6	10.7.2	If the link is re-established, an endpoint shall inform the upper layer of a link reset.
RQ7	10.7.2	An endpoint shall support a link re-establishment which is initiated by the peer endpoint.
RQ8	10.4	An endpoint's default size of sliding window shall be four frames.
RQ9	10.5	If the initial sliding window size is too large or SREJ support is requested and the receiving endpoint cannot handle (at least one) of those features, it shall not acknowledge the RSET frame. Instead, the receiver shall send a RSET frame with an appropriate sliding window size and/or SREJ frame support bit.
RQ10	10.5	An endpoint shall obey to window size reconfiguration and/or SREJ support if the requested window size is lower than its default configuration or the peer endpoint does not support SREJ frames.
RQ11	10.5.1	The number provided for the endpoint sliding window size shall be between 2 to 4 inclusive.
RQ12	10.5.1	In case this RSET frame is sent in response to a received RSET frame, the endpoint size value shall not be higher than the previously provided value.
RQ13	10.5.1	If an RSET frame is received without the second optional byte the default value of SREJ not supported should be used.
RQ14	10.6.1	An endpoint shall retry to setup link if the targeted endpoint did not answer with a UA or a RSET frame to a RSET frame within T3(5 ms).
RQ15	10.7.4	Once the link is established, an endpoint shall be able to receive data.
RQ16	10.5.2	The endpoint shall not include a payload in UA frames.

NOTE 1: Tests for RQ6 are out of scope of the present document.

NOTE 2: Part of RQ5 related to discarding frame in the retransmission buffer when the link is re-establish will not be tested.

5.7.7.3.2 Test Case 1: link establishment by the EUT

5.7.7.3.2.1 Test execution

The test procedure shall only be executed in voltage class B and in voltage class C, full power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test-case specific parameters for this test.

5.7.7.3.2.2 Initial conditions

- SHDLC link is established and idle, i.e. no further communication is expected.

5.7.7.3.2.3 Test procedure

Step	Direction	Description	RQ
1	User → EUT	Trigger the EUT to establish the SHDLC link.	
2	EUT → ES	Send RSET.	RQ1
3	ES → EUT	Send UA.	
4	ES → EUT	Send an I-frame.	
5	EUT → ES	Acknowledge the previously sent I-frame.	RQ15

5.7.7.3.3 Test Case 2: link establishment by the ES

5.7.7.3.3.1 Test execution

For every RSET frame in the table below which contains a window size and endpoint capabilities which are supported by the endpoint under test:

RSET()
RSET(2)
RSET(3)
RSET(4)
RSET(2, SREJ=0)
RSET(2, SREJ=1)
RSET(3, SREJ=0)
RSET(3, SREJ=1)
RSET(4, SREJ=0)
RSET(4, SREJ=1)

run the test procedure with the following initial conditions:

- The SWP interface is activated and SHDLC link is not established.
- The SHDLC link is established and idle, i.e. no further communication is expected.

5.7.7.3.3.2 Initial conditions

The initial conditions shall be established as specified in the test execution clause.

5.7.7.3.3.3 Test procedure

Step	Direction	Description	RQ
1	ES → EUT	Send the RSET frame indicated in the test execution clause.	
2	EUT → ES	Send UA.	RQ2, RQ3, RQ7, RQ13, RQ16
3	ES → EUT	Send an I-frame.	
4	EUT → ES	Acknowledges the previously sent I-frame.	RQ15

NOTE: RQ3 is only validated when RSET() is sent in step 1.

5.7.7.3.4 Test case 3: discard frames before initialization

5.7.7.3.4.1 Test execution

Run the test procedure for the each of the following frames in step 1:

- UA;
- I-frame(0,0);
- RNR(0);
- SREJ(0).

5.7.7.3.4.2 Initial conditions

- The SWP interface is activated and SHDLC link is not established.

5.7.7.3.4.3 Test procedure

Step	Direction	Description	RQ
1	ES → EUT	Do not send a RSET frame and send the defined frame.	
2	ES	Wait for 20 ms.	
3	Conditional	If the EUT sends a RSET frame, perform step 4 and stop. If the EUT sends a different frame, the EUT fails the test. If the EUT does not send any frame, perform steps 5 and 6.	RQ4
4	ES → EUT	Send UA frame.	
5	ES → EUT	Send RSET(Ws=4, SREJ=1).	
6	EUT → ES ES → EUT	Complete SHDLC link establishment.	RQ4

5.7.7.3.5 Test case 4: connection time - reset by EUT

5.7.7.3.5.1 Test execution

The test procedure shall only be executed in voltage class B and in voltage class C, full power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test-case specific parameters for this test.

5.7.7.3.5.2 Initial conditions

- SHDLC link is established and idle, i.e. no further communication is expected.

5.7.7.3.5.3 Test procedure

Step	Direction	Description	RQ
1	User → EUT	Trigger the EUT to reset the SHDLC link.	
2	EUT → ES	Send RSET.	
3	ES	Do not send a UA frame.	
4	EUT → ES	Send RSET after at least T3 time after execution of step 2.	RQ14

5.7.7.3.6 Test case 5: connection time - reset by ES

5.7.7.3.6.1 Test execution

Run the test procedure with each of the following initial conditions:

- The SWP interface is activated and SHDLC link is not established.
- SHDLC link is established and idle, i.e. no further communication is expected.

5.7.7.3.6.2 Initial conditions

The initial conditions shall be established as specified in the test execution clause.

5.7.7.3.6.3 Test procedure

Step	Direction	Description	RQ
1	ES → EUT	Send RSET frame with unsupported features.	
2	EUT → ES	Send RSET.	
3	ES	Do not send a UA frame.	
4	EUT → ES	Send RSET after at least T3 time after execution of step 2.	RQ14

5.7.7.3.7 Test case 6: EUT discards I-frames and S-frames during link establishment

5.7.7.3.7.1 Test execution

The test procedure shall only be executed in voltage class B and in voltage class C, full power mode.

The test procedure shall be executed once for each of the following parameters:

- Run the test procedure for the following frames in step 3:
 - I-frame(0,0);
 - RNR(0);
 - SREJ(0).

5.7.7.3.7.2 Initial conditions

- SHDLC link is established and is idle, i.e. no further communication is expected.

5.7.7.3.7.3 Test procedure

Step	Direction	Description	RQ
1	User → EUT	Trigger the EUT to reset the SHDLC link.	
2	EUT → ES	Send RSET.	
3	ES	Do not send a UA frame and send the defined frame.	
4	EUT → ES	Send RSET after at least T3 time after execution of step 2.	RQ14

5.7.7.3.8 Test case 7: requesting unsupported window size - link establishment by ES

5.7.7.3.8.1 Test execution

The test procedure shall be executed once for each of following parameters:

- Run the test procedure for the following values of RSET frame in step 1:
 - RSET();
 - RSET(WS=4, SREJ=0);

5.7.7.3.8.2 Initial conditions

- SHDLC link is established.

5.7.7.3.8.3 Test procedure

Step	Direction	Description	RQ
1	ES → EUT	Send the defined RSET frame.	
2	EUT → ES	Send RSET(WS _y) or RSET(WS _y ,SREJ=0) Where y = host provider announced size.	RQ3, RQ8, RQ9, RQ11, RQ12
3	ES → EUT	Send UA.	

5.7.7.3.9 Test Case 8: requesting unsupported SREJ support - link establishment by ES

5.7.7.3.9.1 Test execution

The test procedure shall be executed once for each of following parameters:

- There are no test-case specific parameters for this test.

5.7.7.3.9.2 Initial conditions

- SHDLC link is established.

5.7.7.3.9.3 Test procedure

Step	Direction	Description	RQ
1	ES → EUT	Send RSET(WS=2, SREJ=1) frame.	
2	EUT → ES	Send RSET(WS=2, SREJ=0) frame or RSET(WS=2).	RQ9, RQ11, RQ12
3	ES → EUT	Respond UA.	

5.7.7.3.10 Test Case 9: requesting unsupported window size and SREJ support - link establishment by ES

5.7.7.3.10.1 Test execution

The test procedure shall be executed once for each of following parameters:

- There are no test-case specific parameters for this test.

5.7.7.3.10.2 Initial conditions

- SHDLC link is established.

5.7.7.3.10.3 Test procedure

Step	Direction	Description	RQ
1	ES → EUT	Send RSET(WS=4, SREJ=1) frame.	
2	EUT → ES	Send RSET(WSy, SREJ=0) frame Where y = host provider announced size.	RQ9, RQ11, RQ12
3	ES → EUT	Respond UA.	

5.7.7.3.11 Test Case 10: forcing lower window size - link establishment by the EUT

5.7.7.3.11.1 Test execution

The test procedure shall only be executed in voltage class B and in voltage class C, full power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test-case specific parameters for this test.

5.7.7.3.11.2 Initial conditions

- SHDLC link is established and idle, i.e. no further communication is expected.

5.7.7.3.11.3 Test procedure

Step	Direction	Description	RQ
1	User → EUT	Trigger the EUT to reset the SHDLC link.	
2	EUT → ES	Send RSET frame.	
3	ES → EUT	Send RSET(WS=2).	
4	EUT → ES	Send UA.	RQ2, RQ10

5.7.7.3.12 Test Case 11: forcing SREJ not used - link establishment by the EUT

5.7.7.3.12.1 Test execution

The test procedure shall only be executed in voltage class B and in voltage class C, full power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test-case specific parameters for this test.

5.7.7.3.12.2 Initial conditions

- SHDLC link is established and idle, i.e. no further communication is expected.

5.7.7.3.12.3 Test procedure

Step	Direction	Description	RQ
1	User → EUT	Trigger the EUT to reset the SHDLC link.	
2	EUT → ES	Send RSET(WSy, SREJ = 1) frame. Where y = host provider announced size.	
3	ES → EUT	Send RSET(WS=y, SREJ =0) frame.	
4	EUT → ES	Send UA.	RQ2, RQ10

5.7.7.3.13 Test Case 12: forcing lower window size and SREJ not used - link establishment by the EUT

5.7.7.3.13.1 Test execution

The test procedure shall only be executed in voltage class B and in voltage class C, full power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test-case specific parameters for this test.

5.7.7.3.13.2 Initial conditions

- SHDLC link is established and idle, i.e. no further communication is expected.

5.7.7.3.13.3 Test procedure

Step	Direction	Description	RQ
1	User → EUT	Trigger the EUT to reset the SHDLC link.	
2	EUT → ES	Send RSET(WS _y , SREJ=1) frame. Where y = host provider announced size.	
3	ES → EUT	Send RSET(WS=2, SREJ=0) frame.	
4	EUT → ES	Send UA.	RQ2, RQ10

5.7.7.3.14 Test case 13: discard buffered frames on link re-establishment

5.7.7.3.14.1 Test execution

The test procedure shall be executed once for each of following parameters:

- There are no test-case specific parameters for this test.

5.7.7.3.14.2 Initial conditions

- The SHDLC link is established with SREJ support.
- SHDLC link is idle, i.e. no further communication expected.

5.7.7.3.14.3 Test procedure

Step	Direction	Description	RQ
1	ES → EUT	Send I-frame(NS0_S,x).	
2	EUT → ES	Acknowledges I-frame(NS0_S,x).	
3	ES → EUT	Send I-frame(NS0_S+2,x).	
4	EUT → ES	Send SREJ(NS0_S+1).	
5	ES → EUT	Re-establish SHDLC link.	
6	ES ↔ EUT	ES sends I-frames (0,NR) to I-frame(NS0_S+1,NR). EUT acknowledges these I-frames.	RQ5

5.7.7.4 Link establishment with custom sliding window size

5.7.7.4.1 Conformance requirements

Reference: TS 102 613 [1], clause 10.7.3.

There are no conformance requirements for the EUT for the referenced clause.

5.7.7.5 Data flow

5.7.7.5.1 Conformance requirements

Reference: TS 102 613 [1], clauses 10.7.4, 10.6.1 and 10.6.2, 10.8.2

RQ1	10.7.4	An endpoint shall acknowledge frame reception regularly.
RQ2	10.7.4	The acknowledgement timeout shall not be too long .
RQ3	10.7.4	If the number of unacknowledged I-frames on the link equals the negotiated window size, then the endpoint shall not transmit any further I-frames until reception of an acknowledgement.
RQ4	10.6.1	I-frames shall be acknowledged within T1.
RQ5	10.6.2	An endpoint shall increment its value of the N(S) field after emission of an I-Frame.
RQ6	10.6.2, 10.8.2	N(R) shall be set as described in TS 102 613 [1].
RQ7	10.6.2	During full duplex data transmission or by emission of a S type frame, all received frames with a sequence number lower than N(R) are acknowledged.

NOTE 1: RQ2 is covered by RQ1 and therefore will not be mentioned explicitly in test procedures.

NOTE 2: RQ4 (i.e. conformance to T1) is not tested.

5.7.7.5.2 Test case 1: I-frame transmission

5.7.7.5.2.1 Test execution

The test procedure shall only be executed in voltage class B and in voltage class C, full power mode.

Run this test procedure for:

- Every supported window size.
- I-frame acknowledgement method by the ES:
 - Every I-frame acknowledged individually.
 - Acknowledge just before T1 expires and using the maximum allowed value for NR.

5.7.7.5.2.2 Initial conditions

- SHDLIC link is established with the window size indicated in the test execution clause.
- SHDLIC link is idle, i.e. no further communication is expected.

5.7.7.5.2.3 Test procedure

Step	Direction	Description	RQ
1	User → EUT	Trigger the EUT to send 9 I-frames.	
2	EUT → ES ES → EUT	EUT send I-Frames as indicated in step 1. ES acknowledges these frames using the acknowledgement mechanism indicated in the test execution clause, using RR frames unless the upper layer requires the transmission of I-frames.	RQ3, RQ5, RQ6, RQ7

5.7.7.5.3 Test case 2: I-frame reception - single I-Frame reception

5.7.7.5.3.1 Test execution

The test procedure shall be executed once for each of following parameters:

- There are no test-case specific parameters for this test.

5.7.7.5.3.2 Initial conditions

- SHDLC link is established and idle, i.e. no further communication is expected.

5.7.7.5.3.3 Test procedure

Step	Direction	Description	RQ
1	User → EUT	Prepare the ES to send 10 I-frames, without retransmission, waiting the acknowledgement of the previously sent I-frame before sending the next I-frame.	
2	ES → EUT EUT → ES	ES sends I-frames as indicated in step 1. EUT acknowledges these I-frames.	RQ1, RQ6

5.7.7.5.4 Test case 3: I-frame reception - multiple I-Frame reception

5.7.7.5.4.1 Test execution

Run this test procedure for every supported window size.

5.7.7.5.4.2 Initial conditions

- SHDLC link is established with the window size indicated in the test execution clause.
- SHDLC link is idle, i.e. no further communication is expected.

5.7.7.5.4.3 Test procedure

Step	Direction	Description	RQ
1	User → EUT	Prepare the ES to send 10 I-frames. The ES shall send each I-frame as soon as possible, without waiting for the acknowledgement of the previously sent I-frame, while still complying to the current window boundaries.	
2	EUT → ES ES → EUT	ES sends I-Frames as indicated in step 1. EUT acknowledges these frames.	RQ1, RQ6

5.7.7.5.5 Test case 4: piggybacking

5.7.7.5.5.1 Test execution

The test procedure shall only be executed in voltage class B and in voltage class C, full power mode.

Run this test procedure twenty times for every supported window size.

5.7.7.5.5.2 Initial conditions

- SHDLC link is established with the window size indicated in the test execution clause.
- SHDLC link is idle, i.e. no further communication is expected.

5.7.7.5.5.3 Test procedure

Step	Direction	Description	RQ
1	User → ES	Prepare the ES to send 50 I-frames, sending the first I-frame when the first I-frame from the EUT is received. The ES shall send each I-frame as soon as possible, without waiting for the acknowledgement of the previously sent I-frame, while still complying to the current window boundaries.	
2	User → EUT	Trigger the EUT to send 50 I-frames	
3	EUT → ES ES → EUT	EUT sends I-frames according to RQ3, RQ5, RQ6,RQ7 ES sends I-Frames as indicated in step 1 and acknowledges the I-frames sent by the EUT. EUT acknowledges the I-frames sent by the ES according to RQ1 and RQ6.	RQ1, RQ3, RQ5, RQ6, RQ7

5.7.7.6 Reject (go N back)

5.7.7.6.1 Conformance requirements

Reference: TS 102 613 [1], clause 10.7.5.

RQ1	10.7.5	If an endpoint detects missing I-frame sequence numbers and if SREJ is not supported or if several frames got lost, the endpoint shall send a REJ frame as soon as possible.
RQ2	10.7.5	When an endpoint receives a REJ frame with a sequence number which identifies an unacknowledged I-frame previously sent within the sliding window size it shall restart the stream at the first missing frame.
RQ3	10.7.5	After sending REJ, an endpoint shall accept the peer endpoint restarting the stream at the first missing frame.

5.7.7.6.2 Test case 1: REJ transmission

5.7.7.6.2.1 Test execution

Run the test procedure for every combination of supported window size and SREJ support which the EUT supports in the following table.

EUT support		Procedure parameters	
Supported window size	SREJ supported?	SREJ negotiated	I-frame to send in step 3
2	No	No	I-frame(NS0_S+2,x)
3	No	No	I-frame(NS0_S +2,x)
3	No	No	I-frame(NS0_S +3,x)
4	No	No	I-frame(NS0_S +2,x)
4	No	No	I-frame(NS0_S +3,x)
4	No	No	I-frame(NS0_S +4,x)
3	Yes	Yes	I-frame(NS0_S +WS,x)
4	Yes	Yes	I-frame(NS0_S +WS,x)
2	Yes	No	I-frame(NS0_S +2,x)
3	Yes	No	I-frame(NS0_S +2,x)
4	Yes	No	I-frame(NS0_S +2,x)

5.7.7.6.2.2 Initial conditions

- SHDLCLink is established with SREJ support as indicated in the test execution clause.
- SHDLCLink is idle, i.e. no further communication is expected.

5.7.7.6.2.3 Test procedure

Step	Direction	Description	RQ
1	ES → EUT	Sends I-frame(NS0_S,x).	
2	EUT → ES	Acknowledges I-frame(NS0_S,x).	
3	ES → EUT	Sends the I-frame indicated in the test execution clause.	
4	EUT → ES	Sends REJ(NS0_S+1).	RQ1
5	ES ↔ EUT	ES sends 10 I-frames starting at I-frame(NS0_S+1,x). EUT acknowledges I-frames.	RQ3

5.7.7.6.3 Test case 2: REJ transmission - multiple I-frames received

5.7.7.6.3.1 Test execution

The test procedure shall be executed once for each of following parameters:

- There are no test-case specific parameters for this test.

5.7.7.6.3.2 Initial conditions

- SHDLC link is established without SREJ support.
- SHDLC link is idle, i.e. no further communication is expected.

5.7.7.6.3.3 Test procedure

Step	Direction	Description	RQ
1	ES → EUT	Send I-frame(NS0_S,x).	
2	EUT → ES	Acknowledge I-frame(NS0_S,x).	
3	ES → EUT	Send I-frame(NS0_S+WS-1,x) followed immediately by I-frame(NS0_S+WS,x).	
4	EUT → ES	EUT send REJ(NS0_S+1). The EUT is allowed to send additional REJ(NS0_S+1), in response to any additional I-frame(NS0_S+x,x).	RQ1
5	ES ↔ EUT	ES send 10 I-frames starting at I-frame(NS0_S+1,x) EUT acknowledge I-frames.	RQ3

5.7.7.6.4 Test case 3: REJ reception

5.7.7.6.4.1 Test execution

The test procedure shall only be executed in voltage class B and in voltage class C, full power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test-case specific parameters for this test.

5.7.7.6.4.2 Initial conditions

- SHDLC link is established without SREJ support.
- SHDLC link is idle, i.e. no further communication is expected.

5.7.7.6.4.3 Test procedure

Step	Direction	Description	RQ
1	User → EUT	Trigger the EUT to send I-frames.	
2	EUT → ES	Send I-frame(NS0_T, y).	
3	ES	Do not acknowledge I-frame(NS0_T,y).	
4	EUT → ES	If the EUT retransmits I-frame(NS0_T,y), then stop the test procedure, as it is not possible for the ES to send a valid REJ. This is not a failure of the EUT. If the EUT transmits I-frame(NS0+1,y), then continue the test procedure.	
5	ES → EUT	Send REJ(NS0_T). The ES is required to send additional REJ(NS0_T), in response to any additional I-frame(NS0_T+x,y).	
6	EUT → ES	Send I-frame(NS0_T,y).	RQ2
7	ES → EUT	acknowledge I-frame(NS0_T,y).	
8	EUT → ES	Send I-frame(NS0_T+1,y).	RQ2
9	ES → EUT	acknowledge I-frame(NS0-T+1,y).	

5.7.7.7 Last Frame Loss

5.7.7.7.1 Conformance requirements

Reference: TS 102 613 [1], clauses 10.7.6 and 10.6.1.

RQ1	10.7.6	Each frame shall have a guarding/transmit timeout in order to retransmit frames if the destination does not notice a loss.
RQ2	10.6.1	If the I-frames are not acknowledged, an endpoint shall retransmit these frames not sooner than T2.

5.7.7.7.2 Test Case 1: retransmission of a single frame

5.7.7.7.2.1 Test execution

The test procedure shall only be executed in voltage class B and in voltage class C, full power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test-case specific parameters for this test.

5.7.7.7.2.2 Initial conditions

- SHDLC link is established and idle, i.e. no further communication is expected.

5.7.7.7.2.3 Test procedure

Step	Direction	Description	RQ
1	User → EUT	Trigger the EUT to send an I-frame.	
2	EUT → ES	Sends I-frame(NS0_T,x).	
3	ES	Do not acknowledge I-frame(NS0_T,x).	
4	EUT → ES	Sends I-frame(NS0_T,x).	RQ1, RQ2

5.7.7.7.3 Test Case 2: retransmission of multiple frames

5.7.7.7.3.1 Test execution

The test procedure shall only be executed in voltage class B and in voltage class C, full power mode.

Run this test procedure for every supported window size.

5.7.7.7.3.2 Initial conditions

- SHDLC link is established without SREJ support.
- SHDLC link is idle, i.e. no further communication is expected.

5.7.7.7.3.3 Test procedure

Step	Direction	Description	RQ
1	User → EUT	Trigger the EUT to send 9 I-frames.	
2	EUT → ES ES	EUT sends I-frames as indicated in step 1. For the first transmission of each I-frame, ES does not acknowledge the I-frame.	
3	EUT → ES ES	EUT retransmits each I-frame according to RQ1, RQ2. For each retransmitted I-frame, ES acknowledges only this I-frame.	RQ1, RQ2

5.7.7.8 Receive and not ready

5.7.7.8.1 Conformance requirements

Reference: TS 102 613 [1], clause 10.7.7.

RQ1	10.7.7	When an endpoint transmits a RNR and is now ready to receive an I-Frame, it shall send a RR frame every 5 ms to 20 ms until it receives a new I-frame.
RQ2	10.7.7	If an endpoint receives a RR in a context described in RQ1 and has no data to send, it shall send an I-Frame with empty information field to signal the proper reception of the RR frame.
RQ3	10.7.7	If an endpoint receives RNR frame then it shall suspend transmission of I-frames until reception of a RR frame.

NOTE: RQ1 will not be tested as it is not possible to trigger the EUT to transmit a RNR.

5.7.7.8.2 Test case 1: RNR reception

5.7.7.8.2.1 Test execution

The test procedure shall only be executed in voltage class B and in voltage class C, full power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test-case specific parameters for this test.

5.7.7.8.2.2 Initial conditions

- SHDLC link is established and idle, i.e. no further communication is expected.

5.7.7.8.2.3 Test procedure

Step	Direction	Description	RQ
1	User → EUT	Trigger the EUT to send 9 I-frames.	
2	EUT → ES	Starts sending I-frames.	
3	ES → EUT	Acknowledge I-frame(NS0_T,x) with RNR(NS0_T+1).	
4	ES	Wait 20 ms	RQ3
5	ES → EUT	Send RR, where N(R) = N(S) of last received I-frame + 1.	
6	EUT → ES ES → EUT	EUT sends remaining I-frames, where N(S) of the first I-frame = N(S) of previously transmitted I-frame + 1. ES acknowledges remaining I-frames.	

5.7.7.8.3 Test case 2: Empty I-frame transmission

5.7.7.8.3.1 Test execution

The test procedure shall only be executed in voltage class B and in voltage class C, full power mode.

The test procedure shall be executed once for all combinations of the following parameters:

- Each supported window size.
- RR retransmission time of the ES in step 4 between 5 ms and 7 ms; and between 18 ms and 20 ms.

5.7.7.8.3.2 Initial conditions

- SHDLG link is established and idle, i.e. no further communication is expected.

5.7.7.8.3.3 Test procedure

Step	Direction	Description	RQ
1	User → EUT	Trigger the EUT to send 1 I-frame.	
2	EUT → ES	Send I-frame(NS0_T,x).	
3	ES → EUT	Acknowledge I-frames(NS0_T,x) with RNR(NS0_T+1).	
4	ES → EUT EUT → ES	<p>Send RR(NS0_T+1) in order to indicate to the EUT that I-frame transmission can be resumed.</p> <p>In the subsequent frame exchanges:</p> <ul style="list-style-type: none"> • The ES shall apply the RR retransmission time specified in the Test execution clause. • The ES shall ignore the first I-frame sent by the EUT, in order to instigate a retransmission of the RR frame (by the ES) or the I-frame (by the EUT). <p>In order to pass the test, the EUT:</p> <ul style="list-style-type: none"> • Shall send a first empty I-frame(NS0_T+1,x) within 20 ms of the original RR frame; this may occur before or after a retransmission by the ES of the original RR frame. • Shall retransmit the empty I-frame; this may occur before or after a retransmission by the ES of the original RR frame. <p>The ES shall continue with this frame exchange until it successfully acknowledges an empty I-frame with RR(NS0_T+2).</p>	RQ2
5	User → EUT	Trigger the EUT to send further I-frames.	
6	EUT → ES ES → EUT	<p>EUT sends remaining I-frames; the first I-frame shall be I-frame(NS0_T+2,x).</p> <p>ES acknowledges remaining I-frames.</p>	RQ3

5.7.7.9 Selective reject

5.7.7.9.1 Conformance requirements

Reference: TS 102 613 [1], clauses 10.7.8, 10.8.2 and 10.4.2.

RQ1	10.8.2	If an I-frame (lx,y) is received by an endpoint and support for Selective Reject S frames was negotiated for the link and X is exactly one higher than N(R), a SREJn(r) shall be sent instead of the REJn(r). The received I-frame shall be buffered.
RQ2	10.8.2	Once the retransmitted I-frame with X = N(R) is received in the content of RQ3, the buffered I-frame shall also be processed.
RQ3	10.7.8	If an endpoint receives a SREJ frame and supports for SREJ was agreed at link establishment, it shall retransmit the corresponding I-Frame.
RQ4	10.4.2	Only one SREJ shall remain outstanding on each link direction at any one time.
RQ5	10.4.2	An SREJ shall be transmitted for each erroneous frame; each frame is treated as a separate error.
RQ6	10.4.2	Optional type of frame shall not be used before capability negotiation is defined during initialization.

NOTE: RQ6 is not tested, as it is a non-occurrence RQ.

5.7.7.9.2 Test case 1: SREJ transmission

5.7.7.9.2.1 Test execution

The test procedure shall be executed once for each of following parameters:

- There are no test-case specific parameters for this test.

5.7.7.9.2.2 Initial conditions

- The SHDLC link is established with SREJ support.
- SHDLC link is idle, i.e. no further communication is expected.

5.7.7.9.2.3 Test procedure

Step	Direction	Description	RQ
1	ES → EUT	Send I-frame(NS0_S,x).	
2	EUT → ES	Acknowledge I-frame(NS0_S,x).	
3	ES → EUT	Send I-frame(NS0_S+2,x).	
4	EUT → ES	Send SREJ(NS0_S+1).	RQ1
5	ES → EUT	Sends I-frame(NS0_S+1,x).	
6	EUT → ES	Acknowledges I-frame(NS0_S+1,x) and I-frame(NS0_S+2,x).	
7	ES → EUT	Send I-frame(NS0_S+3, x).	
8	EUT → ES	Acknowledges I-frame(NS0_S+3,x).	RQ2

5.7.7.9.3 Test case 2: SREJ transmission - multiple I-frames received

5.7.7.9.3.1 Test execution

- Run this test procedure for each supported window size.

5.7.7.9.3.2 Initial conditions

- The SHDLC link is established with SREJ support.
- SHDLC link is idle, i.e. no further communication is expected.

5.7.7.9.3.3 Test procedure

Step	Direction	Description	RQ
1	ES → EUT	Send I-frame(NS0_S,x).	
2	EUT → ES	Acknowledges I-frame(NS0_S,x).	
3	ES → EUT	Send I-frame(NS0_S+2,x) followed immediately by I-frame(NS0_S+3,x).	
4	EUT → ES	Sends SREJ(NS0_S+1).	RQ1
5	ES → EUT	Sends I-frame(NS0_S+1,x).	
6	EUT → ES	Acknowledges I-frame(NS0_S+1,x), I-frame(NS0_S+2,x) and I-frame(NS0_S+3,x).	
7	ES → EUT	Send I-frame(NS0_S+4, x).	
8	EUT → ES	Acknowledges I-frame(NS0_S+4,x).	RQ2

5.7.7.9.4 Test case 3: SREJ reception

5.7.7.9.4.1 Test execution

The test procedure shall only be executed in voltage class B and in voltage class C, full power mode.

The test procedure shall be executed once for each of following parameters:

- There are no test-case specific parameters for this test.

5.7.7.9.4.2 Initial conditions

- SHDLC link is established with SREJ support.
- SHDLC link is idle, i.e. no further communication is expected.

5.7.7.9.4.3 Test procedure

Step	Direction	Description	RQ
1	User → EUT	Trigger the EUT to send 9 I-frames.	
2	EUT → ES	Send I-frame(NS0_T,x).	
3	ES → EUT	Do not acknowledge the received I-frame.	
4	EUT → ES	If the EUT retransmits I-frame(NS0_T,x), then stop the test procedure, as it is not possible for the ES to send a valid REJ. This is not a failure of the EUT. If the EUT transmits I-frame(NS0_T+1,x), then continue the test procedure.	
5	ES → EUT	Send SREJ(NS0_T).	
6	EUT → ES	Retransmit only the rejected I-Frame and continue sending remaining I-frames. ES acknowledges remaining I-frames.	RQ3

5.7.7.9.5 Test case 4: only one SREJ at any one time for each erroneous frame

5.7.7.9.5.1 Test execution

The test procedure shall be executed once for each of following parameters:

- There are no test-case specific parameters for this test.

5.7.7.9.5.2 Initial conditions

- SHDLC link is established with SREJ support.
- SHDLC link is idle, i.e. no further communication is expected.

5.7.7.9.5.3 Test procedure

Step	Direction	Description	RQ
1	ES → EUT	Send I-frame(NS0_S,x).	
2	EUT → ES	Acknowledge I-frame(NS0_S,x).	
3	ES → EUT	Send I-frame(NS0_S+2,x).	
4	EUT → ES	Send SREJ(NS0_S+1).	
5	ES → EUT	Send I-frame(NS0_S+4,x).	
6	EUT → ES	EUT does not send another SREJ.	RQ4
7	ES → EUT	Send I-frame(NS0_S+1,x).	
8	EUT → ES	Send SREJ(NS0_S+3) (see note).	RQ1, RQ5
9	ES → EUT	Send I-frame(NS0_S+3,x).	
10	EUT → ES	acknowledge I-frame(NS0_S+3,x) and I-frame(NS0_S+4,x).	RQ1
NOTE: EUT may also acknowledge previous I-frames before sending SREJ.			

5.7.8 Implementation

5.7.8.1 Conformance requirements

Reference: TS 102 613 [1], clause 10.8.

There are no conformance requirements for the EUT for the referenced clause.

5.7.8.2 Information Frame emission

5.7.8.2.1 Conformance requirements

Reference: TS 102 613 [1], clause 10.8.1.

There are no conformance requirements for the EUT for the referenced clause.

5.7.8.3 Information Frame reception

5.7.8.3.1 Conformance requirements

Reference: TS 102 613 [1], clause 10.8.2.

All conformance requirements for the referenced clause are included in clause 5.7.7.9.1 of the present document.

5.7.8.4 Reception Ready Frame reception

5.7.8.4.1 Conformance requirements

Reference: TS 102 613 [1], clause 10.8.3.

There are no conformance requirements for the EUT for the referenced clause.

5.7.8.5 Reject Frame reception

5.7.8.5.1 Conformance requirements

Reference: TS 102 613 [1], clause 10.8.4.

There are no conformance requirements for the EUT for the referenced clause.

5.7.8.6 Selective Reject Frame reception

5.7.8.6.1 Conformance requirements

Reference: TS 102 613 [1], clause 10.8.5.

There are no conformance requirements for the EUT for the referenced clause.

5.7.8.7 Acknowledge timeout

5.7.8.7.1 Conformance requirements

Reference: TS 102 613 [1], clause 10.8.6.

There are no conformance requirements for the EUT for the referenced clause.

5.7.8.8 Guarding/transmit timeout

5.7.8.8.1 Conformance requirements

Reference: TS 102 613 [1], clause 10.8.7.

There are no conformance requirements for the EUT for the referenced clause.

5.8 CLT LLC definition

5.8.1 System Assumptions

Reference: TS 102 613 [1], clause 11.1.

There are no conformance requirements for the UICC for the referenced clause.

5.8.2 Overview

Reference: TS 102 613 [1], clause 11.2.

There are no conformance requirements for the UICC for the referenced clause.

5.8.3 Supported RF protocols

5.8.3.1 Conformance requirements

Reference: TS 102 613 [1], clause 11.2a.

RQ1	The UICC shall provide the initialization data to the CLF, which performs RF protocol initialization commands of ISO/IEC 18092 [8] 212 kbps/424 kbps passive mode based card emulation protocols.
-----	---

NOTE: Test cases for RQ1 are out of scope of the present document.

5.8.4 CLT Frame Format

5.8.4.1 Conformance requirements

Reference: TS 102 613 [1], clause 11.3.

RQ1	When sending a CLT frame with the CLT PAYLOAD in Type A aligned structure, meaningless bits in the last byte of the CLT PAYLOAD shall be padded with 0.
-----	---

5.8.4.2 Test case 1: Padding of CLT PAYLOAD in Type A aligned structure

This test case is carried out only if DUT manufacturer provides sufficient information about opening a CLT session and exchanging CLT frames in Type A aligned manner, and all parameters needed are present in the terminal.

5.8.4.2.1 Test execution

The test procedure shall be executed once for each of following parameters:

- There are no test case specific parameters for this test case.

5.8.4.2.2 Initial conditions

- The SWP interface is activated and no more communication is expected.

5.8.4.2.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Send CLT frame with CL_PROTO_INF(A) in the ADMIN_FIELD and a valid command (see Note) for one of the RF protocols supported by the UICC in the DATA_FIELD.	
2	UICC → T	Respond CLT frame with CLT_CMD field set to 00000 and at least 1 byte of data in the CLT PAYLOAD field.	RQ1
3	T → UICC	Send CLT frame with CLT_CMD field set to 00000 and a valid command (see note) for one of the RF protocols supported by the UICC in the DATA_FIELD.	
4	UICC → T	Respond CLT frame with CLT_CMD field set to 00000 and at least 1 byte of data in the CLT PAYLOAD field.	RQ1
NOTE: This command shall be chosen in a way, that the UICC responds data with respect to RF (but not 8, 16 or 24 RF bytes), and without requesting a transition to "HALT" or "IDLE" state as per ISO/IEC 14443-3 [6].			

5.8.5 CLT Command Set

5.8.5.1 Conformance requirements

Reference: TS 102 613 [1], clause 11.4.

RQ1	The UICC shall interpret received data in DATA_FIELD as Type A aligned, if bit 5 in CLT CMD field is 0.
RQ2	The UICC shall interpret received data in DATA_FIELD as byte aligned, if bit 5 in CLT CMD field is 1.
RQ3	The UICC shall interpret a CLT frame containing an ADMIN_FIELD with the value 0000 as containing no administrative command.
RQ4	The UICC shall interpret a CLT frame containing an ADMIN_FIELD with the value 1000 as containing a CL_PROTO_INF(A) command.
RQ5	The UICC shall interpret a CLT frame containing an ADMIN_FIELD with the value 1001 as containing a CL_PROTO_INF(F) command.
RQ6	The UICC indicates that no administrative command is being sent by setting the ADMIN_FIELD in a CLT frame to 0000.
RQ7	For ISO/IEC 14443-3 [6], the UICC instructs the CLF to enter the initial state by sending a CLT frame with the ADMIN_FIELD set to 0001.
RQ8	For ISO/IEC 14443-3 [6], the UICC instructs the CLF to enter the "HALT" state by sending a CLT frame with the ADMIN_FIELD set to 0010.
RQ9	RFU values for ADMIN_FIELD shall not be sent by the UICC.
RQ10	When sending Type A aligned data in DATA_FIELD, the UICC shall set bit 5 in CLT CMD field to 0.
RQ11	When sending byte aligned data in DATA_FIELD, the UICC shall set bit 5 in CLT CMD field to 1.

NOTE 1: RQ9 is a non-occurrence RQ.

5.8.5.2 Test case 1: CLT commands, ISO/IEC 14443 Type A

This test case is carried out only if DUT manufacturer provides sufficient information about opening a CLT session and exchanging CLT frames in Type A aligned manner, and all parameters needed are present in the terminal.

5.8.5.2.1 Test execution

The test procedure shall be executed once for each of following parameters:

- There are no test case specific parameters for this test case.

5.8.5.2.2 Initial conditions

- The SWP interface is activated and no more communication is expected.

5.8.5.2.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Send CLT frame with CL_PROTO_INF(A) in the ADMIN_FIELD and a valid command (see note 1) for one of the RF protocols supported by the UICC in the DATA_FIELD.	
2	UICC → T	Respond CLT frame with CLT_CMD field set to 00000 and at least 1 byte of data in the CLT PAYLOAD field.	RQ2, RQ4, RQ6, RQ9, RQ10
3	T → UICC	Send CLT frame with CLT_CMD field set to 00000 and a valid command (see note 1) for one of the RF protocols supported by the UICC in the DATA_FIELD.	
4	UICC → T	Respond CLT frame with CLT_CMD field set to 00000.	RQ1, RQ3, RQ6, RQ9 RQ10
5	T → UICC	Send CLT frame with CLT_CMD field set to 00000 and a command which causes the UICC to request a transition to "HALT" state as per ISO/IEC 14443-3 [6].	
6	UICC → T	Respond CLT frame with CLT_CMD field set to 00010 (i.e. ADMIN_FIELD set to CL_GOTO_HALT) (see note 2).	RQ1, RQ3, RQ8, RQ9 RQ10
7	T → UICC	Send CLT frame with CL_PROTO_INF(A) in the ADMIN_FIELD and a valid command (see note 1) for one of the RF protocols supported by the UICC in the DATA_FIELD.	
8	UICC → T	Respond CLT frame with CLT_CMD field set to 00000 and at least 1 byte of data in the CLT PAYLOAD field.	RQ2, RQ4, RQ6, RQ9 RQ10
9	T → UICC	Send CLT frame with CLT_CMD field set to 00000 and a command which causes the UICC to request a transition to "IDLE" state as per ISO/IEC 14443-3 [6].	
10	UICC → T	Respond CLT frame with CLT_CMD field set to 00001 (i.e. ADMIN_FIELD set to CL_GOTO_INIT) (see note 2).	RQ1, RQ3, RQ7, RQ9 RQ10
NOTE 1: This command shall be chosen in a way, that the UICC responds data with respect to RF, and without requesting a transition to "HALT" or "IDLE" state as per ISO/IEC 14443-3 [6].			
NOTE 2: DATA_FIELD may be present or not.			

5.8.5.3 Test case 2: CLT commands, ISO/IEC 18092

This test case is carried out only if DUT manufacturer provides sufficient information about opening a CLT session and exchanging CLT frames in Type F RF technology, and all parameters needed are present in the terminal.

5.8.5.3.1 Test execution

The test procedure shall be executed once for each of following parameters:

- There are no test case specific parameters for this test case.

5.8.5.3.2 Initial conditions

- The SWP interface is activated and no more communication is expected.

5.8.5.3.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Send CLT frame with CL_PROTO_INF(F) in the ADMIN_FIELD and the RF data representing the initialization command 'POLLING REQUEST' which matches the application available on the UICC in the DATA_FIELD.	
2	UICC → T	Respond CLT frame with CLT_CMD field set to 10000 and RF data representing the initialization response 'POLLING RESPONSE' in the DATA_FIELD field.	RQ2, RQ5, RQ6, RQ9 RQ11
3	T → UICC	Send CLT frame with CL_PROTO_INF(F) in the ADMIN_FIELD and the RF data representing the initialization command 'POLLING REQUEST' which does not match the application available on the UICC in the DATA_FIELD.	
4	UICC → T	Respond CLT frame with CLT_CMD field set to 10000, without a DATA_FIELD.	RQ2, RQ5, RQ6, RQ9 RQ11

5.8.6 CLT Frame Interpretation

5.8.6.1 CLT frames with Type A aligned DATA_FIELD

5.8.6.1.1 Conformance requirements

Reference: TS 102 613 [1], clause 11.5.1.

RQ1	When the UICC receives a CLT frame with Type A aligned DATA_FIELD, the bit count shall be retrieved implicitly from the length of the CLT PAYLOAD, where the interpretation rule is defined as table 11.2 in TS 102 613 [1].
RQ2	When the UICC sends a CLT frame with Type A aligned DATA_FIELD, the size of the CLT PAYLOAD shall be determined according to table 11.3 in TS 102 613 [1] and the number of RF bits to be sent.
RQ3	The UICC instructs the CLF to send N full bytes plus N parity bits over the RF by sending a CLT frame with a CLT PAYLOAD of a size determined according to table 11.3 based on DATA_FIELD of (N × 9) bits in a Type A aligned manner, for 1 ≤ N ≤ 25.
RQ4	The UICC instructs the CLF to send 4 bits over the RF by sending a CLT frame with a CLT PAYLOAD of a size of 1 byte, based on DATA_FIELD of 4 bits in a Type A aligned manner.

NOTE: Test cases for RQ1, RQ2, RQ3, RQ4 are out of scope of the present document, as the UICC can hardly be triggered to fulfill the needs of a test case.

5.8.6.2 Handling of DATA_FIELD by the CLF

5.8.6.2.1 Conformance requirements

Reference: TS 102 613 [1], clause 11.5.2.

RQ1	If the condition not to respond is evaluated by the UICC, it shall send a CLF frame without a DATA_FIELD.
RQ2	If the condition to respond is evaluated by the UICC, it shall send a CLT frame with a DATA_FIELD of a size greater than zero bytes to the CLF.

NOTE: Test cases for RQ1, RQ2, RQ3, RQ4 are out of scope of the present document, as the UICC can hardly be triggered to fulfill the needs of a test case.

5.8.6.3 Handling of ADMIN_FIELD

5.8.6.3.1 CL_PROTO_INF(A)

5.8.6.3.1.1 Conformance requirements

Reference: TS 102 613 [1], clause 11.5.3.2.

RQ1	On receiving a CLT frame with ADMIN_FIELD CL_PROTO_INF(A), if the contents of the DATA_FIELD are a valid command for one of the RF protocols supported by the UICC, the UICC shall compute the response and send it to the CLF within a CLT frame.
RQ2	On receiving a CLT frame with ADMIN_FIELD CL_PROTO_INF(A), if the contents the DATA_FIELD are equal to ISO/IEC 14443-3 [6] command "HALT", the UICC shall reply with a CLT frame with the ADMIN_FIELD CL_GOTO_HALT.
RQ3	On receiving a CLT frame with ADMIN_FIELD CL_PROTO_INF(A), if the contents of DATA_FIELD are not a valid command for one of the RF protocols supported by the UICC or its not equal to ISO/IEC 14443-3 [6] command "HALT", the UICC shall send a CLT frame with the ADMIN_FIELD CL_GOTO_INIT.

5.8.6.3.1.2 Test case 1: Interpretation of CL_PROTO_INF(A)

This test case is carried out only if DUT manufacturer provides sufficient information about opening a CLT session and exchanging CLT frames in Type A aligned manner, and all parameters needed are present in the terminal.

5.8.6.3.1.2.1 Test execution

The test procedure shall be executed once for each of following parameters:

- There are no test case specific parameters for this test case.

5.8.6.3.1.2.2 Initial conditions

- The SWP interface is activated and no more communication is expected.

5.8.6.3.1.2.3 Test procedure

Step	Direction	Description	RQ
1	T → UICC	Send CLT frame with CL_PROTO_INF(A) in the ADMIN_FIELD and a valid command (see note 1) for one of the RF protocols supported by the UICC in the DATA_FIELD.	
2	UICC → T	Respond CLT frame with CLT_CMD field set to 00000 and at least 1 byte of data in the CLT PAYLOAD field.	RQ1
3	T → UICC	Send CLT frame with CL_PROTO_INF(A) in the ADMIN_FIELD and the "HALT" command as per ISO/IEC 14443-3 [6] in the DATA_FIELD.	
4	UICC → T	Respond CLT frame with CLT_CMD field set to 00010 (i.e. ADMIN_FIELD set to CL_GOTO_HALT) (see note 2).	RQ2
5	T → UICC	Send CLT frame with CL_PROTO_INF(A) in the ADMIN_FIELD and a command not representing either "HALT" as per ISO/IEC 14443-3 [6] or a valid command (see note 1) for one of the RF protocols supported by the UICC in the DATA_FIELD.	
6	UICC → T	Respond CLT frame with CLT_CMD field set to 00001 (i.e. ADMIN_FIELD set to CL_GOTO_INIT) (see note 2).	RQ3
NOTE 1: This command shall be chosen in a way, that the UICC responds data with respect to RF, and without requesting a transition to "HALT" or "IDLE" state as per ISO/IEC 14443-3 [6].			
NOTE 2: DATA_FIELD may be present or not.			

5.8.6.3.2 CL_PROTO_INF(F)

5.8.6.3.2.1 Conformance requirements

Reference: TS 102 613 [1], clause 11.5.3.2.

RQ1	On receiving a CLT frame with ADMIN_FIELD CL_PROTO_INF(F), and in case the error detection code (RF CRC) and the LEN byte are correct and the received DATA_FIELD does not match with the applications available on the UICC, the UICC shall send a CLT frame without a DATA_FIELD to the CLF within 1 150 μ s.
RQ2	On receiving a CLT frame with ADMIN_FIELD CL_PROTO_INF(F), and in case the error detection code and the LEN byte are correct and the received DATA_FIELD matches with the applications available on the UICC, the UICC shall respond with an CLT frame containing the ISO/IEC 18092 [8] 212 kbps/424 kbps passive mode initialization response frame ("POLLING RESPONSE", including the LEN and RF CRC field) encapsulated in the DATA_FIELD, within 1 150 μ s.
RQ3	On receiving a CLT frame with ADMIN_FIELD CL_PROTO_INF(F), and in case an error with respect to ISO/IEC 18092 [8] 212 kbps/424 kbps passive mode is detected, the UICC shall send a CLT frame without a DATA_FIELD to the CLF within 1 150 μ s.

NOTE: Development of test cases for RQ1 to RQ3 is FFS.

5.8.6.3.3 CL_GOTO_INIT and CL_GOTO_HALT

Reference: TS 102 613 [1], clause 11.5.3.2.

There are no conformance requirements for the UICC for the referenced clause.

5.8.7 CLT Protocol Rules

5.8.7.1 Rules for the CLF

Reference: TS 102 613 [1], clause 11.6.1.

There are no conformance requirements for the UICC for the referenced clause.

5.8.7.2 Rules for the UICC

5.8.7.2.1 Conformance requirements

Reference: TS 102 613 [1], clause 11.6.2.

RQ1	The UICC shall not send a CLT frame before having received a CLT frame with the ADMIN_FIELD set to CL_PROTO_INF(A) or CL_PROTO_INF(F).
RQ2	The UICC shall interpret a received CLT frame with the ADMIN_FIELD set to CL_PROTO_INF(A) or CL_PROTO_INF(F) as condition to open a new CLT session and to close any former CLT session.
RQ3	After having received a CLT frame with the ADMIN_FIELD set to CL_PROTO_INF(A), subsequently sent CLT frames within the CLT session shall be coded in Type A aligned manner.
RQ4	During a CLT session, the UICC shall ignore a corrupted SWP frame.
RQ5	During a CLT session, the UICC shall ignore received CLT frames if the ADMIN_FIELD contains a value which is reserved for future use.
RQ6	During a CLT session, the UICC shall ignore received CLT frames if the length of the DATA_FIELD indicated for a Type A aligned CLT frame is invalid.

NOTE 1: RQ1 is a non-occurrence RQ.

NOTE 2: Test cases for RQ2 are given also in clause 5.6.3.2 and subclauses of the present document.

NOTE 3: Development of test cases for RQ1 to RQ6 is FFS.

5.9 Timing and performance

Reference: TS 102 613 [1], clause 12.

There are no conformance requirements for the UICC for the referenced clause.

Annex A (informative): State diagrams

A.1 SDL symbols definition

All symbols (except „State“) used are available in Microsoft Visio 2003, SDL Diagram Shapes (Metric)

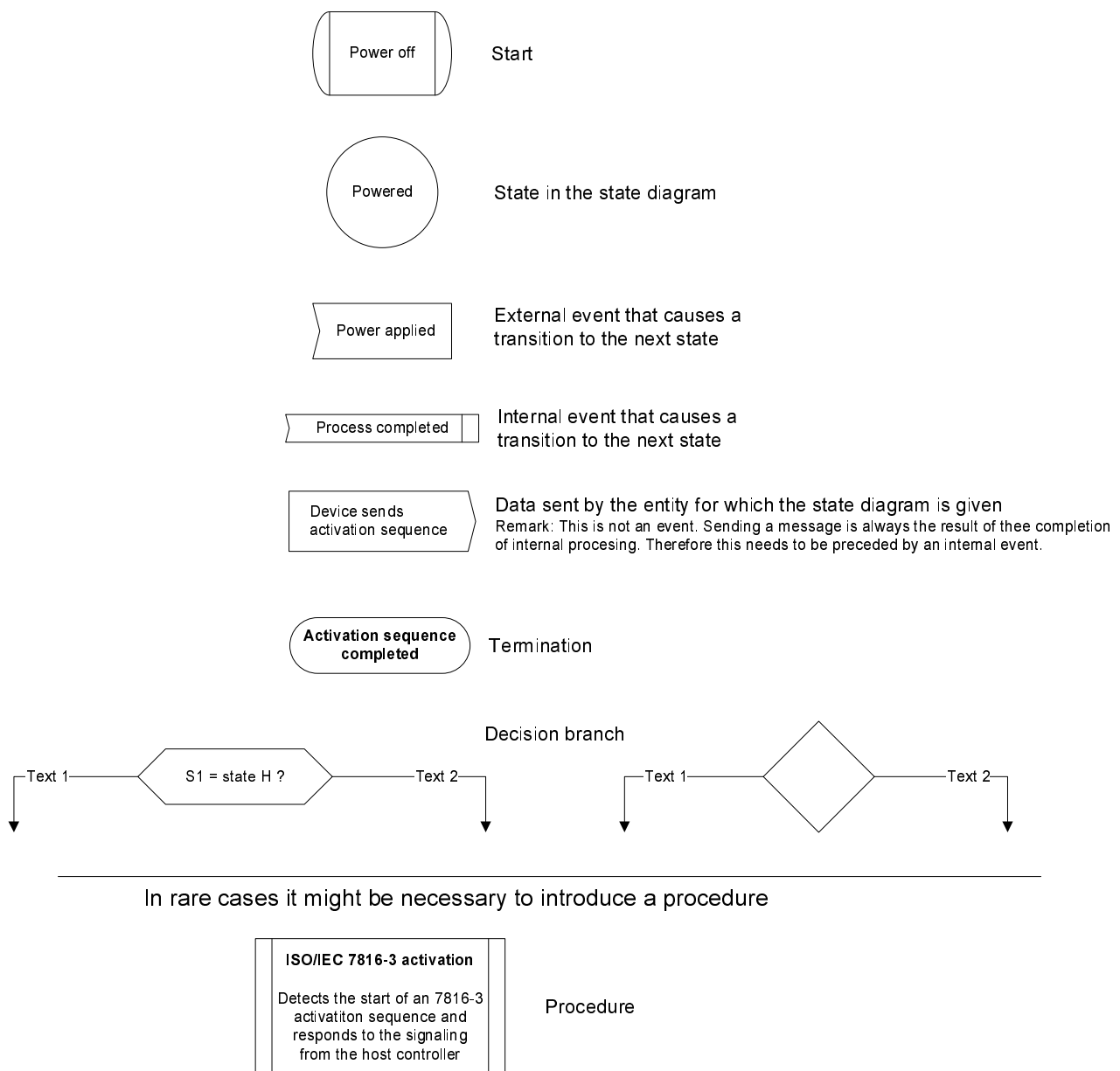


Figure A.1.1: SDL symbols definition

A.2 Initial SWP interface activation

This clause describes part of TS 102 613 [1], clause 6.2.3.1 in SDL notation.

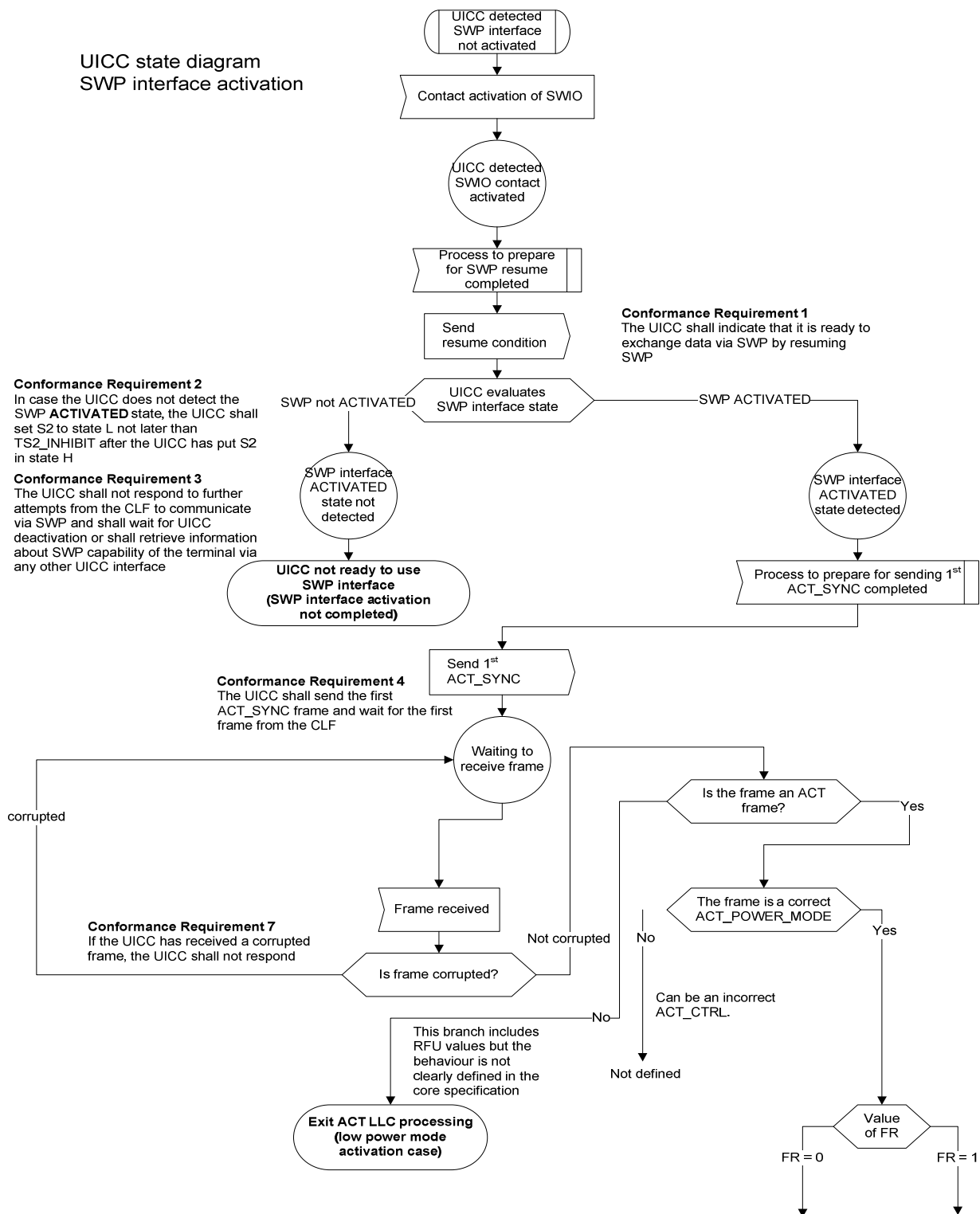


Figure A.2.1: Initial SWP interface activation, part 1

Conformance Requirement 6
 If the UICC has received a correct ACT_POWER_MODE and the FR bit of this frame is 0 then the UICC shall respond with an ACT_READY frame

Conformance Requirement 5
 If the UICC has received a correct ACT_POWER_MODE and the FR bit of this frame is 1, then the UICC shall repeat the last ACT frame it had sent

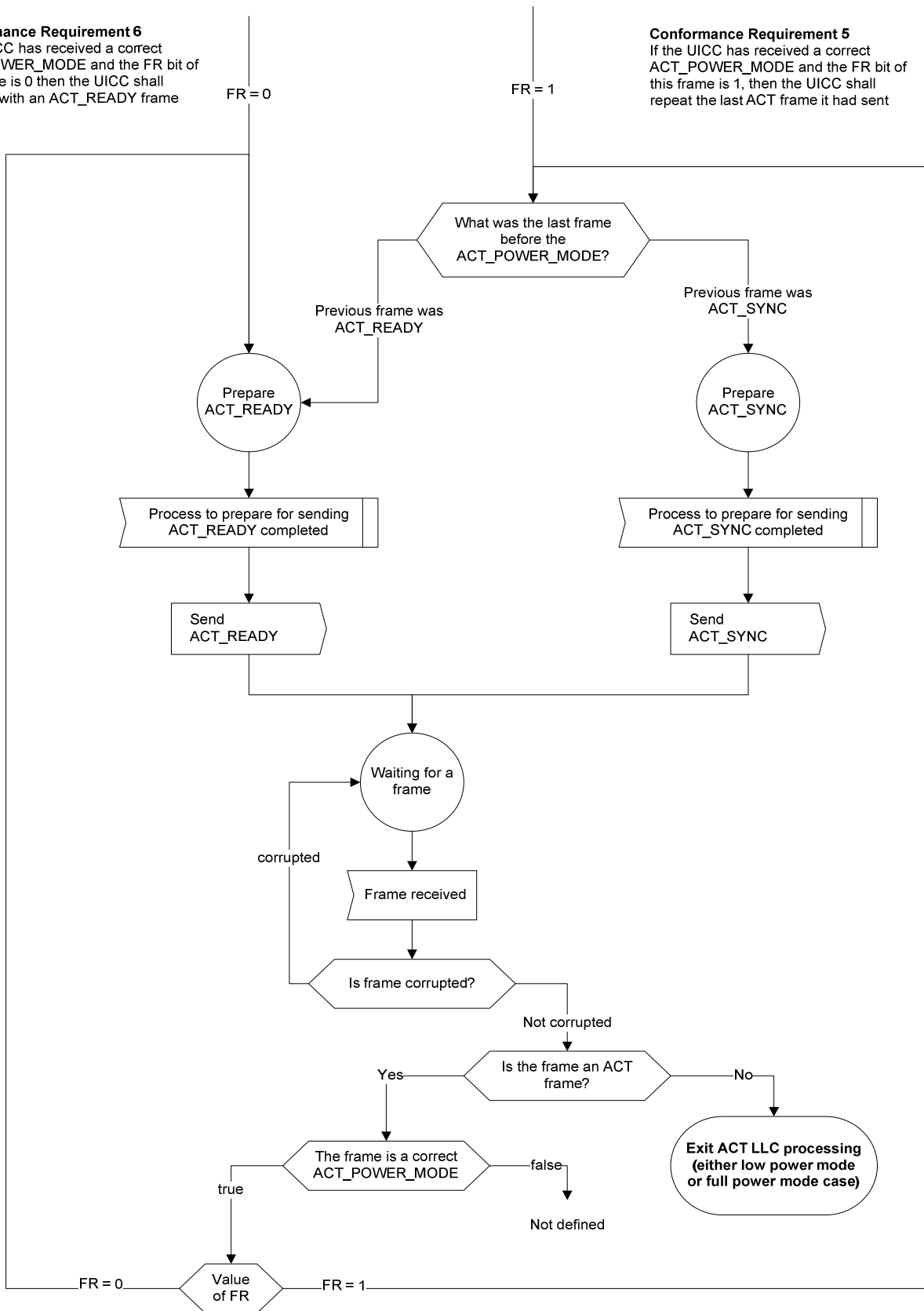


Figure A.2.2: Initial SWP interface activation, part 2

A.3 SHDLC operation

This clause describes part of TS 102 613 [1], clause 10 in SDL notation.

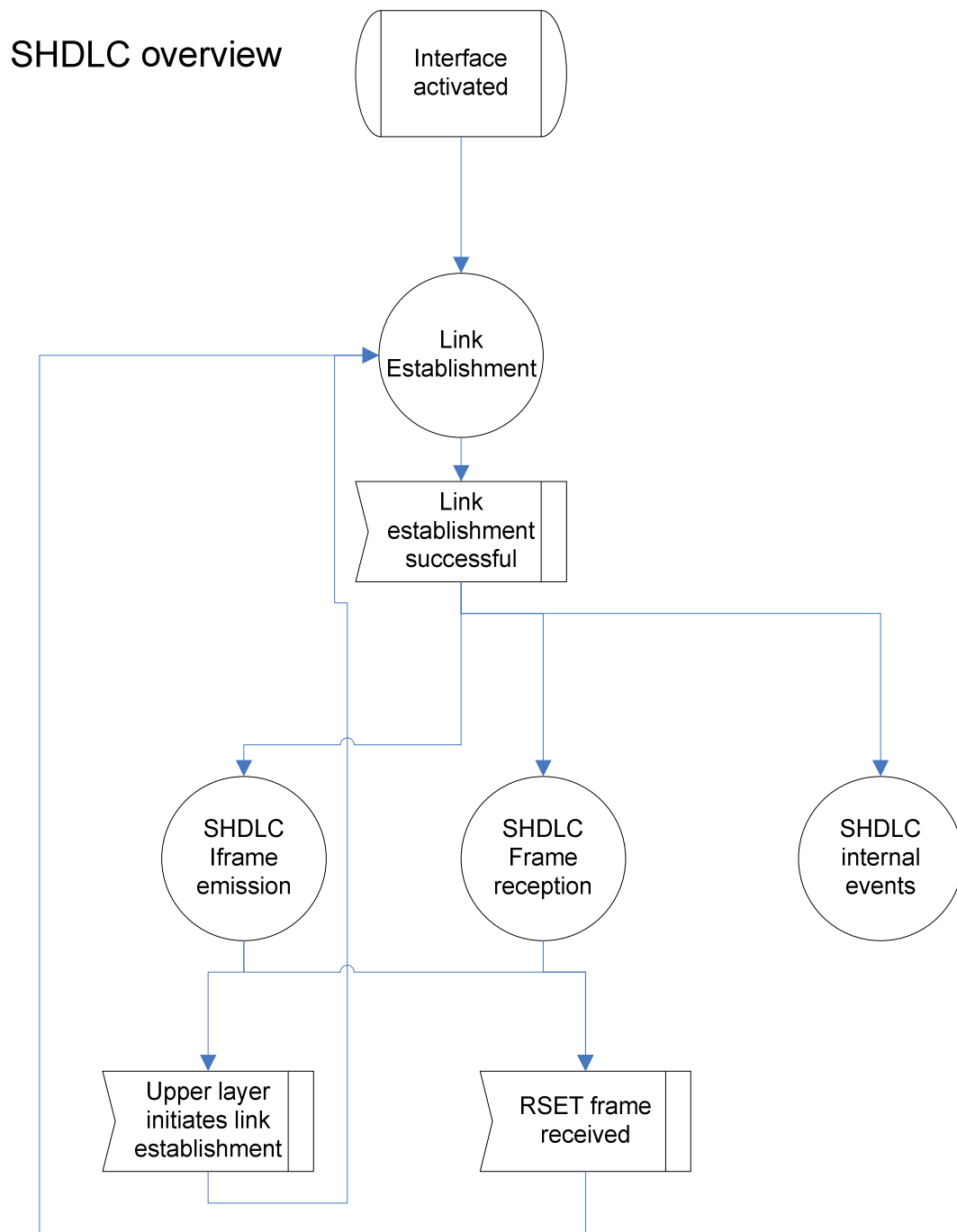


Figure A.3.1: SHDLC overview

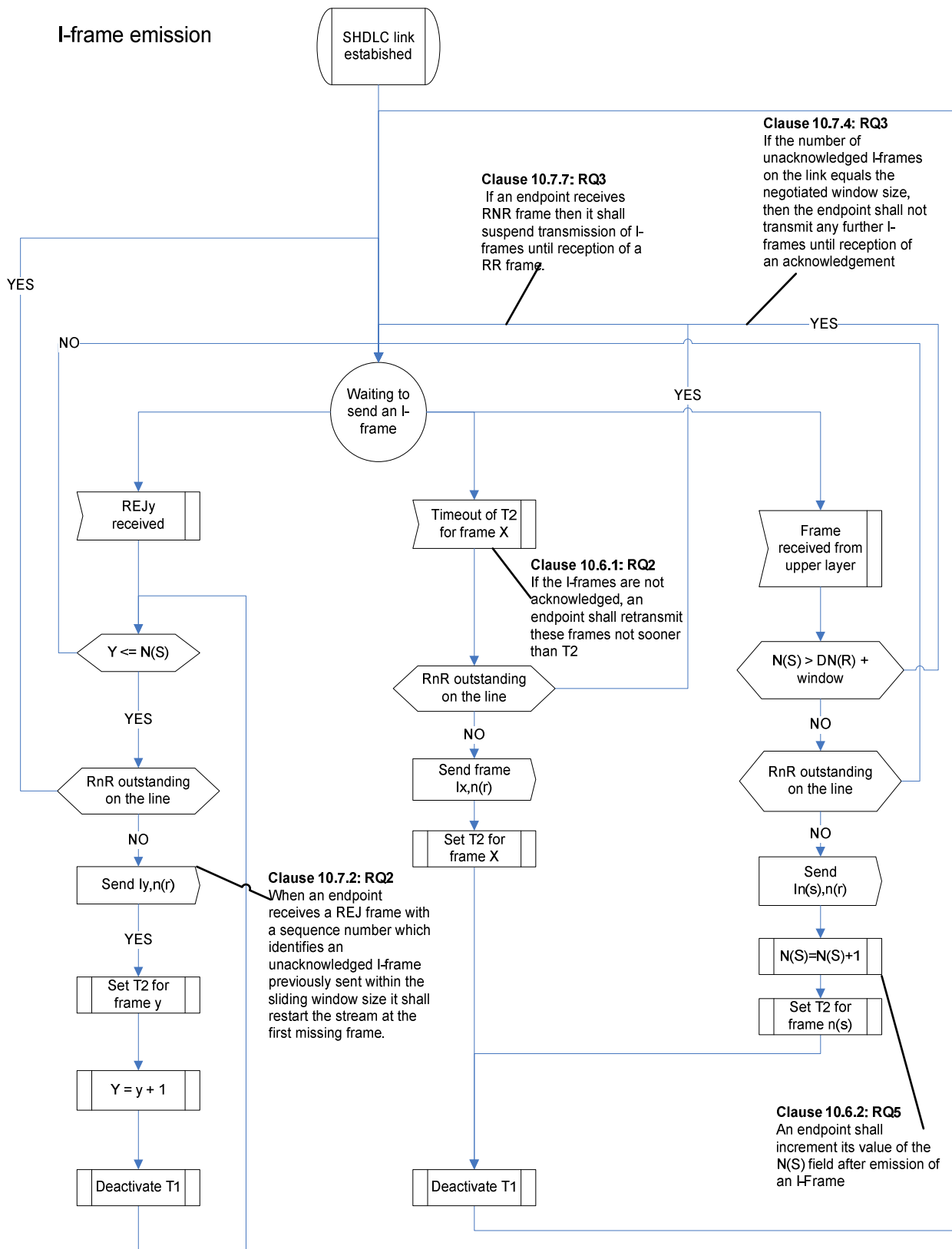


Figure A.3.3: I-frame emission

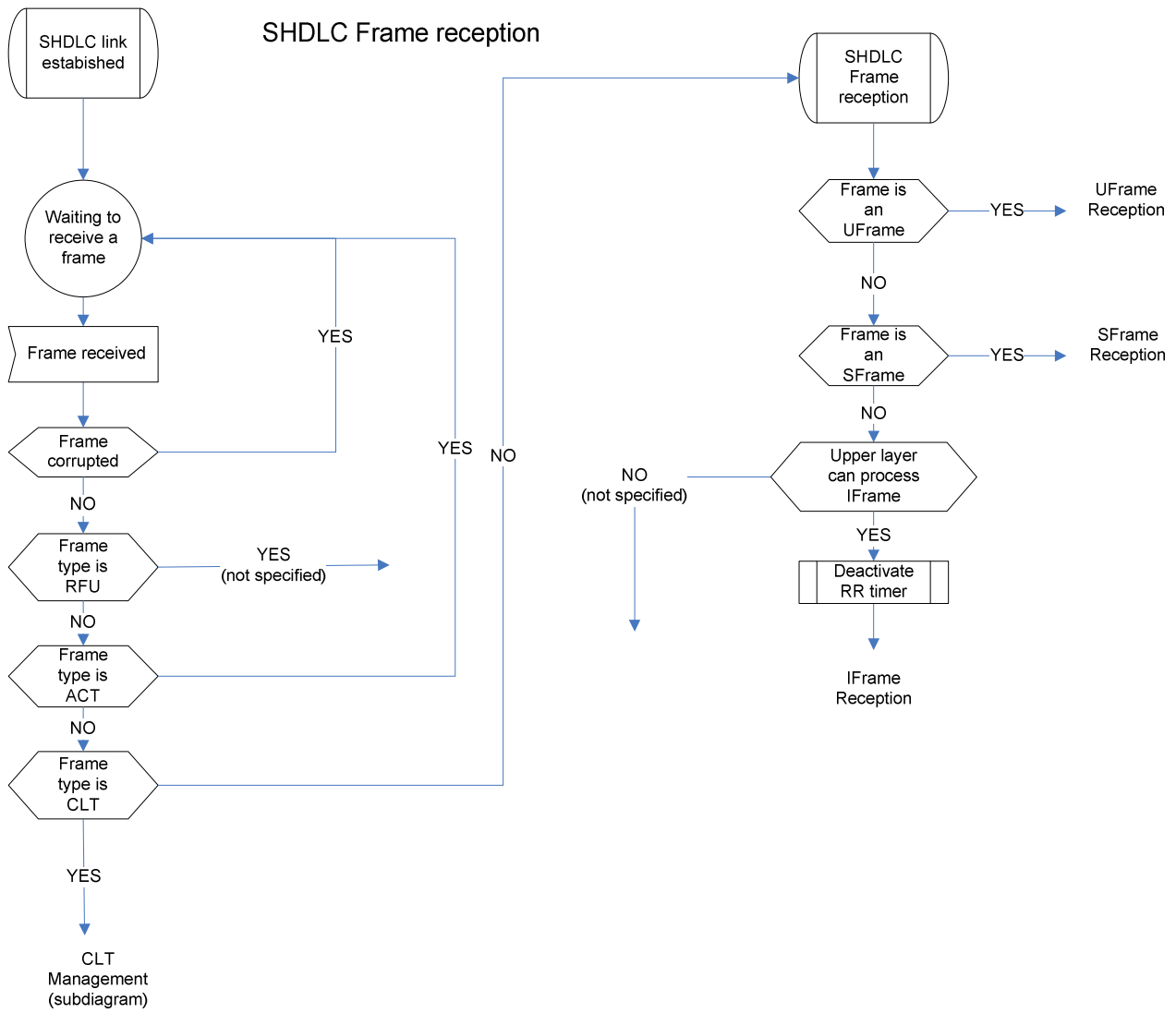


Figure A.3.4: SHDLC frame reception

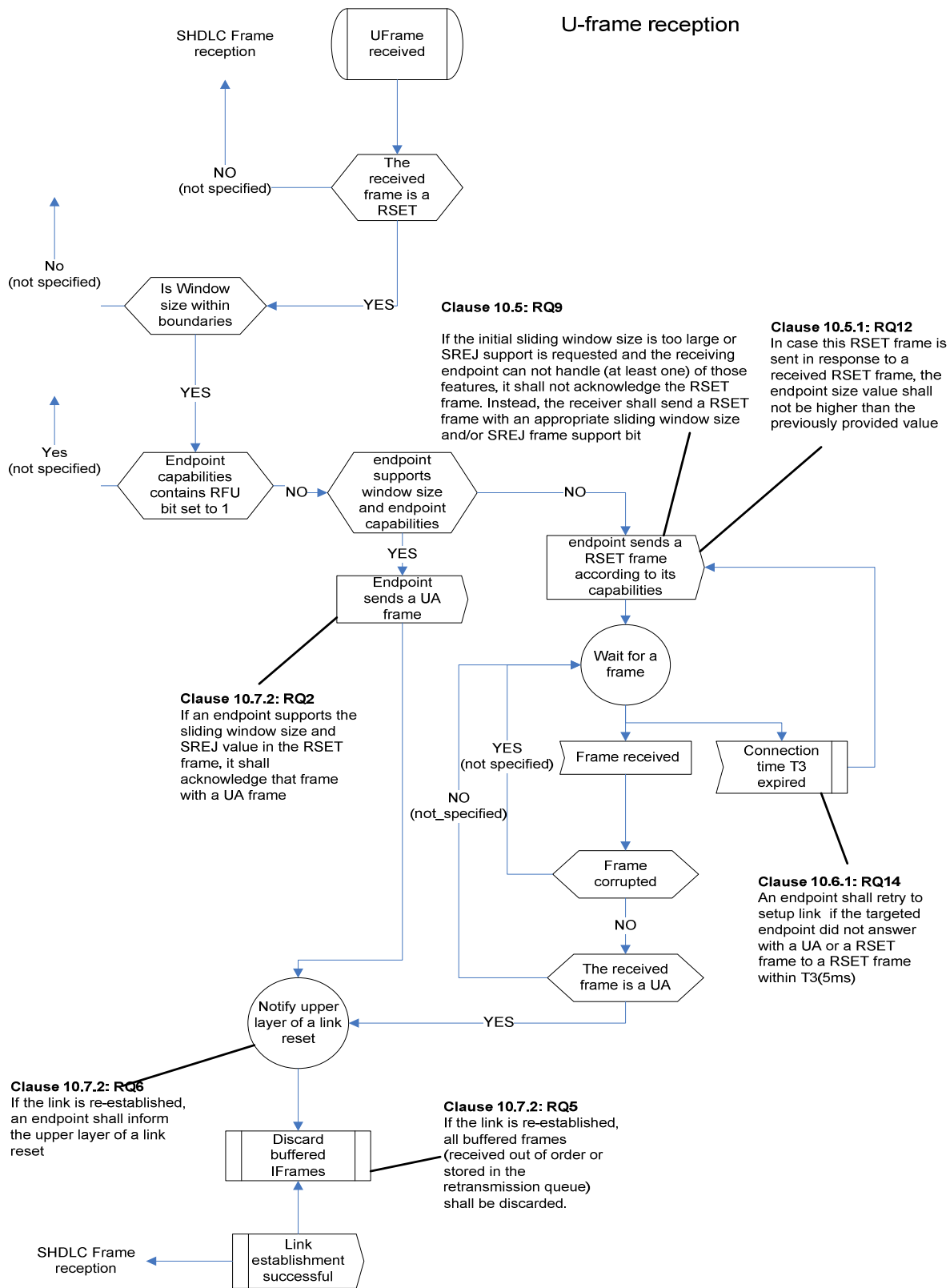


Figure A.3.5: U-frame reception

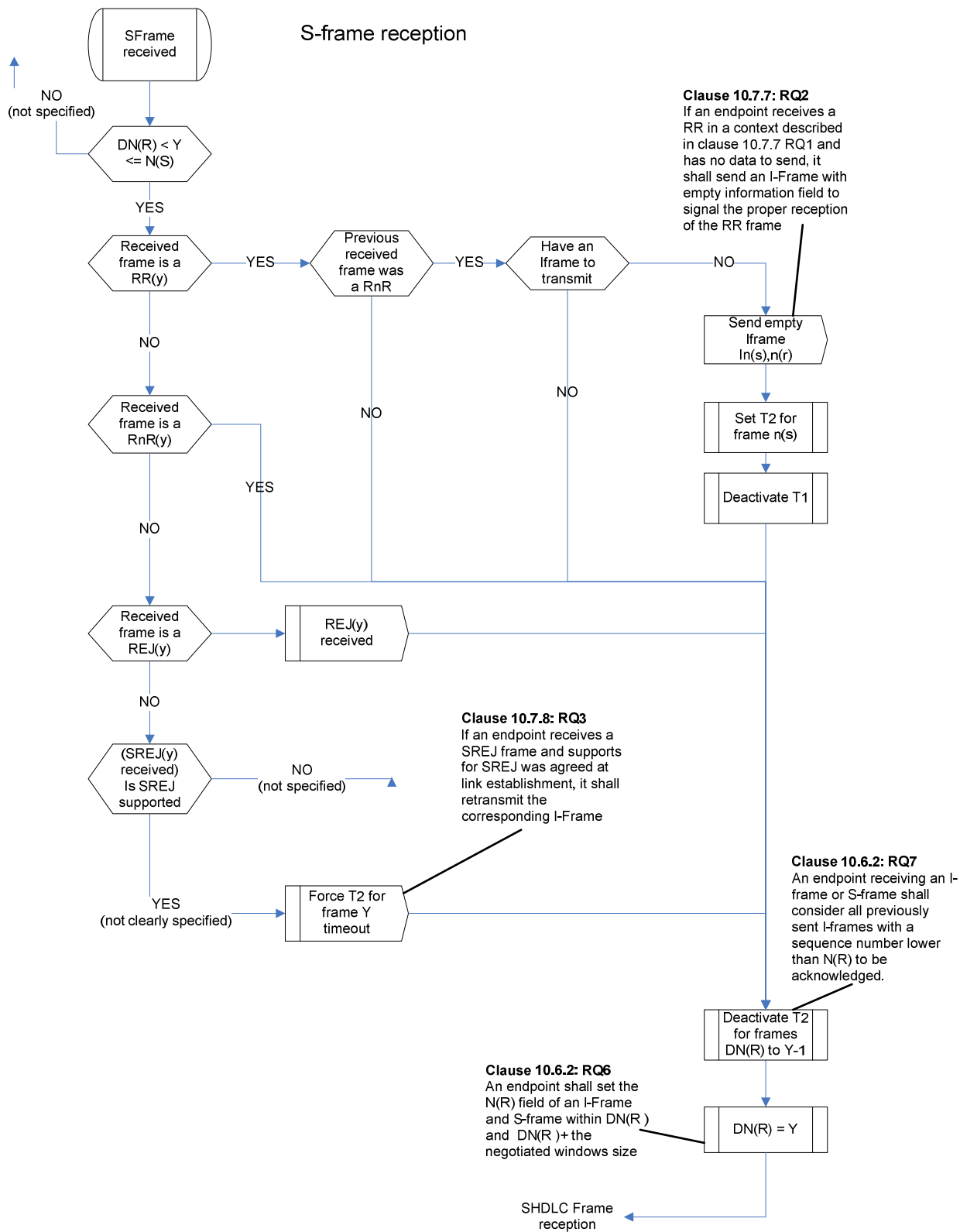


Figure A.3.6: S-frame reception

SHDLC internal events

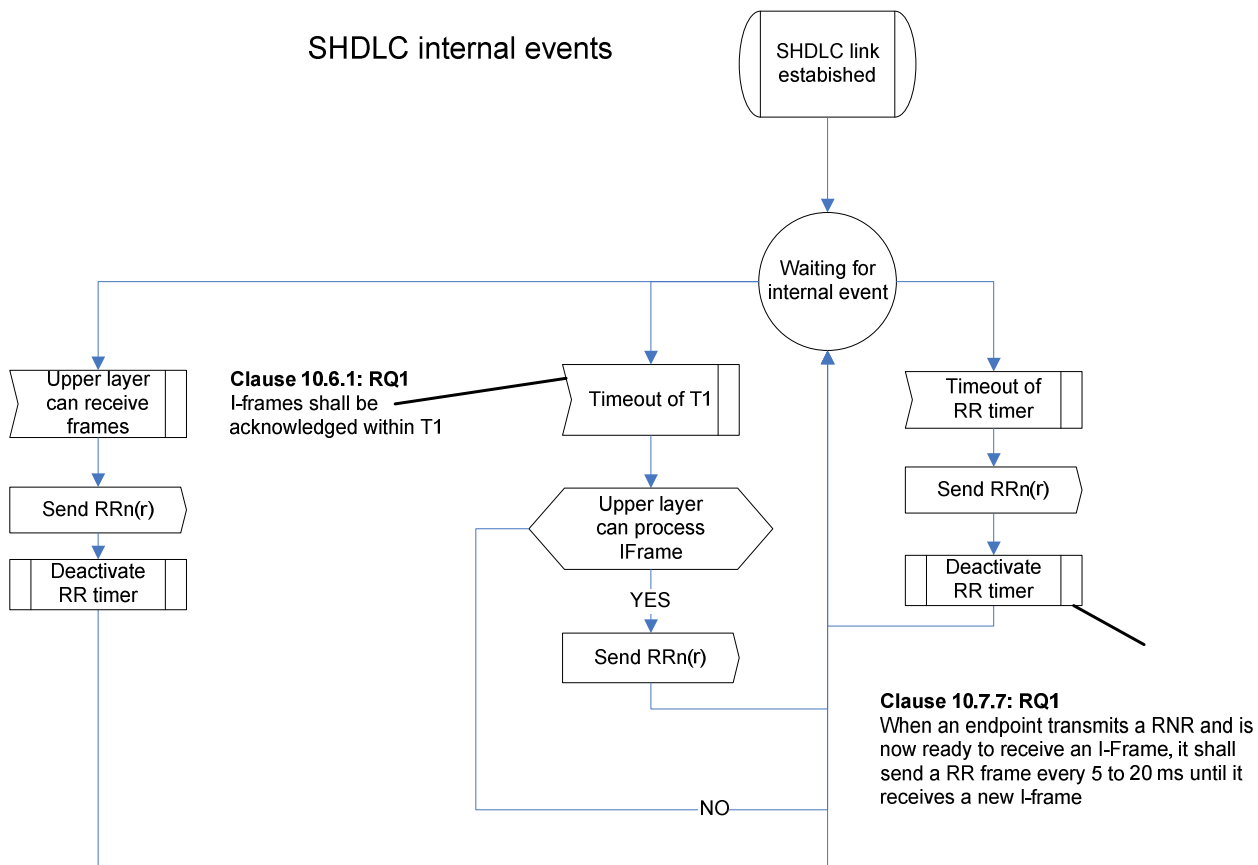


Figure A.3.8: SHDLC internal events

Annex B (informative): Bibliography

- ISO/IEC 14443-4: "Identification cards - Contactless integrated circuit cards - Proximity cards - Part 4: Transmission protocol".

Annex C (informative): Change history

The table below indicates all changes that have been incorporated into the present document since it was placed under change control.

Change history								
Date	Meeting	Plenary Doc	CR	Rev	Cat	Subject/Comment	Old	New
2009-07	SCP #42	SCP-090254				Creation of the specification	2.4.0	7.0.0
2009-10	SCP #43	SCP-090315	001	-	F	Test Case 5.3.2.3.3: initial activation in low power mode with corrupted frames	7.0.0	7.1.0
		SCP-090315	002	-	F	Correction of the RQ verification of TC 4: 'Communication with frames - idle bits and wakeup sequence'	7.0.0	7.1.0
		SCP-090315	003	2	F	Addition of test cases fro CLT LLC definition	7.0.0	7.1.0
		SCP-090315	004		F	Changes with respect to TS 102 221 interface	7.0.0	7.1.0
2010-03	SCP #44	SCP(10)0066	005	1	D	Editorial corrections	7.0.0	7.1.0
		SCP(10)0067	006	1	F	Modify test case 5.2.4.5 and adding new test cases 5.2.4.x and 5.2.4.y	7.0.0	7.1.0
		SCP(10)0068	007	1	F	Reword RQ6 in clause 5.7.7.5	7.0.0	7.1.0
		SCP(10)0069	008	1	F	Correct test case 5.7.7.6.3	7.0.0	7.1.0
		SCP(10)0070	009	1	F	Modified 5.2.4.2 to start clock in middle of frame exchange	7.0.0	7.1.0
		SCP(10)0071	010	1	F	Modification of 5.2.4.4/5 to send ISO command after SWP deactivation	7.0.0	7.1.0
		SCP(10)0072	011	1	F	Updated 5.3.2.3.6 to test both with and without activation of TS 102 221 interface	7.0.0	7.1.0
		SCP(10)0073	012	1	F	Loosened test equipment timing constraints in 5.7.1.X	7.0.0	7.1.0
		SCP(10)0074	013	1	D	Various editorial corrections	7.0.0	7.1.0
		SCP(10)0075	014	1	F	Updated test cases for activation / corrupted frames to send subsequent frames in order to check for response	7.0.0	7.1.0
		SCP(10)0076	015	1	F	Correction of tests wrongly implying an ACT_POWER_MODE after a correct ACT_SYNC in low power mode	7.0.0	7.1.0
		SCP(10)0077	016	1	F	5.5.1.3 - removal of redundant test execution parameters	7.0.0	7.1.0
		SCP(10)0078	017	1	F	5.6.2.3.9: removal of redundant and unclearly specified test case	7.0.0	7.1.0
		SCP(10)0079	018	1	F	Correction of test case 5.6.2.2.4	7.0.0	7.1.0
2010-07	SCP #45	SCP(10)0119	019	-	F	Removal of test case in 5.3.2.3.15	7.1.0	7.2.0
		SCP(10)0119	020	-	F	Addition of specific max. time for 'no response'	7.1.0	7.2.0
		SCP(10)0119	022	-	F	Delete test case 5.6.2.1.2	7.1.0	7.2.0
		SCP(10)0119	023	-	F	Addition of new test case to test RQ5 from TS 102 694-2, clause 5.5.1.1 and remove this RQ from the related test cases	7.1.0	7.2.0
		SCP(10)0119	024	-	F	Removal of duplication/invalid execution parameters in activation tests	7.1.0	7.2.0
		SCP(10)0119	025	-	F	Correction of test case 5.7.7.8.	7.1.0	7.2.0
		SCP(10)0119	026	-	F	Improved testing of idle bits	7.1.0	7.2.0
		SCP(10)0119	027	-	F	Change of usage of 10 I-frames throughout specification to 9 I-frames	7.1.0	7.2.0
		SCP(10)0119	029	-	F	Test case 5.6.4.1.6: removal of redundant parameter	7.1.0	7.2.0
		SCP(10)0119	030	-	F	ACT_INFORMATION in ACT_SYNC during initial interface activation made mandatory	7.1.0	7.2.0
		SCP(10)0119	031	-	F	Correction of Terminal Capability support to be optional	7.1.0	7.2.0
		SCP(10)0119	032	-	F	Test case 5.7.1.2: correction of ambiguous text	7.1.0	7.2.0
		SCP(10)0119	033	-	F	Test case 5.4.1.2.2: correction of ATR test	7.1.0	7.2.0
		SCP(10)0119	035	-	F	Test case 5.7.7.3.4: consistency of window size support	7.1.0	7.2.0
SCP(10)0119	021	-	F	Update of SHDLC test cases to align with TS 102 694-1	7.1.0	7.2.0		
SCP(10)0119	028	1	F	HCP message fragmentation	7.1.0	7.2.0		
SCP(10)0119	034	1	F	Clarification of O_WS_3	7.1.0	7.2.0		
2010-10	SCP #46	SCP(10)0222	016	-	F	Removal of execution parameter in test cases 'interpretation of incorrect formatted frames'	7.2.0	7.3.0

History

Document history		
V7.0.0	October 2009	Publication
V7.1.0	April 2010	Publication
V7.2.0	October 2010	Publication
V7.3.0	January 2011	Publication