



**Intelligent Transport Systems (ITS);
RTTT;**

**Test specifications for High Data Rate (HDR) data
transmission equipment operating in the 5,8 GHz ISM band;
Part 2: Application Layer;**

Sub-Part 2: Test Suite Structure and Test Purposes (TSS & TP)

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Intelligent Transport Systems (ITS).

The present document is part 2, sub-part 2 of a multi-part deliverable covering the test specifications for High Data Rate (HDR) Dedicated Short Range Communication (DSRC).

Full details of the entire series can be found in part 2-1 [2].

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

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1 Scope

The present document contains the Test Suite Structure (TSS) and Test Purposes (TP) to test the Dedicated Short Range Communication (DSRC) High Data Rate (HDR) Application Layer.

The objective of the present document is to provide a basis for conformance tests for DSRC-HDR equipment specified in ETSI ES 200 674-1 [1] giving a high probability of inter-operability between different manufacturer's equipment.

The ISO standard for the methodology of conformance testing ISO/IEC 9646-1 [3] is used as a basis for the test methodology.

2 References

2.1 Normative 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 referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <https://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.

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

- [1] ETSI ES 200 674-1: "Intelligent Transport Systems (ITS); Road Transport and Traffic Telematics (RTTT); Dedicated Short Range Communications (DSRC); Part 1: Technical characteristics and test methods for High Data Rate (HDR) data transmission equipment operating in the 5,8 GHz Industrial, Scientific and Medical (ISM) band".
- [2] ETSI TS 102 708-2-1: "Intelligent Transport Systems (ITS); RTTT; Test specifications for High Data Rate (HDR) data transmission equipment operating in the 5,8 GHz ISM band; Part 2: Application Layer; Sub-Part 1: Protocol Implementation Conformance Statement (PICS) proforma specification".
- [3] ISO/IEC 9646-1 (1994): "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 1: General concepts".

2.2 Informative references

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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 and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in ETSI ES 200 674-1 [1] and ISO/IEC 9646-1 [3] apply.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI ES 200 674-1 [1] and ISO/IEC 9646-1 [3] apply.

4 Test Suite Structure

4.1 Structure

Table 1 shows the application layer test suite structure (TSS) including its groups defined for the conformance testing.

Table 1: Test suite structure for DSRC-HDR application layer

Group	Type of system under test (SUT)	Behaviour
Kernel unit	On Board Unit	Valid behaviour
		Invalid behaviour
Read access	Road Side Unit	Valid behaviour
	On Board Unit	Invalid behaviour
Write access	Road Side Unit	Valid behaviour
	On Board Unit	Invalid behaviour
Optional functionality	Road Side Unit	Valid behaviour
	On Board Unit	Invalid behaviour
Security	Road Side Unit	Valid behaviour
	On Board Unit	Invalid behaviour
Integrity constraints	Road Side Unit	Valid behaviour
	On Board Unit	Invalid behaviour

4.2 Test groups

There are six test groups defined for the application layer of DSRC-HDR as presented in table 1.

4.3 Type of SUT

Two types of systems under test (SUT) are distinguished, i.e. on board units (OBUs) and road side units (RSUs).

4.4 Behaviour test groups

4.4.1 Valid behaviour tests

Valid behaviour tests shall verify that the IUT reacts in conformity with the base standard [1], after receipt or exchange of valid protocol data units (PDUs). "Valid PDU" means that the exchange of messages and the content of the exchanged messages are considered as valid, i.e. compliant with the base standard.

4.4.2 Invalid behaviour tests

Invalid behaviour tests shall verify that the IUT reacts in conformity with the base standard [1], after receipt of a syntactically invalid protocol data unit (PDU).

5 Test purposes

5.1 Introduction

5.1.1 Definition conventions

Test purposes (TPs) are defined following particular rules as presented in table 2.

Table 2: TP definition rules

TP ID	Title:
	Reference:
	PICS Selection:
	TC Reference:
	Initial condition:
Stimulus and Expected behaviour:	

TP ID	The TP ID is a unique identifier. It shall be specified according to the TP naming conventions defined in the clause below.
Title	Short description of test purpose objective.
Reference	The reference should contain the references of the subject to be validated by the actual TP (specification reference, clause and paragraph).
PICS Selection	Reference to the PICS statement involved for selection of the TP. Contains a Boolean expression. Only those ICS statements are shown that are explicitly related to the test.
TC reference	Shows the reference number of the related test case in the ATS.
Initial condition	The condition defines in which initial state the IUT has to be to apply the actual TP.
Stimulus and Expected behaviour	Definition of the events the tester performs, and the events that are expected from the IUT to conform to the base specification.

5.1.2 Naming conventions

The identifier of the TP is built according to table 3.

Table 3: TP naming convention

Identifier	TP/<sut>/<layer>/<group>/<x>/<n>		
	<sut> = Type of SUT	OBU	On Board Unit
		RSU	Road Side Unit
	<layer>	AL	Application Layer
		<group>	KU
	RA		Read Access
	WA		Write Access
	OF		Optional Functionality
	IC		Integrity Constraints
	SC		Security
	x = Type of testing		BV
		BI	Invalid Behaviour Test
	<n> = sequential number	>0	<n> = sequential number
	NOTE: All tests specified in the present document are application layer tests. The term <layer> in the TP identifier is used to have a consistent TP reference covering also the tests on the data link layer provided in a separate part of this multi-part deliverable.		

5.1.3 Sources of TP definitions

All TPs are specified according to the base standard ETSI ES 200 674-1 [1].

5.1.4 General reference

All references in the test purposes, if not stated differently, are indicating clauses of the base standard ETSI ES 200 674-1 [1].

All references to PICS are indicating tables in ETSI TS 102 708-2-1 [2].

5.1.5 General conditions

For all TPs related to OBUs the following pre-conditions shall apply, if not defined differently for a specific TP:

- The SUT (OBU) shall be ready for communication, i.e. it shall not be in sleep mode and all boot processes shall be finalized.
- The "AP Invocation Identifier" used in the SUT shall be as defined by the applicant.
- "Responding Mode" used in the SUT (RSU) shall be set to "response-slow-speed", if not required differently for a specific TP.
- The SUT (OBU) shall have no active association with the tester (RSU).

For all TPs related to RSUs, the following general conditions shall apply, if not defined differently for a specific TP:

- The SUT (RSU) shall provide means which allow issuing requests for APDUs to be transmitted.
- Repetition of a request message shall be possible only in case a reply was not received within due time.

NOTE: From this it follows that repetitive or periodic request messages are disabled in the SUT.

Additional pre-conditions may apply for specific TPs.

5.1.6 Default PICS selection

For all TPs related to OBUs the following PICS selections shall apply in addition to those specified for a specific TP:

- Tables A.1, A.3, A.5/1, A.5/2, A5/3 and A.5/7 of the PICS [2] shall be implicitly selected for all TPs.

For all TPs related to RSUs the following PICS selections shall apply in addition to those specified for a specific TP:

- Tables B.1, B.3, B.5, B.6/1, B.6/4, B.9/1, B.9/2, B.9/3 and B.9/7 of the PICS [2] shall be implicitly selected for all TPs.

Further PICS selections may apply as specified for a specific TP. These either select options of the base standard [1] or give hints on the major properties to be tested.

5.1.7 Presentation conventions

Concatenation of directives in a single frame shall be indicated with the symbol |.

EXAMPLE: Concatenation of Open-Rq with Close-Rq is presented as
Open-Rq | Close-Rq,
with Open-Rq sent first.

5.2 Test purposes for on-board units

5.2.1 Kernel Unit

5.2.1.1 Valid behaviour

TP/OBU/AL/KU/BV/01	Verify that the IUT can handle Open-Rq
	Reference: Clauses 11.5.2, 11.5.3, 11.6.1, 11.6.2, 11.6.3 and 11.6.4
	PICS Selection: Table A.4/1 AND Table A.4/2 AND Table A.4/3 AND Table A.4/4
Initial conditions	
with { the IUT being in the "initial state" }	
Expected behaviour	
ensure that { when { the IUT receives a valid Open-Rq with new private LinkID and an "AP Invocation Identifier" having a valid value as specified by the applicant } then { the IUT issues a response with "Result" set to '06'H and "Diagnostic" set to '00'H and with "AP Invocation Identifier" having the same value as received } }	

TP/OBU/AL/KU/BV/02	Verify that the IUT can handle Close-Rq
	Reference: Clauses 11.5.2, 11.5.3, 11.6.1, 11.6.2, 11.6.3 and 11.6.4
	PICS Selection: Table A.4/1 AND Table A.4/2 AND Table A.4/3 AND Table A.4/4
Initial conditions	
with { the IUT being in the "initial state" and the IUT having received a valid Open-Rq with new private LinkID and a valid "AP Invocation Identifier" and the IUT having issued a response with "Result" set to '06'H and "Diagnostic" set to '00'H }	
Expected behaviour	
ensure that { when { the IUT receives a valid Close-Rq with LinkID having the same value as in the initial conditions } then { the IUT issues a response with "Result" set to '06'H and "Diagnostic" set to '00'H and with "AP Invocation Identifier" having the same value as received } }	

TP/OBU/AL/KU/BV/03	Verify that the IUT can handle Open-Rq and Close-Rq
	Reference: Clauses 11.5.2, 11.5.3, 11.6.1, 11.6.2, 11.6.3 and 11.6.4
	PICS Selection: Table A.4/1 AND Table A.4/2 AND Table A.4/3 AND Table A.4/4
Initial conditions	
with { the IUT being in the "initial state" }	
Expected behaviour	
ensure that { when { the IUT receives a valid Open-Rq Close-Rq with new private LinkID } then { the IUT issues a response with "Result" set to '06'H and "Diagnostic" set to '00'H and with "AP Invocation Identifier" having the same value as received } }	

TP/OBU/AL/KU/BV/04	Verify that the IUT can handle Select-TBA-Id-Rq
	Reference: Clauses 11.5.4, 11.6.1, 11.6.2 and 11.6.5
	PICS Selection: Table A.4/5 AND Table A.4/6
	TC reference:
	Initial condition:
Initial conditions	
with { the IUT being in the "initial state" and the IUT having received a valid Open-Rq Close-Rq with new private LinkID and the IUT having issued a response with "Result" set to '06'H and "Diagnostic" set to '00'H }	
Expected behaviour	
ensure that { when { the IUT receives a valid Open Select-TBA-Id-Rq Close-Rq with new private LinkID and with "Responding AP Title" set equal to the value of "Called AP Title" as sent in the initial conditions } then { the IUT issues a response with "Result" set to '06'H and "Diagnostic" set to '00'H } }	

5.2.1.2 Invalid behaviour

TP/OBU/AL/KU/BI/01	Verify that the IUT can manage Select-TBA-Id-Rq with an invalid length
	Reference: Clauses 11.5.4, 11.6.1, 11.6.2 and 11.6.5
	PICS Selection: Table A.4/5 AND Table A.4/6
Initial conditions	
with { the IUT being in the "initial state" and the IUT having received a valid Open-Rq Close-Rq with new private LinkID and the IUT having issued a response with "Result" set to '06'H and "Diagnostic" set to '00'H }	
Expected behaviour	
ensure that { when { the IUT receives a Open Select-TBA-Id-Rq Close-Rq with new private LinkID and with "Responding AP Title" set equal to the value of "Called AP Title" as sent in the initial conditions, but with an invalid value of "Length" } then { the IUT issues a response with "Result" set to '15'H and "Diagnostic" set to '04'H } }	

TP/OBU/AL/KU/BI/02	Verify that the IUT supporting the EETS profile can manage Select-TBA-Id-Rq with an invalid value
	Reference: Clauses 11.5.4, 11.6.1, 11.6.2, 11.6.5 and D.2.2
	PICS Selection: Table A.4/5 AND Table A.4/6 AND Table A.2/1
Initial conditions	
with { the IUT being in the "initial state" and the IUT having received a valid Open-Rq Close-Rq with new private LinkID and the IUT having issued a response with "Result" set to '06'H and "Diagnostic" set to '00'H }	
Expected behaviour	
ensure that { when { the IUT receives a valid Open Select-TBA-Id-Rq Close-Rq with new private LinkID and with "Responding AP Title" set equal to a value different to "Called AP Title" as sent in the initial conditions } then { the IUT does not respond } }	

TP/OBU/AL/KU/BI/03	Verify that the IUT not supporting the EETS profile can manage Select-TBA-Id-Rq with an invalid value
	Reference: Clauses 11.5.4, 11.6.1, 11.6.2 and 11.6.5
	PICS Selection: Table A.4/5 AND Table A.4/6 AND NOT Table A.2/1
Initial conditions	
with { the IUT being in the "initial state" and the IUT having received a valid Open-Rq Close-Rq with new private LinkID and the IUT having issued a response with "Result" set to '06'H and "Diagnostic" set to '00'H }	
Expected behaviour	
ensure that { when { the IUT receives a valid Open Select-TBA-Id-Rq Close-Rq with new private LinkID and with "Responding AP Title" set equal to a value different to "Called AP Title" noted previously } then { the IUT does not respond OR the IUT responds with "Result" set to '15'H and "Diagnostic" set to '05'H } }	

TP/OBU/AL/KU/BI/04	Verify that the IUT handles an invalid application identifier
	Reference: Clauses 11.5.2, 11.5.3, 11.6.1, 11.6.2, 11.6.3 and 11.6.4
	PICS Selection: Table A.4/1 AND Table A.4/2 AND Table A.4/3 AND Table A.4/4
Initial conditions	
with { the IUT being in the "initial state" }	
Expected behaviour	
ensure that { when { the IUT receives a valid Open-Rq with new private LinkID and an invalid "AP Invocation Identifier" (different from valid values specified by the applicant) } then { the IUT issues a response with "Result" set to '15'H and "Diagnostic" set to '06'H } }	

5.2.2 Read access

5.2.2.1 Valid behaviour

TP/OBU/AL/RA/BV/01	Verify that the IUT can manage Open-Rq Read-Master-Core-Rq Close-Rq
	Reference: Clauses 11.5.6, 11.6.2 and 11.6.7
	PICS Selection: Table A.4/9 AND Table A.4/10
Initial conditions	
with { the IUT being in the "initial state" }	
Expected behaviour	
ensure that { repeat with different private LinkID and different combinations of "Offset" and "Length" parameters in order to cover the whole Master Core when { the IUT receives a valid Open-Rq Read-Master-Core-Rq Close-Rq with new private LinkID and with valid combinations of "Offset" and "Length" in Read-Master-Core-Rq in order to retrieve a part of or the whole master core } then { the IUT issues a response with "Result" set to '06'H and "Diagnostic" set to '00'H, and with the data of "Read-Master-Core-Rs" as specified by the applicant for the selected range } }	

TP/OBU/AL/RA/BV/02	Verify that the IUT can manage Read-Master-Core-Rq with broadcast LinkID
	Reference: Clauses 11.5.6, 11.6.2 and 11.6.7
	PICS Selection: Table A.4/9 AND Table A.4/10
Initial conditions	
with { the IUT being in the "initial state" }	
Expected behaviour	
ensure that { repeat with different combinations of "Offset" and "Length" parameters in order to cover the whole Master Core when { the IUT receives a valid Read-Master-Core-Rq with broadcast LinkID and with valid combinations of "Offset" and "Length" in Read-Master-Core-Rq in order to retrieve a part of or the whole master core } then { the IUT issues a response with "Result" set to '06'H and "Diagnostic" set to '00'H, and with the data of "Read-Master-Core-Rs" as specified by the applicant for the selected range } }	

TP/OBU/AL/RA/BV/03	Verify that the IUT can manage Open-Rq Get-Master-Record-Rq Close-Rq with no support for security level 1
	Reference: Clauses 11.5.7, 11.6.2 and 11.6.8
	PICS Selection: Table A.4/11 AND Table A.4/12 AND NOT Table A.2/3
Initial conditions	
with { the IUT being in the "initial state" }	
Expected behaviour	
ensure that { repeat with different private LinkID and different combinations of "Offset" and "Length" parameters in order to cover the whole Master Record when { the IUT receives a valid Open-Rq Get-Master-Record-Rq Close-Rq with new private LinkID and with valid combinations of "Offset" and "Length" in Get-Master-Record-Rq in order to retrieve a part of or the whole master record } then { the IUT issues a response with "Result" set to '06'H and "Diagnostic" set to '00'H, and with the data of "Get-Master-Record-Rs" as specified by the applicant for the selected range } }	

TP/OBU/AL/RA/BV/04	Verify that the IUT can manage Open-Rq Read-Appl-Core-Rq Close-Rq with no support for security level 1
	Reference: Clauses 11.5.8, 11.6.2 and 11.6.9
	PICS Selection: Table A.4/13 AND Table A.4/14 AND NOT Table A.2/3
Initial conditions	
with { the IUT being in the "initial state" }	
Expected behaviour	
ensure that { repeat with different private LinkID and different combinations of "Offset" and "Length" parameters in order to cover the whole Application Core when { the IUT receives a valid Open-Rq Read-Appl-Core-Rq Close-Rq with new private LinkID and with valid combinations of "Offset" and "Length" in Read-Appl-Core-Rq in order to retrieve a part of or the whole application core } then { the IUT issues a response with "Result" set to '06'H and "Diagnostic" set to '00'H, and with the data of "Read-Application-Core-Rs" as specified by the applicant for the selected range } }	