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*Technical Specification*

**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 Common Application  
Service Elements;  
Sub-Part 2: Test Suite Structure and Test Purposes (TSS&TP)**

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# Contents

Intellectual Property Rights .....	4
Foreword.....	4
1 Scope .....	5
2 References .....	5
2.1 Normative references .....	5
2.2 Informative references.....	5
3 Definitions and abbreviations.....	6
3.1 Definitions.....	6
3.2 Abbreviations .....	6
4 Test Suite Structure .....	6
4.1 Structure .....	6
4.2 Test groups .....	6
4.3 Type of SUT.....	6
4.4 Behaviour test groups.....	6
4.4.1 Valid behaviour tests .....	6
4.4.2 Invalid behaviour tests .....	7
5 Test purposes.....	7
5.1 Introduction .....	7
5.1.1 Definition conventions.....	7
5.1.2 Naming conventions .....	7
5.1.3 Sources of TP definitions.....	8
5.1.4 General reference.....	8
5.1.5 General conditions .....	8
5.1.6 Default PICS selection.....	8
5.1.7 Presentation conventions .....	8
5.2 Test purposes for on-board units .....	9
5.2.1 Kernel Unit .....	9
5.2.1.1 Valid behaviour tests.....	9
5.2.1.2 Invalid behaviour tests .....	9
5.2.2 Read access .....	10
5.2.3 Write Access.....	12
5.2.4 Optional functionality.....	16
5.2.4.1 Valid behaviour tests.....	16
5.2.4.2 Invalid behaviour tests .....	17
5.2.5 Integrity constraints .....	17
5.3 Test purposes for road side units.....	22
5.3.1 Kernel Unit .....	22
5.3.2 Read access.....	22
5.3.3 Write access.....	23
5.3.4 Optional functionality.....	24
<b>Annex A (informative): Test coverage matrix .....</b>	<b>26</b>
A.1 Introduction .....	26
A.2 OBU .....	26
A.3 RSU .....	28
History .....	30

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## Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Intelligent Transport System (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].

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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 Common Application Service Elements.

The objective of this test specification is to provide a basis for conformance tests for DSRC-HDR equipment specified in [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.

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# 2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific.

- For a specific reference, subsequent revisions do not apply.
- Non-specific reference may be made only to a complete document or a part thereof and only in the following cases:
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## 2.1 Normative references

The following referenced documents are indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

- [1] ETSI ES 200 674-1: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); 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 Common Application Service Elements; Sub-Part 1: Protocol Implementation Conformance Statement (PICS) proforma specification".
- [3] ISO/IEC 9646-1 (1991): "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 1: General concepts".

## 2.2 Informative references

The following referenced documents are not essential to the use of the present document but they assist the user with regard to a particular subject area. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Not applicable.

## 3 Definitions and abbreviations

### 3.1 Definitions

For the purpose of the present document, the terms and definitions given in [1] and [3] apply.

### 3.2 Abbreviations

For the purpose of the present document, the abbreviations given in [1] and [3] apply.

## 4 Test Suite Structure

### 4.1 Structure

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

**Table 1: Test suite structure for DSRC-HDR application layer common application service elements**

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

### 4.2 Test groups

There are five test groups defined for the application layer common application service elements 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**

<b>TP ID</b>	Title:
	Reference:
	ICS Selection:
	TC Reference:
	Initial condition:
Stimulus and Expected behaviour:	

<b>TP ID</b>	The TP ID is a unique identifier. It shall be specified according to the TP naming conventions defined in the clause below.
<b>Title</b>	Short description of test purpose objective.
<b>Reference</b>	The reference should contain the references of the subject to be validated by the actual TP (specification reference, clause, paragraph).
<b>PICS Selection</b>	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.
<b>TC reference</b>	Shows the reference number of the related test case in the ATS.
<b>Initial condition</b>	The condition defines in which initial state the IUT has to be to apply the actual TP.
<b>Stimulus and Expected behaviour</b>	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	Data Link Layer
		<group>	KU
	RA		Read Access
	WA		Write Access
	OF		Optional Functionality
	IC		Integrity Constraints
	x = Type of testing	BV	Valid Behaviour Test
		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 ES 200 674 [1].

### 5.1.4 General reference

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

All references to PICS are indicating tables in part 2 sub-part 1 [2] of this multi-part deliverable.

### 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.2, A.4/1, A.4/2 and A.4/3 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.2, B.4/1, B.4/2 and B.4/3 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 tests

<b>TP/OBU/AL/KU/BV/01</b>	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.3/1 AND Table A.3/2 AND Table A.3/3 AND Table A.3/4
	TC reference:
	Initial condition:
Stimulus and Expected Behaviour:	
<ol style="list-style-type: none"> <li>1) Tester sends Open-Rq with new private LinkID.</li> <li>2) Verify reception of a response with "Result" set to '06'H and "Diagnostic" set to '00'H and with "AP Invocation Identifier" having the same value as used in step 1).</li> <li>3) Tester sends Close-Rq with LinkID as used in step 1).</li> <li>4) Verify reception of a response with "Result" set to '06'H and "Diagnostic" set to '00'H and with "AP Invocation Identifier" having the same value as used in step 3).</li> <li>5) Tester sends Open-Rq   Close-Rq with new private LinkID.</li> <li>6) Verify reception of a response with "Result" set to '06'H and "Diagnostic" set to '00'H and with "AP Invocation Identifier" having the same value as used in step 5).</li> </ol>	

<b>TP/OBU/AL/KU/BV/02</b>	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.3/5 AND Table A.3/6
	TC reference:
	Initial condition:
Stimulus and Expected Behaviour:	
<ol style="list-style-type: none"> <li>1) Tester sends Open-Rq   Close-Rq with new private LinkID.</li> <li>2) Verify reception of a response message with "Result" set to '06'H and "Diagnostic" set to '00'H. Note the value of "Called AP Title".</li> <li>3) Tester sends 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" noted in step 2).</li> <li>4) Verify reception of a response message with "Result" set to '06'H and "Diagnostic" set to '00'H.</li> </ol>	

#### 5.2.1.2 Invalid behaviour tests

<b>TP/OBU/AL/KU/BI/01</b>	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.3/5 AND Table A.3/6
	TC reference:
	Initial condition:
Stimulus and Expected Behaviour:	
<ol style="list-style-type: none"> <li>1) Tester sends Open-Rq   Close-Rq with new private LinkID.</li> <li>2) Verify reception of a response message with "Result" set to '06'H and "Diagnostics" set to '00'H. Note the value of "Called AP Title".</li> <li>3) Tester sends 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" noted in step 2), but giving a wrong value of "Length".</li> <li>4) Verify reception of a response message with "Result" set to '06'H and "Diagnostic" set to '05'H.</li> </ol>	

<b>TP/OBU/AL/KU/BI/02</b>	Verify that the IUT 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.3/5 AND Table A.3/6
	TC reference:
	Initial condition:
Stimulus and Expected Behaviour:	
<ol style="list-style-type: none"> <li>1) Tester sends Open-Rq   Close-Rq new private LinkID.</li> <li>2) Verify reception of a response message with "Result" set to '06'H and "Diagnostic" set to '00'H. Note the value of "Called AP Title".</li> <li>3) Tester sends 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 in step 2), but with correct value of "Length".</li> <li>4) Verify reception of a response message with "Result" set to '06'H and "Diagnostic" set to '05'H.</li> </ol>	

## 5.2.2 Read access

<b>TP/OBU/AL/RA/BV/01</b>	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.3/9 AND Table A.3/10
	TC reference:
	Initial condition:
Stimulus and Expected Behaviour:	
<ol style="list-style-type: none"> <li>1) Tester sends 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.</li> <li>2) Verify reception of a response message 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.</li> <li>3) Repeat steps 1) and 2) for different valid combinations of "Offset" and "Length" in order to cover the whole master core, each with new private LinkID.</li> </ol>	

<b>TP/OBU/AL/RA/BV/02</b>	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.3/9 AND Table A.3/10
	TC reference:
	Initial condition:
Stimulus and Expected Behaviour:	
<ol style="list-style-type: none"> <li>1) Tester sends 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.</li> <li>2) Verify reception of a response message 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.</li> <li>3) Repeat steps 1) and 2) for different valid combinations of "Offset" and "Length" in order to cover the whole master core.</li> </ol>	

<b>TP/OBU/AL/RA/BV/03</b>	Verify that the IUT can manage Open-Rq   Read-Appl-Core-Rq   Close-Rq
	Reference: Clauses 11.5.7, 11.6.2 and 11.6.8
	PICS Selection: Table A.3/11 AND Table A.3/12
	TC reference:
	Initial condition:
Stimulus and Expected Behaviour:	
<ol style="list-style-type: none"> <li>1) Tester sends 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.</li> <li>2) Verify reception of a response message with "Result" set to '06'H and "Diagnostic" set to '00'H, and with the data of "Read-Appl-Core-Rs" as specified by the applicant for the selected range.</li> <li>3) Repeat steps 1) and 2) for different valid combinations of "Offset" and "Length" in order to cover the whole application core, each with new private LinkID.</li> </ol>	

<b>TP/OBU/AL/RA/BV/04</b>	Verify that the IUT can manage Read-Appl-Core-Rq with broadcast LinkId
	Reference: Clauses 11.5.7, 11.6.2 and 11.6.8
	PICS Selection: Table A.3/11 AND Table A.3/12
	TC reference:
Initial condition:	
Stimulus and Expected Behaviour:	
<ol style="list-style-type: none"> <li>1) Tester sends Read-Appl-Core-Rq with broadcast LinkID with valid combinations of "Offset" and "Length" in Read-Appl-Core-Rq in order to retrieve a part of or the whole application core.</li> <li>2) Verify reception of a response message with "Result" set to '06'H and "Diagnostic" set to '00'H, and with the data of "Read-Appl-Core-Rs" as specified by the applicant for the selected range.</li> <li>3) Repeat steps 1) and 2) for different valid combinations of "Offset" and "Length" in order to cover the whole application core.</li> </ol>	

<b>TP/OBU/AL/RA/BV/05</b>	Verify that the IUT can manage Open-Rq   Read-Appl-Record-Rq   Close-Rq
	Reference: Clauses 11.5.10, 11.6.2 and 11.6.11
	PICS Selection: Table A.3/17 AND Table A.3/18
	TC reference:
Initial condition:	
Stimulus and Expected Behaviour:	
<ol style="list-style-type: none"> <li>1) Tester sends Open-Rq   Read-Appl-Record-Rq   Close-Rq with new private LinkID and with valid combinations of "Offset" and "Length" in Read-Appl-Record-Rq in order to retrieve a part of or the whole application record.</li> <li>2) Verify reception of a response message with "Result" set to '06'H and "Diagnostic" set to '00'H, and with the data of "Read-Appl-Record-Rs" as specified by the applicant for the selected range.</li> <li>3) Repeat steps 1) and 2) for different valid combinations of "Offset" and "Length" in order to cover the whole application record, each with new private LinkID.</li> </ol>	

<b>TP/OBU/AL/RA/BV/06</b>	Verify that the IUT can manage Read-Appl-Record-Rq with broadcast LinkId
	Reference: Clauses 11.5.10, 11.6.2 and 11.6.11
	PICS Selection: Table A.3/17 AND Table A.3/18
	TC reference:
Initial condition:	
Stimulus and Expected Behaviour:	
<ol style="list-style-type: none"> <li>1) Tester sends Read-Appl-Record-Rq with broadcast Link ID with valid combinations of "Offset" and "Length" in Read-Appl-Record-Rq in order to retrieve a part of or the whole application record.</li> <li>2) Verify reception of a response message with "Result" set to '06'H and "Diagnostic" set to '00'H, and with the data of "Read-Appl-Record-Rs" as specified by the applicant for the selected range.</li> <li>3) Repeat steps 1) and 2) for different valid combinations of "Offset" and "Length" in order to cover the whole application record.</li> </ol>	