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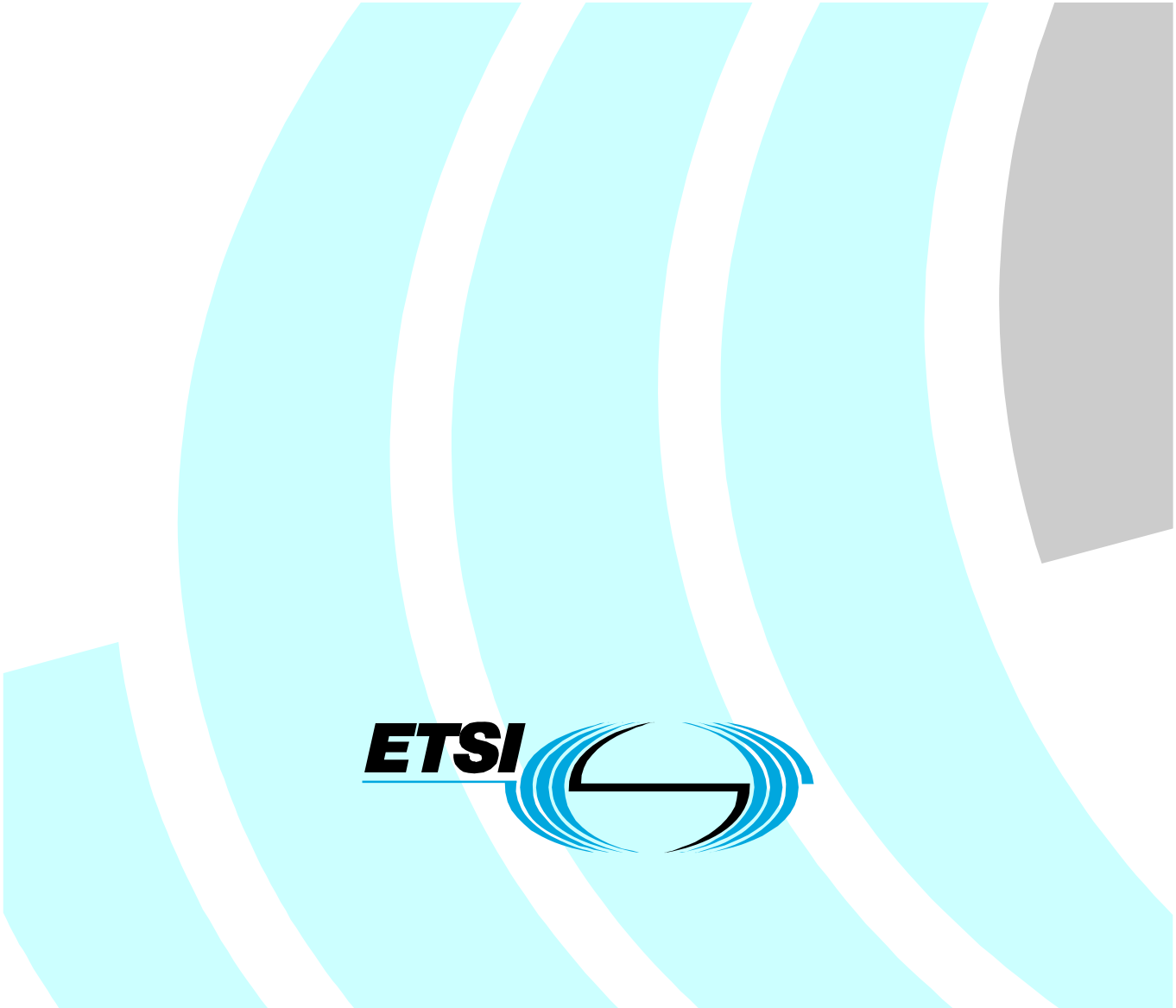
Technical Specification

Intelligent Transport Systems (ITS);
Testing;
Conformance test specification for
Co-operative Awareness Messages (CAM);
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 System (ITS).

The present document is part 2 of a multi-part deliverable covering Conformance test specification for Co-operative Awareness Messages (CAM) as identified below:

Part 1: "Test requirements and Protocol Implementation Conformance Statement (PICS) proforma";

Part 2: "Test Suite Structure and Test Purposes (TSS&TP)";

Part 3: "Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT)".

1 Scope

The present document provides the Test Suite Structure and Test Purposes (TSS&TP) for Co-operative Awareness Messages (CAM) as defined in TS 102 637-2 [1] in compliance with the relevant requirements and in accordance with the relevant guidance given in ISO/IEC 9646-7 [6].

The ISO standard for the methodology of conformance testing (ISO/IEC 9646-1 [3] and ISO/IEC 9646-2 [4]) as well as the ETSI rules for conformance testing (ETS 300 406 [7]) are used as a basis for the test methodology.

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.

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

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2.1 Normative references

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

[1] ETSI TS 102 637-2 (V1.2.1): "Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Part 2: Specification of Cooperative Awareness Basic Service".

[2] ETSI TS 102 868-1: "Intelligent Transport Systems (ITS); Testing; Conformance test specification for Co-operative Awareness Messages (CAM); Part 1: Test requirements and Protocol Implementation Conformance Statement (PICS) proforma".

[3] ISO/IEC 9646-1 (1994): "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 1: General concepts".

[4] ISO/IEC 9646-2 (1994): "Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework -- Part 2: Abstract Test Suite specification".

[5] ISO/IEC 9646-6 (1994): "Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework -- Part 6: Protocol profile test specification".

[6] ISO/IEC 9646-7 (1995): "Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework -- Part 7: Implementation Conformance Statements".

[7] ETSI ETS 300 406 (1995): "Methods for testing and Specification (MTS); Protocol and profile conformance testing specifications; Standardization methodology".

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.

[i.1] ETSI EG 202 798: "Intelligent Transport Systems (ITS); Testing; Framework for conformance and interoperability testing".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

- terms given in TS 102 637-2 [1];
- terms given in ISO/IEC 9646-6 [5] and in ISO/IEC 9646-7 [6].

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

BI	Invalid Behaviour
BV	Valid Behaviour
CAM	Co-operative Awareness Message
CAN	Controller Area Network
CLW	Confidence Station Length/Width
CRS	Crash Status
CUC	Curvature Change
DAG	Dangerous Goods
DOP	Door Open
DSL	Distance to Stop Line
EXL	Exterior Lights
INA	Information Adaptation
IPC	ITS Profile Checking
ITS	Intelligent Transportation Systems
IUT	Implementation Under Test
LBU	Light Bar in Use
MSG	Message Generation
MSP	Message Processing
OCC	Occupancy
PLD	PT Line Description
POA	Position Adaptation
PT	Public Transport
SCE	Schedule Deviation
SIU	Siren in Use
SUT	System Under Test
TAD	Turn Advice
TLP	Traffic Light Priority
TP	Test Purposes
TSS	Test Suite Structure
V2I	Vehicle-to-Infrastructure
V2V	Vehicle-to-Vehicle

4 Test Suite Structure (TSS)

4.1 Structure for CAM tests

Table 1 shows the CAM Test Suite Structure (TSS) including its subgroups defined for conformance testing.

Table 1: TSS for CAM

Root	Group	Sub-Group	category
CAM	Message generation		Valid behaviour
	ITS profile checking		Valid behaviour
	Information adaptation	Crash Status	Valid behaviour
		Dangerous goods	Valid behaviour
		Confidence station length/width	Valid behaviour
		Door open	Valid behaviour
		Distance To Stop Line	Valid behaviour
		Turn Advice	Valid behaviour
		Curvature Change	Valid behaviour
		Occupancy	Valid behaviour
		Light Bar In Use	Valid behaviour
		Siren In Use	Valid behaviour
		Traffic Light Priority	Valid behaviour
		Schedule Deviation	Valid behaviour
		PT Line Description	Valid behaviour
		Exterior Lights	Valid behaviour
	Position adaptation		Valid behaviour
	Message processing		Valid behaviour
			Invalid behaviour

The test suite is structured as a tree with the root defined as CAM. The tree is of rank 3 with the first rank a Group, the second a Sub-group, and the third a category. The third rank is the standard ISO conformance test categories.

4.2 Test groups

The test suite has a total of four levels. The first level is the root. The second level separates the root into various functional areas. The third level is the sub-functional areas if necessary. The fourth level is the standard ISO conformance test categories.

4.2.1 Root

The root identify the Co-operative Awareness Messages (CAM) given in TS 102 637-2 [1].

4.2.2 Groups

This level contains five functional areas identified as:

- Message Generation;
- ITS profile checking;
- Information adaptation;
- Position adaptation; and
- Message Processing.

4.2.3 Sub-Groups

This level contains fourteen sub-functional areas identified only for the Information adaptation group and defined as:

- Crash Status;
- Dangerous goods;
- Confidence station length/width;
- Door open;
- Distance To Stop Line;
- Turn Advice;
- Curvature Change;
- Occupancy;
- Light Bar In Use;
- Siren In Use;
- Traffic Light Priority;
- Schedule Deviation;
- PT Line Description; and
- Exterior Lights.

4.2.4 Categories

This level contains the standard ISO conformance test categories limited to the valid behaviour and the invalid behaviour.

5 Test Purposes (TP)

5.1 Introduction

5.1.1 TP definition conventions

The TP definition is built according to EG 202 798 [i.1].

5.1.2 TP Identifier naming conventions

The identifier of the TP is built according to table 2.

Table 2: TP naming convention

Identifier	TP/<root>/<gr>/<sgr>/<x>/<nn> or TP/<root>/<gr>/<x>/<nn> when no <sgr>		
	<root> = root	CAM	
	<gr> = group	MSG	Message Generation
		IPC	ITS profile checking
		INA	Information adaptation
		POA	Position adaptation
		MSP	Message Processing
	<sgr> =sub- group	CRS	Crash Status
		DAG	Dangerous goods
		CLW	Confidence station length/width
		DOP	Door open
		DSL	Distance To Stop Line
		TAD	Turn Advice
		CUC	Curvature Change
		OCC	Occupancy
		LBU	Light Bar In Use
		SIU	Siren In Use
		TLP	Traffic Light Priority
		SCE	Schedule Deviation
		PLD	PT Line Description
		EXL	Exterior Lights
	<x> = type of testing	BV	Valid Behaviour tests
		BI	Invalid Syntax or Behaviour Tests
	<nn> = sequential number		01 to 99

5.1.3 Rules for the behaviour description

The description of the TP is built according to EG 202 798 [i.1].

The base standards are not using finite state machine concept. As consequence, the test purposes use a generic "Initial State" that corresponds to a state where the IUT is ready for starting the test execution. Furthermore, the IUT shall be left in this "Initial State", when the test is completed.

Being in the "Initial State", no pending actions, which could disturb the execution of following test purposes, are left in the IUT.

5.1.4 Sources of TP definitions

All TPs are specified according to TS 102 637-2 [1].

5.1.5 Mnemonics for PICS reference

To avoid an update of all TPs when the PICS document is changed, the following table introduce mnemonics name and the correspondence with the real PICS item number.

Table 3: Mnemonics for PICS reference

Mnemonic	PICS item
PICS_BASICVEH	A.2/1 [2]
PICS_BASICIRS	A.3/1 [2]
PICS_EMERVEH	A.2/2 [2]
PICS_PUBTRANSVEH	A.2/3 [2]
PICS_DOOROPEN	A.16/29 [2]
PICS_LIGHTBARINUSE	A.16/3 [2]
PICS_SIRENEINUSE	A.16/4 [2]
PICS_DISTTOSTOPLINE	A.16/24 [2]
PICS_TURNADVICE	A.16/23 [2]
PICS_CURVCHANGE	A.16/33 [2]
PICS_OCCUPANCY	A.16/26 [2]
PICS_SCHEDULEDEVIATION	A.16/27 [2]
PICS_TRAFFICLIGHTPRIORITY	A.16/28 [2]
PICS_PTLINEDESCRIPTION	A.16/22 [2]

5.2 Test purposes for CAM

5.2.1 Message generation

TP Id	TP/CAM/MSG/BV/01
Test objective	Checks the minimum time interval between CAM generations
Reference	TS 102 637-2 [1], clause 5.1
PICS Selection	
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having sent a valid CAM message
}	

Expected behaviour	

ensure that {
the IUT sends a valid CAM message after expiry of the minimum timer interval
}	

TP Id	TP/CAM/MSG/BV/02
Test objective	Checks the maximum time interval between CAM generations in the default IUT state
Reference	TS 102 637-2 [1], clause 5.1
PICS Selection	
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having sent a valid CAM message
}	

Expected behaviour	

ensure that {
the IUT sends a valid CAM message before expiry of the maximum timer interval
}	

TP Id	TP/CAM/MSG/BV/03
Test objective	Checks that IUT generates CAM message according to the generation rules for heading
Reference	TS 102 637-2 [1], annex B
PICS Selection	PICS_BASICVEH or PICS_EMERVEH or PICS_PUBTRANSVEH
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
absolute difference between current heading (towards North) and last CAM heading > 4
}
then {
the IUT generates immediately a CAM message
}
}	

TP Id	TP/CAM/MSG/BV/04
Test objective	Checks that IUT generates CAM message according to the generation rules for position
Reference	TS 102 637-2 [1], annex B
PICS Selection	PICS_BASICVEH or PICS_EMERVEH or PICS_PUBTRANSVEH
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
distance between current position and last CAM position > 5 m
}
then {
the IUT generates immediately a CAM message
}
}	

TP Id	TP/CAM/MSG/BV/05
Test objective	Checks that IUT generates CAM message according to the generation rules for speed
Reference	TS 102 637-2 [1], annex B
PICS Selection	PICS_BASICVEH or PICS_EMERVEH or PICS_PUBTRANSVEH
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
absolute difference between current speed and last CAM speed > 1 m/s
}
then {
the IUT generates immediately a CAM message
}
}	

5.2.2 ITS profile checking

TP Id	TP/CAM/IPC/BV/01
Test objective	Checks that CAM message is formatted according to the basicVehicle profile
Reference	TS 102 637-2 [1], clauses 7.1 and 7.2
PICS Selection	PICS_BASICVEH
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having sent a CAM message
}	

Expected behaviour	

ensure that {
the IUT sends a valid basicVehicle CAM message
containing the protocolVersion indicating "0",
containing the messageID indicating "0",
containing the stationCharacteristics indicating "111",
containing all the mandatory TaggedValue
}	

TP Id	TP/CAM/IPC/BV/02
Test objective	Checks that CAM message is formatted according to the basicIRS profile
Reference	TS 102 637-2 [1], clauses 7.1 and 7.2
PICS Selection	PICS_BASICIRS
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having sent a CAM message
}	

Expected behaviour	

ensure that {
the IUT sends a valid basicIRS CAM message
containing the protocolVersion indicating "0"
containing the messageID indicating "0"
containing the stationCharacteristics indicating "000",
not containing heading, positionConfidence, elevationConfidence fields in the referencePosition structure,
not containing any TaggedValue
}	

TP Id	TP/CAM/IPC/BV/03
Test objective	Checks that CAM message is formatted according to the emergencyVehicle profile
Reference	TS 102 637-2 [1], clauses 7.1 and 7.2
PICS Selection	PICS_EMERVEH
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having sent a CAM message
}	

Expected behaviour	

ensure that {
the IUT sends a valid emergencyVehicle CAM message
containing the protocolVersion indicating "0"
containing the messageID indicating "0"
containing the stationCharacteristics indicating "101",
containing all the mandatory basicVehicle TaggedValue fields and also emergencyResponseType
}	

TP Id	TP/CAM/IPC/BV/04
Test objective	Checks that CAM message is formatted according to the publicTransportVehicle profile
Reference	TS 102 637-2 [1], clauses 7.1 and 7.2
PICS Selection	PICS_PUBTRANSVEH
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having sent a CAM message
}	

Expected behaviour	

ensure that {
the IUT sends a valid publicTransportVehicle CAM message
containing the protocolVersion indicating "0"
containing the messageID indicating "0"
containing the stationCharacteristics indicating "101",
containing all the mandatory basicVehicle TaggedValue fields and also publicVehicleType
}	

5.2.3 Information adaptation

5.2.3.1 Crash Status

TP Id	TP/CAM/INA/CRS/BV/01
Test objective	Checks that CAM message includes crashStatus information if crash signal is activated
Reference	TS 102 637-2 [1], clauses 7.1 and 7.2
PICS Selection	PICS_BASICVEH or PICS_EMERVEH or PICS_PUBTRANSVEH
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having sent a valid CAM message
not containing crashStatus TaggedValue
}	

Expected behaviour	

ensure that {
when {
a crash signal is activated
}
then {
the IUT sends a valid CAM message
containing crashStatus TaggedValue indicating "True"
}
}	

TP Id	TP/CAM/INA/CRS/BV/02
Test objective	Checks that CAM message does not include crashStatus information if crash signal is not activated
Reference	TS 102 637-2 [1], clauses 7.1 and 7.2
PICS Selection	PICS_BASICVEH or PICS_EMERVEH or PICS_PUBTRANSVEH
Initial conditions	
with { the IUT being in the "initial state" and the crash signal is deactivated}	
Expected behaviour	

ensure that {
when {
aCAM message is generated
}
then {
the IUT sends a valid CAM message
not containing crashStatus TaggedValue
}
}	

5.2.3.2 Dangerous goods

TP Id	TP/CAM/INA/DAG/BV/01
Test objective	Checks that CAM message includes DangerousGoods information if they are transported
Reference	TS 102 637-2 [1], clauses 7.1 and 7.2
PICS Selection	PICS_BASICVEH or PICS_EMERVEH or PICS_PUBTRANSVEH
Initial conditions	

with {
}the IUT being in the "initial state" and
the IUT having sent a valid CAM message
not containing DangerousGoods TaggedValue
}	

Expected behaviour	

ensure that {
when {
Dangerous goods are transported
}
then {
the IUT sends a valid CAM message
containing DangerousGoods TaggedValue indicating value > 0
}
}	

TP Id	TP/CAM/INA/DAG/BV/02
Test objective	Checks that CAM message does not include DangerousGoods information if they are not longer transported
Reference	TS 102 637-2 [1], clauses 7.1 and 7.2
PICS Selection	PICS_BASICVEH or PICS_EMERVEH or PICS_PUBTRANSVEH
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having sent a valid CAM message
containing DangerousGoods TaggedValue indicating value > 0
}	

Expected behaviour	

ensure that {
when {
Dangerous goods are no longer transported
}
then {
the IUT sends a valid CAM message
not containing DangerousGoods TaggedValue
}
}	

5.2.3.3 Confidence station length/width

TP Id	TP/CAM/INA/CLW/BV/01
Test objective	Checks that CAM message includes confidenceStationLength / confidenceStationWidth if vehicle length/width is not precise determined
Reference	TS 102 637-2 [1], clauses 7.1 and 7.2
PICS Selection	PICS_BASICVEH or PICS_EMERVEH or PICS_PUBTRANSVEH
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the vehicle length/width is not precisely determined
}
then {
the IUT sends a valid CAM message
containing confidenceStationLength/confidenceStationWidth TaggedValue
}
}	

TP Id	TP/CAM/INA/CLW/BV/02
Test objective	Checks that CAM message includes confidenceStationLength / confidenceStationWidth if vehicle length/width is precisely determined
Reference	TS 102 637-2 [1], clauses 7.1 and 7.2
PICS Selection	PICS_BASICVEH or PICS_EMERVEH or PICS_PUBTRANSVEH
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the vehicle length/width is precisely determined
}
then {
the IUT sends a valid CAM message
not containing confidenceStationLength/confidenceStationWidth TaggedValue
}
}	

5.2.3.4 Door open

TP Id	TP/CAM/INA/DOP/BV/01
Test objective	Checks that CAM message includes DoorOpen information if doors opened
Reference	TS 102 637-2 [1], clauses 7.1 and 7.2
PICS Selection	PICS_PUBTRANSVEH
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
a door is opened
}
then {
the IUT sends a valid CAM message
containing DoorOpen TaggedValue
}
}	

TP Id	TP/CAM/INA/DOP/BV/02
Test objective	Checks that CAM message includes DoorOpen information 30s after closed
Reference	TS 102 637-2 [1], clauses 7.1 and 7.2
PICS Selection	PICS_PUBTRANSVEH
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having sent a valid CAM message
containing DoorOpen TaggedValue
}	

Expected behaviour	

ensure that {
when {
the door is closed
}
then {
the IUT sends CAM messages
containing DoorOpen TaggedValue during the 30s following the door closing event
}
}	

TP Id	TP/CAM/INA/DOP/BV/03
Test objective	Checks that CAM message includes DoorOpen informationwhen supported
Reference	TS 102 637-2 [1], clauses 7.1 and 7.2
PICS Selection	PICS_PUBTRANSVEH OR PICS_DOOROPEN
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
only the driver door is opened
}
then {
the IUT sends a valid CAM message
containing DoorOpen TaggedValue
indicating the opened door (‘1000’B value)
}
}	

TP Id	TP/CAM/INA/DOP/BV/04
Test objective	Checks that CAM message includes DoorOpen informationwhen supported
Reference	TS 102 637-2 [1], clauses 7.1 and 7.2
PICS Selection	PICS_PUBTRANSVEH OR PICS_DOOROPEN
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
Only any passenger door is opened
}
then {
the IUT sends a valid CAM message
containing DoorOpen TaggedValue
indicating the opened door (‘0100’B value)
}
}	

TP Id	TP/CAM/INA/DOP/BV/05
Test objective	Checks that CAM message includes DoorOpen informationwhen supported
Reference	TS 102 637-2 [1], clauses 7.1 and 7.2
PICS Selection	PICS_PUBTRANSVEH OR PICS_DOOROPEN
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
Only access to engine is opened
}
then {
the IUT sends a valid CAM message
containing DoorOpen TaggedValue
indicating the opened door (‘0010’B value)
}
}	

TP Id	TP/CAM/INA/DOP/BV/06
Test objective	Checks that CAM message includes DoorOpen informationwhen supported
Reference	TS 102 637-2 [1], clauses 7.1 and 7.2
PICS Selection	PICS_PUBTRANSVEH OR PICS_DOOROPEN
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
Only luggage door is opened
}
then {
the IUT sends a valid CAM message
containing DoorOpen TaggedValue
indicating the opened door (‘0001’B value)
}
}	

TP Id	TP/CAM/INA/DOP/BV/07
Test objective	Checks that CAM message includes DoorOpen informationwhen supported
Reference	TS 102 637-2 [1], clauses 7.1 and 7.2
PICS Selection	PICS_PUBTRANSVEH OR PICS_DOOROPEN
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
All doors are closed
}
then {
the IUT sends a valid CAM message
containing DoorOpen TaggedValue
indicating the closed doors (‘0000’B value)
}
}	

5.2.3.5 Distance To Stop Line

TP Id	TP/CAM/INA/DSL/BV/01
Test objective	Checks that CAM message includes distanceToStopLinewhen supported
Reference	TS 102 637-2 [1], clauses 7.1, 7.2 and annex A
PICS Selection	PICS_DISTTOSTOPLINE
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the distanceToStopLine value is provided
}
then {
the IUT sends CAM messages
containing distanceToStopLine TaggedValue
indicating the measured value
}
}	

5.2.3.6 Turn Advice

TP Id	TP/CAM/INA/TAD/BV/01
Test objective	Checks that CAM message includes turnAdvicewhen supported
Reference	TS 102 637-2 [1], clauses 7.1, 7.2 and annex A
PICS Selection	PICS_TURNADVICE
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
a turning manoeuvre information is provided
}
then {
the IUT sends a valid CAM message
containing turnAdvice TaggedValue
indicating the next turning manoeuvre
}
}	

5.2.3.7 Curvature Change

TP Id	TP/CAM/INA/CUC/BV/01
Test objective	Checks that CAM message includes curvatureChangewhen supported
Reference	TS 102 637-2 [1], clauses 7.1, 7.2 and annex A
PICS Selection	PICS_CURVCHANGE
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the curvaturevalue is provided
}
then {
the IUT sends CAM messages
containing curvatureChange TaggedValue
indicating the measured value
}
}	

5.2.3.8 Occupancy

TP Id	TP/CAM/INA/OCC/BV/01
Test objective	Checks that CAM message includes occupancywhen supported
Reference	TS 102 637-2 [1], clauses 7.1, 7.2 and annex A
PICS Selection	PICS_ OCCUPANCY
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the passager load status is provided
}
then {
the IUT sends CAM messages
containing occupancy TaggedValue
indicating the measured value
}
}	

5.2.3.9 Light Bar In Use

TP Id	TP/CAM/INA/LBU/BV/01
Test objective	Checks that CAM message includes lightBarInUse TaggedValuewhen supported
Reference	TS 102 637-2 [1], clauses 7.1, 7.2 and annex A
PICS Selection	PICS_EMERVEH AND PICS_LIGHTBARINUSE
Initial conditions	

with {
the IUT being in the "initial state" and
}	

Expected behaviour	

ensure that {
when {
the SUT is not equipped with light Bar or the light Bar is out of order
}
then {
the IUT sends a valid CAM message
containing lightBarInUse TaggedValue
indicating "0" (unavailable)
}
}	

TP Id	TP/CAM/INA/LBU/BV/02
Test objective	Checks that CAM message includes lightBarInUse TaggedValuewhen supported
Reference	TS 102 637-2 [1], clauses 7.1, 7.2 and annex A
PICS Selection	PICS_EMERVEH AND PICS_LIGHTBARINUSE
Initial conditions	

with {
the IUT being in the "initial state" and
the SUT is equipped with light Bar
}	

Expected behaviour	

ensure that {
when {
the light Bar is switched off
}
then {
the IUT sends a valid CAM message
containing lightBarInUse TaggedValue
indicating "1" (disabled)
}
}	

TP Id	TP/CAM/INA/LBU/BV/03
Test objective	Checks that CAM message includes lightBarInUse TaggedValuewhen supported
Reference	TS 102 637-2 [1], clauses 7.1, 7.2 and annex A
PICS Selection	PICS_EMERVEH AND PICS_LIGHTBARINUSE
Initial conditions	

with {
the IUT being in the "initial state" and
the SUT is equipped with light Bar
}	

Expected behaviour	

ensure that {
when {
the light Bar is switched on but not in action
}
then {
the IUT sends a valid CAM message
containing lightBarInUse TaggedValue
indicating "2" (enabled)
}
}	

TP Id	TP/CAM/INA/LBU/BV/04
Test objective	Checks that CAM message includes lightBarInUse TaggedValuewhen supported
Reference	TS 102 637-2 [1], clauses 7.1, 7.2 and annex A
PICS Selection	PICS_EMERVEH AND PICS_LIGHTBARINUSE
Initial conditions	

with {
the IUT being in the "initial state" and
the SUT is equipped with light Bar
}	

Expected behaviour	

ensure that {
when {
the light Bar is switched on and in action
}
then {
the IUT sends a valid CAM message
containing lightBarInUse TaggedValue
indicating "3" (engaged)
}
}	

5.2.3.10 Siren In Use

TP Id	TP/CAM/INA/SIU/BV/01
Test objective	Checks that CAM message includes sireneInUse TaggedValuewhen supported
Reference	TS 102 637-2 [1], clauses 7.1, 7.2 and annex A
PICS Selection	PICS_EMERVEH AND PICS_ SIRENEINUSE
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the SUT is not equipped with siren or the siren is out of order
}
then {
the IUT sends a valid CAM message
containing sireneInUse TaggedValue
indicating "0" (unavailable)
}
}	

TP Id	TP/CAM/INA/SIU/BV/02
Test objective	Checks that CAM message includes sireneInUse TaggedValuewhen supported
Reference	TS 102 637-2 [1], clauses 7.1, 7.2 and annex A
PICS Selection	PICS_EMERVEH AND PICS_ SIRENEINUSE
Initial conditions	

with {
the IUT being in the "initial state" and
the SUT is equipped with siren
}	

Expected behaviour	

ensure that {
when {
the siren is switched off
}
then {
the IUT sends a valid CAM message
containing sireneInUse TaggedValue
indicating "1" (disabled)
}
}	

TP Id	TP/CAM/INA/SIU/BV/03
Test objective	Checks that CAM message includes sireneInUse TaggedValuewhen supported
Reference	TS 102 637-2 [1], clauses 7.1, 7.2 and annex A
PICS Selection	PICS_EMERVEH AND PICS_ SIRENEINUSE
Initial conditions	

with {
the IUT being in the "initial state" and
the SUT is equipped with siren
}	

Expected behaviour	

ensure that {
when {
the siren is switched on but not in action
}
then {
the IUT sends a valid CAM message
containing sireneInUse TaggedValue
indicating "2" (enabled)
}
}	

TP Id	TP/CAM/INA/SIU/BV/04
Test objective	Checks that CAM message includes sireneInUse TaggedValuewhen supported
Reference	TS 102 637-2 [1], clauses 7.1, 7.2 and annex A
PICS Selection	PICS_EMERVEH AND PICS_ SIRENEINUSE
Initial conditions	

with {
the IUT being in the "initial state" and
the SUT is equipped with siren
}	

Expected behaviour	

ensure that {
when {
the siren is switched on and in action
}
then {
the IUT sends a valid CAM message
containing sireneInUse TaggedValue
indicating "3" (engaged)
}
}	

5.2.3.11 Traffic Light Priority

TP Id	TP/CAM/INA/TLP/BV/01
Test objective	Checks that CAM message includes trafficLightPriority TaggedValuewhen supported
Reference	TS 102 637-2 [1], clauses 7.1, 7.2 and annex A
PICS Selection	PICS_PUBTRANSVEH AND PICS_TRAFFICLIGHTPRIORITY
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the trafficLightPriority is provided
}
then {
the IUT sends a valid CAM message
containing trafficLightPriority TaggedValue
indicating the new value
}
}	

5.2.3.12 Schedule Deviation

TP Id	TP/CAM/INA/SCE/BV/01
Test objective	Checks that CAM message includes scheduleDeviation TaggedValuewhen supported
Reference	TS 102 637-2 [1], clauses 7.1, 7.2 and annex A
PICS Selection	PICS_PUBTRANSVEH AND PICS_SCHEDULEDEVIATION
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the schedule deviation is provided
}
then {
the IUT sends CAM messages
containing scheduleDeviation TaggedValue
indicating the measured value
}
}	

5.2.3.13 PT Line Description

TP Id	TP/CAM/INA/PLD/BV/01
Test objective	Checks that CAM message includes PTLineDescription TaggedValuewhen supported
Reference	TS 102 637-2 [1], clauses 7.1, 7.2 and annex A
PICS Selection	PICS_PUBTRANSVEH AND PICS_PTLINEDESCRIPTION
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the PTLineDescription is available
}
then {
the IUT sends a valid CAM message
containing PTLineDescription TaggedValue
indicating the values
}
}	

5.2.3.14 Exterior Lights

TP Id	TP/CAM/INA/EXL/BV/01
Test objective	Checks that CAM message reflects the state of low Beam Head lights
Reference	TS 102 637-2 [1], annex A
PICS Selection	PICS_BASICVEH or PICS_EMERVEH or PICS_PUBTRANSVEH
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the low Beam Head lights are switched on
}
then {
the IUT sends a CAM message
containing ExteriorLights Tagged Value
indicating lowBeamHeadlightsOn field set to 1
}
}	

TP Id	TP/CAM/INA/EXL/BV/02
Test objective	Checks that CAM message reflects the state of low Beam Head lights
Reference	TS 102 637-2 [1], annex A
PICS Selection	PICS_BASICVEH or PICS_EMERVEH or PICS_PUBTRANSVEH
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the low Beam Head lights are switched off
}
then {
the IUT sends a CAM message
containing ExteriorLights Tagged Value
indicating lowBeamHeadlightsOn field set to 0
}
}	

TP Id	TP/CAM/INA/EXL/BV/03
Test objective	Checks that CAM message reflects the state of high Beam Head lights
Reference	TS 102 637-2 [1], annex A
PICS Selection	PICS_BASICVEH or PICS_EMERVEH or PICS_PUBTRANSVEH
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the high Beam Head lights are switched on
}
then {
the IUT sends a CAM message
containing ExteriorLights Tagged Value
indicating highBeamHeadlightsOn field set to 1
}
}	

TP Id	TP/CAM/INA/EXL/BV/04
Test objective	Checks that CAM message reflects the state of high Beam Head lights
Reference	TS 102 637-2 [1], annex A
PICS Selection	PICS_BASICVEH or PICS_EMERVEH or PICS_PUBTRANSVEH
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the high Beam Head lights are switched off
}
then {
the IUT sends a CAM message
containing ExteriorLights Tagged Value
indicating highBeamHeadlightsOn field set to 0
}
}	

TP Id	TP/CAM/INA/EXL/BV/05
Test objective	Checks that CAM message reflects the state of left Turn Signal
Reference	TS 102 637-2 [1], annex A
PICS Selection	PICS_BASICVEH or PICS_EMERVEH or PICS_PUBTRANSVEH
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the left Turn Signal is switched on
}
then {
the IUT sends a CAM message
containing ExteriorLights Tagged Value
indicating leftTurnSignalOn field set to 1 without alternate with the blinking interval
}
}	

TP Id	TP/CAM/INA/EXL/BV/06
Test objective	Checks that CAM message reflects the state of left Turn Signal
Reference	TS 102 637-2 [1], annex A
PICS Selection	PICS_BASICVEH or PICS_EMERVEH or PICS_PUBTRANSVEH
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the left Turn Signal is switched off
}
then {
the IUT sends a CAM message
containing ExteriorLights Tagged Value
indicating leftTurnSignalOn field set to 0
}
}	

TP Id	TP/CAM/INA/EXL/BV/07
Test objective	Checks that CAM message reflects the state of right Turn Signal
Reference	TS 102 637-2 [1], annex A
PICS Selection	PICS_BASICVEH or PICS_EMERVEH or PICS_PUBTRANSVEH
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the right Turn Signal is switched on
}
then {
the IUT sends a CAM message
containing ExteriorLights Tagged Value
indicating rightTurnSignalOn field set to 1 without alternate with the blinking interval
}
}	

TP Id	TP/CAM/INA/EXL/BV/08
Test objective	Checks that CAM message reflects the state of right Turn Signal
Reference	TS 102 637-2 [1], annex A
PICS Selection	PICS_BASICVEH or PICS_EMERVEH or PICS_PUBTRANSVEH
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the right Turn Signal is switched off
}
then {
the IUT sends a CAM message
containing ExteriorLights Tagged Value
indicating rightTurnSignalOn field set to 0
}
}	

TP Id	TP/CAM/INA/EXL/BV/09
Test objective	Checks that CAM message reflects the state of automatic Light Control
Reference	TS 102 637-2 [1], annex A
PICS Selection	PICS_BASICVEH or PICS_EMERVEH or PICS_PUBTRANSVEH
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the automatic Light Control is switched on
}
then {
the IUT sends a CAM message
containing ExteriorLights Tagged Value
indicating automaticLightControlOn field set to 1
}
}	

TP Id	TP/CAM/INA/EXL/BV/10
Test objective	Checks that CAM message reflects the state of automatic Light Control
Reference	TS 102 637-2 [1], annex A
PICS Selection	PICS_BASICVEH or PICS_EMERVEH or PICS_PUBTRANSVEH
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the automatic Light Control is switched off
}
then {
the IUT sends a CAM message
containing ExteriorLights Tagged Value
indicating automaticLightControlOn field set to 0
}
}	

TP Id	TP/CAM/INA/EXL/BV/11
Test objective	Checks that CAM message reflects the state of daytime Running Lights
Reference	TS 102 637-2 [1], annex A
PICS Selection	PICS_BASICVEH or PICS_EMERVEH or PICS_PUBTRANSVEH
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the daytime Running Lights are switched on
}
then {
the IUT sends a CAM message
containing ExteriorLights Tagged Value
indicating daytimeRunningLightsOn field set to 1
}
}	

TP Id	TP/CAM/INA/EXL/BV/12
Test objective	Checks that CAM message reflects the state of daytime Running Lights
Reference	TS 102 637-2 [1], annex A
PICS Selection	PICS_BASICVEH or PICS_EMERVEH or PICS_PUBTRANSVEH
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the daytime Running Lights are switched off
}
then {
the IUT sends a CAM message
containing ExteriorLights Tagged Value
indicating daytimeRunningLightsOn field set to 0
}
}	

TP Id	TP/CAM/INA/EXL/BV/13
Test objective	Checks that CAM message reflects the state of fog Light
Reference	TS 102 637-2 [1], annex A
PICS Selection	PICS_BASICVEH or PICS_EMERVEH or PICS_PUBTRANSVEH
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the fog Light is switched on
}
then {
the IUT sends a CAM message
containing ExteriorLights Tagged Value
indicating fogLightOn field set to 1
}
}	

TP Id	TP/CAM/INA/EXL/BV/14
Test objective	Checks that CAM message reflects the state of fog Light
Reference	TS 102 637-2 [1], annex A
PICS Selection	PICS_BASICVEH or PICS_EMERVEH or PICS_PUBTRANSVEH
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the vehicle is not equipped with fog Light or the fog Light is switched off
}
then {
the IUT sends a CAM message
containing ExteriorLights Tagged Value
indicating fogLightOn field set to 0
}
}	

TP Id	TP/CAM/INA/EXL/BV/15
Test objective	Checks that CAM message reflects the state of parking Lights
Reference	TS 102 637-2 [1], annex A
PICS Selection	PICS_BASICVEH or PICS_EMERVEH or PICS_PUBTRANSVEH
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the parking Lights are switched on
}
then {
the IUT sends a CAM message
containing ExteriorLights Tagged Value
indicating parkingLightsOn field set to 1
}
}	

TP Id	TP/CAM/INA/EXL/BV/16
Test objective	Checks that CAM message reflects the state of parking Lights
Reference	TS 102 637-2 [1], annex A
PICS Selection	PICS_BASICVEH or PICS_EMERVEH or PICS_PUBTRANSVEH
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the parking Lights are switched off
}
then {
the IUT sends a CAM message
containing ExteriorLights Tagged Value
indicating parkingLightsOn field set to 0
}
}	

TP Id	TP/CAM/INA/EXL/BV/17
Test objective	Checks that CAM message reflects the state of hazard condition
Reference	TS 102 637-2 [1], annex A
PICS Selection	PICS_BASICVEH or PICS_EMERVEH or PICS_PUBTRANSVEH
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
a hazard condition is detected
}
then {
the IUT sends a CAM message
containing ExteriorLights Tagged Value
indicating rightTurnSignalOn field set to 1 and leftTurnSignalOn field set to 1
}
}	

5.2.4 Position adaptation

TP Id	TP/CAM/POA/BV/01
Test objective	Checks that Reference Position is updated if the ITS Station is moving
Reference	TS 102 637-2 [1], clauses 4.1 and 7.1
PICS Selection	PICS_BASICVEH or PICS_EMERVEH or PICS_PUBTRANSVEH
Initial conditions	

with {
the IUT being in the "initial state" and
the IUT having sent a valid CAM message
containing ReferencePosition indicating "Position1"
}	

Expected behaviour	

ensure that {
when {
the position changes.
}
then {
the IUT sends a CAM messages
containing ReferencePosition indicating "Position2" in the minimum and maximum interval allowed by CAM
}
}	

NOTE: Position1 is a combination of the following fields: Longitude1, Latitude1 and Elevation1; Position2 is a combination of the following fields: Longitude2, Latitude2 and Elevation2. At least one of the fields must be different.	

5.2.5 Message processing

5.2.5.1 Valid

TP Id	TP/CAM/MSP/BV/01
Test objective	Checks that CAM Management passes the valid CAMs to the LDM Management
Reference	TS 102 637-2 [1], clauses 4.1 and 4.2
PICS Selection	
Initial conditions	

with {
the IUT being in the "initial state"
}	

Expected behaviour	

ensure that {
when {
the IUT receives a valid CAM message
}
then {
the IUT updates the LDM Management with the information received from the CAM message
}
}	

Annex A (informative): Bibliography

- ETSI TS 102 637-1: "Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Part 1: Functional Requirements".
- ETSI TS 102 637-3 (V1.1.1): "Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Part 3: Specifications of Decentralized Environmental Notification Basic Service".
- ETSI TS 102 637-4: "Intelligent Transport Systems (ITS); Vehicular Communications; Basic set of applications; Part 4: Operational Requirements".

History

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