
**Electronic fee collection — Test
procedures for user and fixed
equipment —**

**Part 2:
Conformance test for the onboard unit
application interface**

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*Perception du télépéage — Modes opératoires relatifs aux équipements
embarqués et aux équipements fixes —*

*Partie 2: Essai de conformité de l'interface d'application de l'unité
embarquée*

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Published in Switzerland

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of document:

- an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50 % of the members of the parent committee casting a vote;
- an ISO Technical Specification (ISO/TS) represents an agreement between the members of a technical committee and is accepted for publication if it is approved by 2/3 of the members of the committee casting a vote.

An ISO/PAS or ISO/TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/PAS or ISO/TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO/TS 14907-2 was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems*.

This second edition cancels and replaces the first edition (ISO/TS 14907-2:2006), which has been technically revised.

ISO/TS 14907 consists of the following parts, under the general title *Electronic fee collection — Test procedures for user and fixed equipment*:

- *Part 1: Description of test procedures*
- *Part 2: Conformance test for the onboard unit application interface*

Introduction

This part of ISO/TS 14907 describes tests that verify OBU conformance of implementations of functions and data structures for EFC applications.

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Electronic fee collection — Test procedures for user and fixed equipment —

Part 2: Conformance test for the onboard unit application interface

1 Scope

This part of ISO/TS 14907 describes tests that verify on-board unit (OBU) conformance of implementations of functions and data structures, as defined in the implementation conformance statement based on ISO 14906:2011, for electronic fee collection (EFC) applications. After the tests of isolated data items and functions (C.1-C.2), an example is given for testing of a complete EFC transaction (C.3).

The scope of this part of ISO/TS 14907 comprises definitions of OBU conformance assessment tests of

- basic dedicated short-range communication (DSRC) L7 functionality;
- EFC application functions, (standards.iteh.ai)
- EFC attributes (i.e. EFC application information);
- the addressing procedures of EFC attributes and (hardware) components [e.g. integrated circuit cards (ICC) and man-machine interfaces (MMI)],
- the EFC transaction model, which defines the common elements and steps of any EFC transaction, and
- the behaviour of the interface so as to support interoperability on an EFC-DSRC application interface level, see Figure 1.

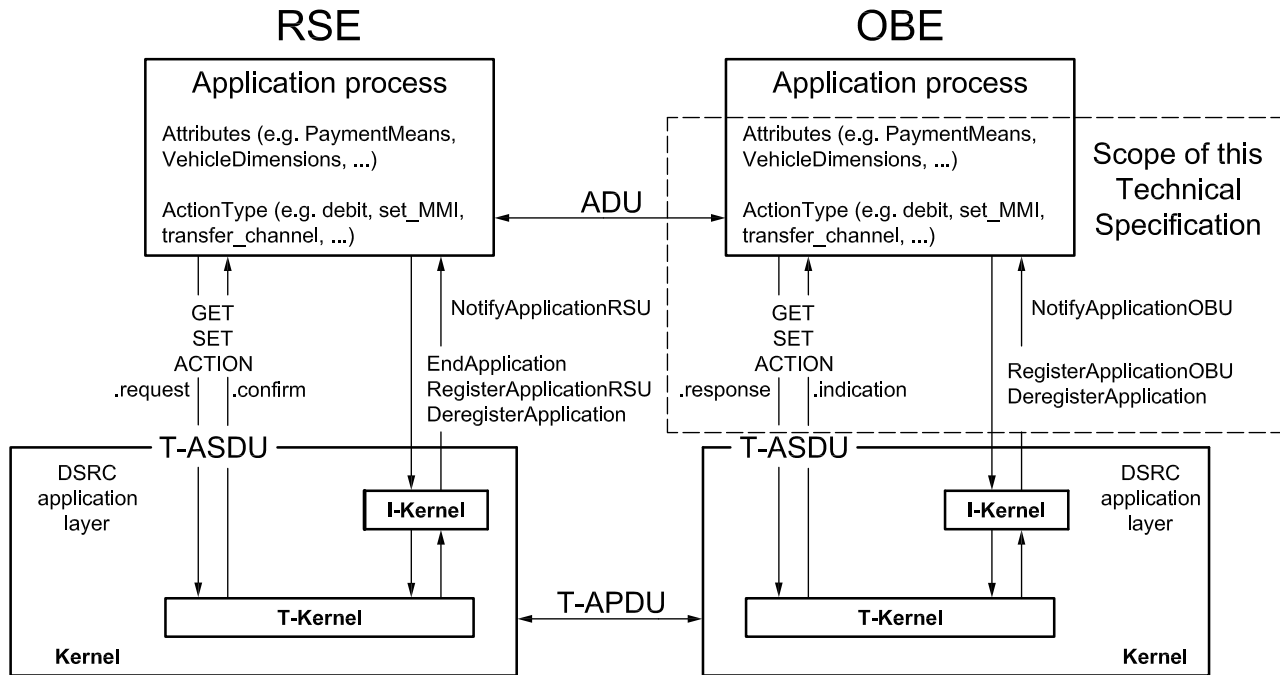


Figure 1 — The EFC application interface

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The purpose of this part of ISO/TS 14907 is to define tests that

- assess OBU capabilities,
- assess OBU behaviour, <https://standards.itteh.ai/catalog/standards/sist/6f3e3e39-cb34-4b6f-baa1-92b10c491276/iso-ts-14907-2-2011>
- serve as a guide for OBU conformance evaluation and type approval,
- achieve comparability between the results of the corresponding tests applied in different places at different times, and
- facilitate communications between parties.

Whereas this part of ISO/TS 14907 defines examples of test cases for DSRC and EFC functionality in Annex C, it does not intend to specify a complete test suite for a certain implementation. To compose a test suite for a specific EFC implementation, the test cases may have to be modified and new test cases may have to be defined and added in order for the conformance test to be complete. It can be useful to take into account the following considerations when defining a complete test suite

- small range: “exhaustive testing” of critical interoperability/compatibility features,
- large range: testing of boundaries and random values, and
- composite types: testing of individual items in sequence or parallel.

Figure 2 shows the overall procedure of conformance testing.

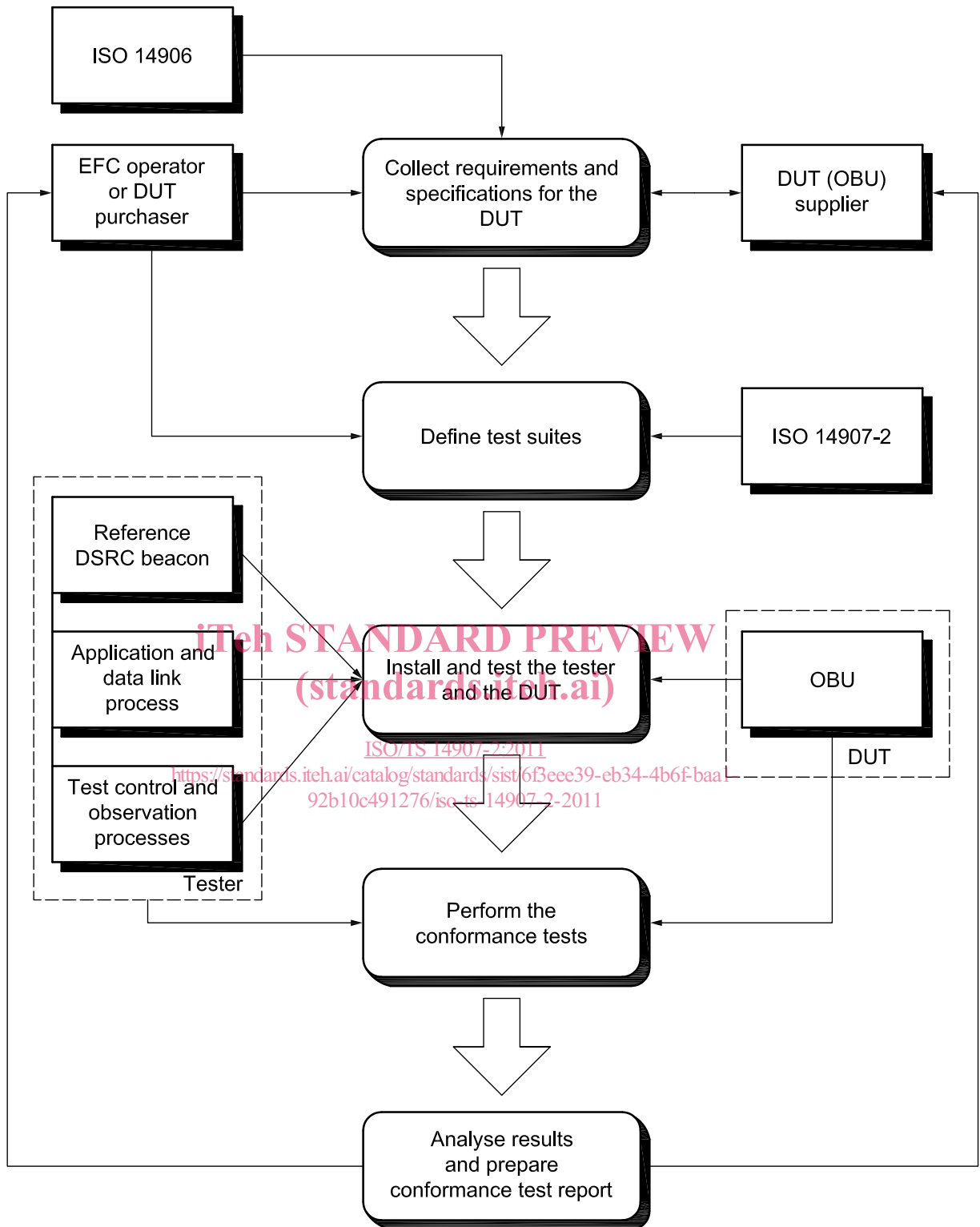
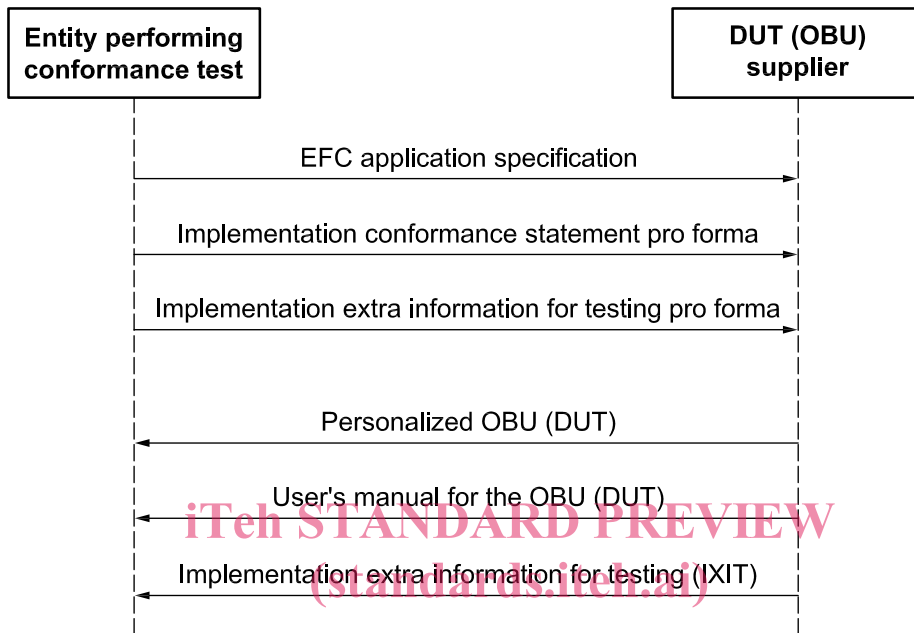


Figure 2 — Conformance testing process

Figure 3 gives a more detailed picture of the interface between the entity performing the conformance test and the supplier of the Device Under Test (DUT). By the EFC application specification, the implementation conformance statement pro forma and the implementation extra information for testing pro forma the supplier is requested to provide the DUT (OBU), containing the Implementation Under Test (IUT), as well as the documentation needed to perform the tests. More details on the content of the different documents are given in Clause 5 on OBU and supporting information.

NOTE 1 The Device Under Test contains the Implementation Under Test.



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Figure 3 — Documentation DUT supplier

It is outside the scope of this part of ISO/TS 14907 to define tests that assess

- performance,
- robustness, and
- reliability of an implementation.

NOTE 2 ISO/TS 14907-1 defines test procedures that are aimed at assessing performance, robustness and reliability of EFC equipment and systems.

NOTE 3 The ISO/IEC 10373 family of International Standards defines test methods for proximity, vicinity, integrated circuits(s) cards and related devices that may be relevant for OBUs that support such cards.

Annex D provides an informative overview of Japanese OBE conformance tests that are based on ISO/TS 14907 suite of standards, in order to illustrate how these can be applied in practice.

2 Normative references

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

ISO 14906:2011, *Electronic fee collection — Application interface definition for dedicated short-range communication*

EN 12834, *Road transport and traffic telematics — Dedicated short-range communication (DSRC) — DSRC application layer*

3 Terms and definitions

For the purposes of this document, the following definitions apply.

3.1

access credentials

data that is transferred to on-board equipment (OBE) in order to establish the claimed identity of a roadside equipment (RSE) application process entity

[ISO 14906:2011, definition 3.1]

NOTE The access credentials carry information needed to fulfil access conditions in order to perform the operation on the addressed element in the OBE. The access credentials can carry passwords as well as cryptographic based information such as authenticators.

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3.2

action

function that an application process resident at the roadside equipment (RSE) can invoke in order to make the on-board equipment (OBE) execute a specific operation during the transaction

[ISO 14906:2011, definition 3.2]

3.3

attribute

application information formed by one or by a sequence of data elements, and that is managed by different actions used for implementation of a transaction

[ISO 14906:2011, definition 3.3]

3.4

authenticator

data appended to, or a cryptographic transformation of, a data unit that allows a recipient of the data unit to prove the source and/or the integrity of the data unit and protect against forgery

[ISO 14906:2011, definition 3.4]

3.5

channel

information transfer path

[ISO/IEC 7498-2:1989, definition 3.3.13 and ISO 14906:2011, definition 3.5]

3.6

component

logical and physical entity composing an on-board equipment (OBE), supporting a specific functionality

[ISO 14906:2011, definition 3.6]

3.7

contract

expression of an agreement between two or more parties concerning the use of the road infrastructure

[ISO 14906:2011, definition 3.7]

3.8

data integrity

property that data has not been altered or destroyed in an unauthorised manner

[ISO/IEC 7498-2:1989, definition 3.3.21 and ISO 14906:2011, definition 3.10]

3.9

element

⟨DSRC⟩ directory containing application information in the form of attributes

[ISO 14906:2011, definition 3.11]

3.10

implementation conformance statement

statement made by the supplier of an implementation or system claimed to conform to a given specification, stating which capabilities have been implemented

3.11

implementation conformance statement pro forma

document, in the form of a questionnaire, which when completed for an implementation or system becomes an implementation conformance statement

3.12

implementation extra information for testing

statement made by the supplier or an implementer of an IUT which contains or references all of the information (in addition to that given in the implementation conformance statement) related to the IUT and its testing environment, which will enable the test laboratory to run an appropriate test suite against the IUT

3.13

implementation extra information for testing pro forma

document, in the form of a questionnaire, which when completed for an IUT becomes an implementation extra information for testing

3.14

on-board equipment

equipment located within the vehicle and supporting the information exchange with the RSE, it is composed of the OBU and other sub-units whose presence are considered optional for the execution of a transaction

NOTE Adapted from ISO 14906:2011, definition 3.13.

3.15

on-board unit

minimum component of an on-board equipment (OBE), whose functionality always includes at least the support of the DSRC interface

[ISO 14906:2011, definition 3.14]

3.16

roadside equipment

equipment located at a fixed position along the road transport network, for the purpose of communication and data exchanges with the on-board equipment (OBE) of passing vehicles

NOTE Adapted from ISO 14906:2011, definition 3.16.

3.17 service

〈EFC〉 road transport related facility provided by a service provider, normally a type of infrastructure, the use of which is offered to the user, for which the user may be requested to pay

[ISO 14906:2011, definition 3.17]

3.18 service primitive

〈communication〉 elementary communication service provided by the application layer protocol to the application processes

[ISO 14906:2011, definition 3.18]

NOTE The invocation of a service primitive by an application process implicitly calls upon and uses services offered by the lower protocol layers.

3.19 toll service provider

〈EFC〉 legal entity providing to his customers toll services on one or more toll domains for one or more classes of vehicle

[ISO 14906:2011, definition 3.23]

NOTE 1 In other documents the terms issuer or contract issuer may be used.

NOTE 2 The toll service provider may provide the OBE or may provide only a magnetic card or a smart card to be used with OBE provided by a third party (like a mobile telephone and a SIM card can be obtained from different parties).

NOTE 3 The toll service provider is responsible for the operation (functioning) of the OBE.

3.20 transaction

whole of the exchange of information between the roadside equipment (RSE) and the on-board equipment (OBE) necessary for the completion of an electronic fee collection (EFC) operation over the DSRC

[ISO 14906:2011, definition 3.24]

3.21 transaction model

functional model describing the general structure of electronic fee collection (EFC) transactions

[ISO 14906:2011, definition 3.25]

3.22 tester

combination of equipment and processes which is able to perform conformance tests according to this part of ISO/TS 14907

3.23 user

entity that uses transport services provided by the service provider according to the terms of a contract

NOTE Adapted from ISO 14906:2011, definition 3.26.

4 Abbreviated terms

For the purposes of this document, the following abbreviated terms apply throughout the document unless otherwise specified.

4.1

ADU

Application Data Unit

4.2

APDU

Application Protocol Data Unit

4.3

AP

Application Process

4.4

ARIB

Association of Radio Industries and Businesses

NOTE ARIB (www.arib.or.jp) is based in Japan.

4.5

ASCII

American Standard Code for Information Interchange

4.6

AVI

Automatic Vehicle Identification

4.7

BST

Beacon Service Table

4.8

cf

confirm

4.9

DSRC

Dedicated Short-Range Communication

4.10

DUT

Device Under Test

4.11

EID

Element Identifier

4.12

EFC

Electronic Fee Collection

4.13

FTP

File Transfer Protocol

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4.14**ICS**

Implementation Conformance Statement

4.15**I-Kernel**

Initialization Kernel

4.16**IID**

Invoker Identifier

4.17**ind**

indication

4.18**IUT**

Implementation Under Test

[ISO 9646-1]

4.19**IXIT**

Implementation eXtra Information for Testing

4.20**L1**

Layer 1 of DSRC (physical layer)

4.21**L2**

Layer 2 of DSRC (data link layer)

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Application Layer Core of DSRC

4.23**LID**

Logical Link Control Identifier

4.24**LLC**

Logical Link Control

4.25**LPDU**

LLC Protocol Data Unit

4.26**M_a**

ManufacturerID

[EN 12834]

4.27**MAC**

Medium Access Control