# TECHNICAL SPECIFICATION

## ISO/TS 14907-2

Third edition
2016-07-15

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

## Part 2:
## Conformance test for the on-board unit application interface

*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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# Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: Foreword — Supplementary information.

The committee responsible for this document is ISO/TC 204, *Intelligent transport systems*.

This third edition cancels and replaces the second edition (ISO/TS 14907-2:2011), which has been technically revised with the following changes:

— updated references to clauses and annexes in accordance with ISO 14906:2011/Amd1:2015;

— updated Annex D to reflect current situation in Japan.

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 on-board unit application interface*

## Introduction

This part of ISO/TS 14907 describes tests that verify on-board unit (OBU) conformance of implementations of functions and data structures for electronic fee collection (EFC) applications.

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

## Part 2:
## Conformance test for the on-board 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/Amd1:2015, for electronic fee collection (EFC) applications. After the tests of isolated data items and functions (C.2 to C.4), 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,

— 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.
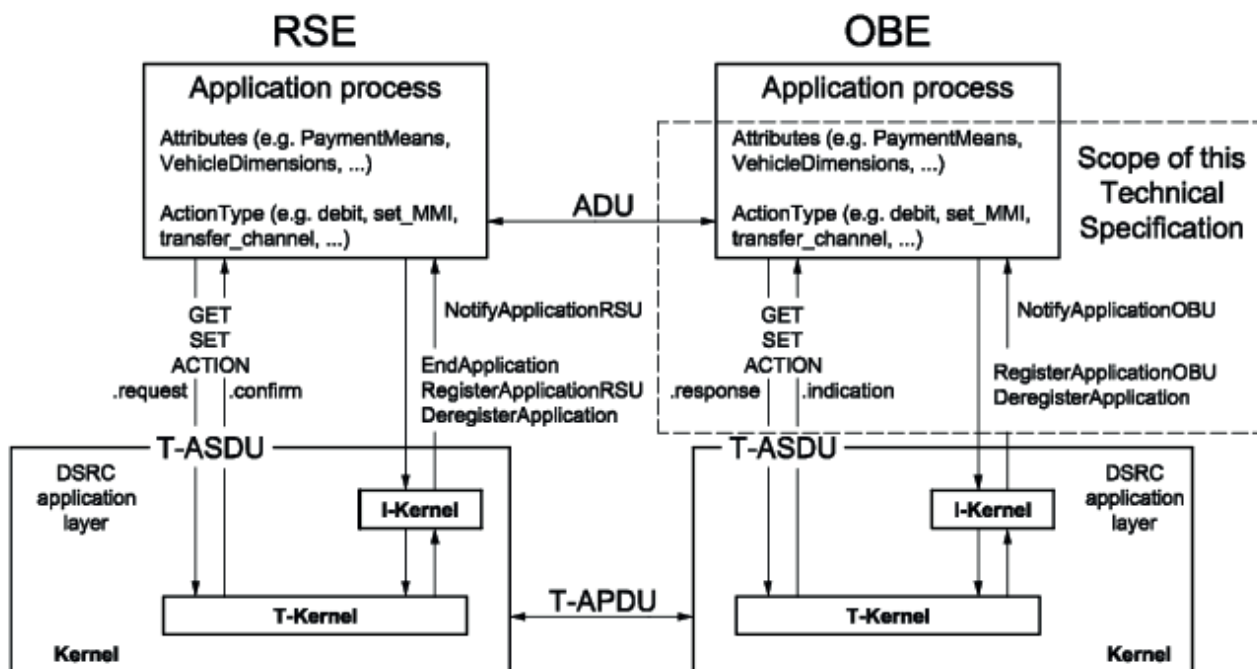
**Figure 1 — The EFC application interface**

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

— assess OBU capabilities,

— assess OBU behaviour,

— 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**
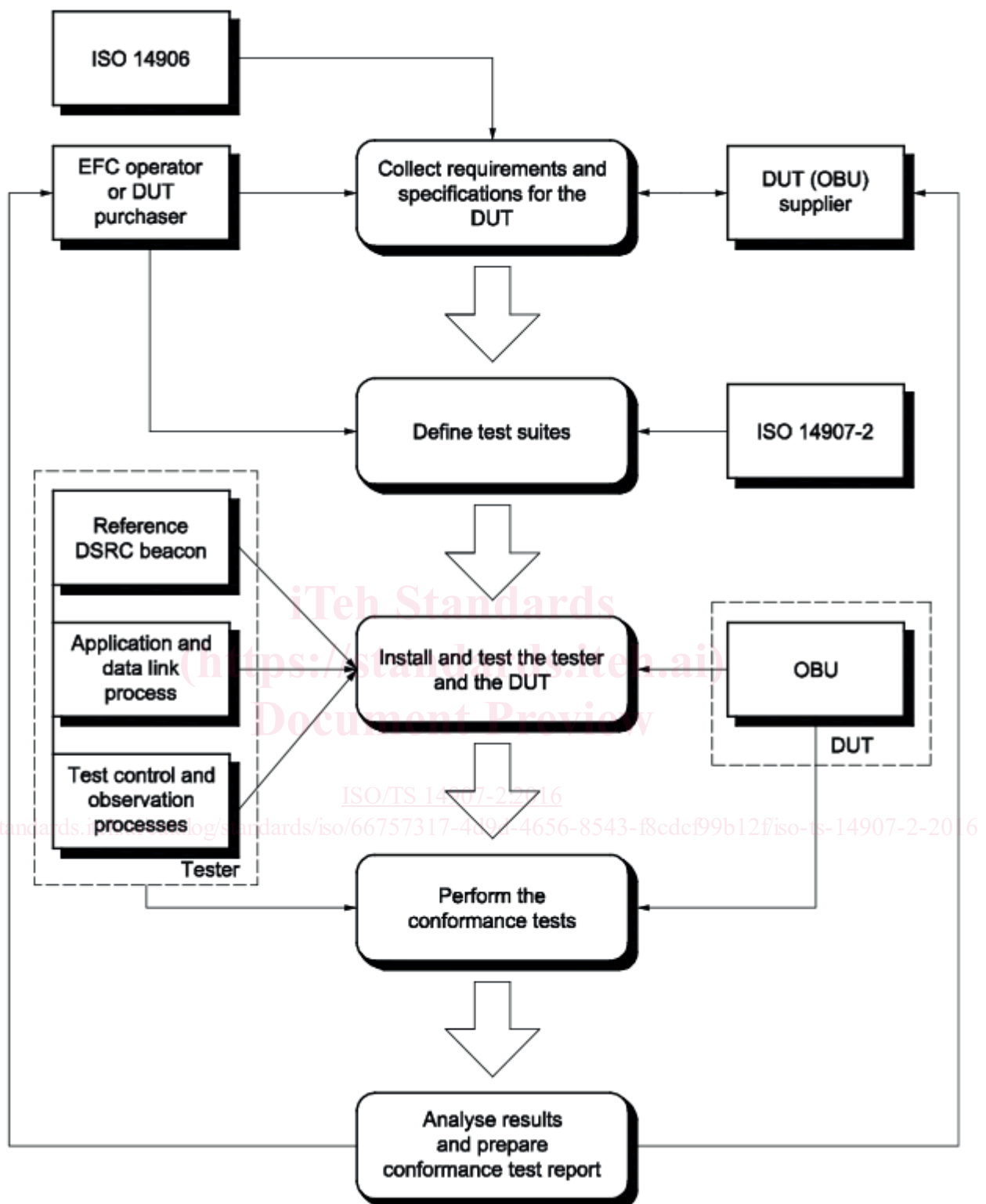
Figure 3 gives a more detailed picture of the interface between the entity performing the conformance test and the supplier of the Device Under Test (DUT). By the EFC application specification, the implementation conformance statement proforma and the implementation extra information for testing proforma 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.
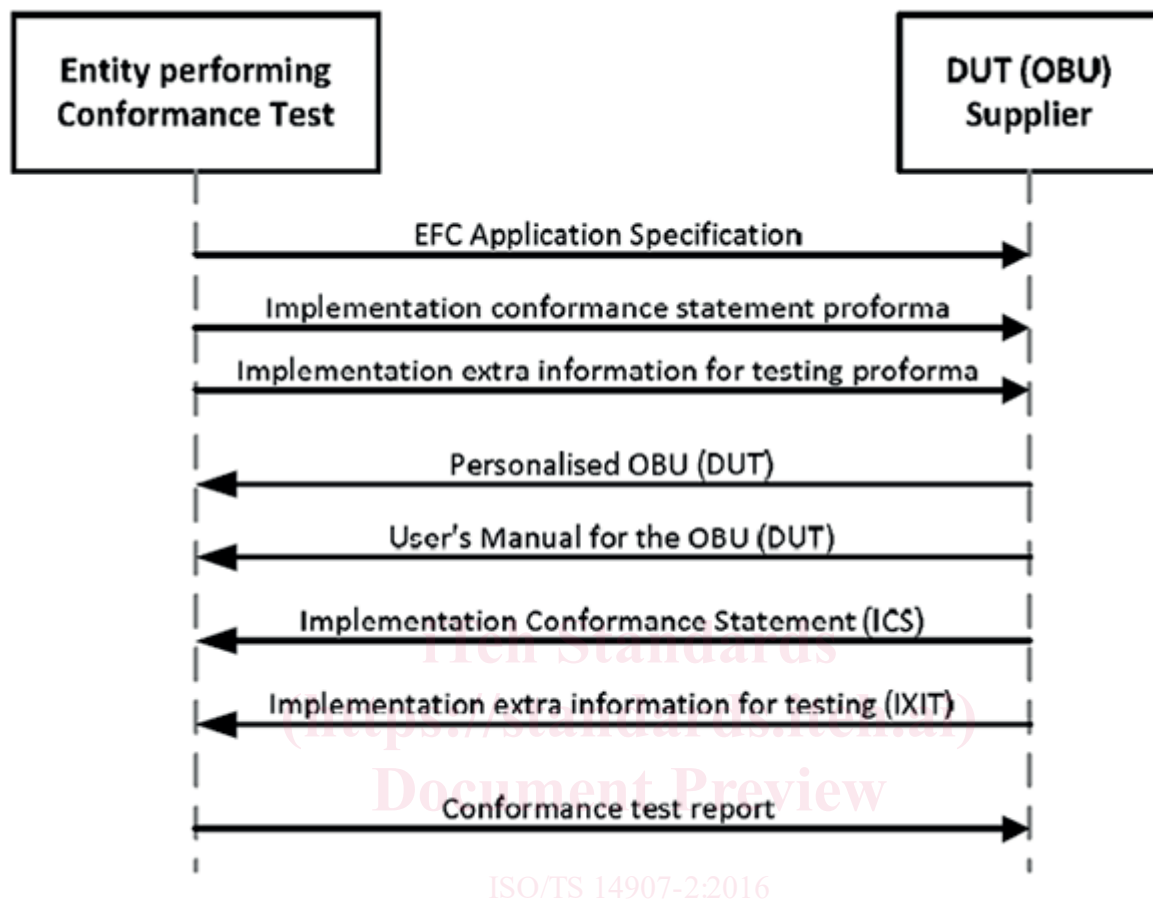


**Figure 3 — Documentation DUT supplier**

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 series defines test methods for proximity, vicinity, integrated circuit(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 the ISO/TS 14907 series, in order to illustrate how these can be applied in practice.

## 2    Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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/Amd1:2015, *Electronic fee collection — Application interface definition for dedicated short-range communication*

EN 12834:2003, *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 terms and definitions apply.

**3.1**
**access credentials**
trusted attestation or secure module that establishes the claimed identity of an object or application

[SOURCE: EN 15509:2014, 3.1]

**3.2**
**attribute**
addressable package of data consisting of a single data element or structured sequences of data element

[SOURCE: ISO 17575-1:—, 3.2]

**3.3**
**authenticator**
data, possibly encrypted, that is used for authentication

[SOURCE: EN 15509:2014, 3.3]

**3.4**
**channel**
information transfer path

[SOURCE: ISO/IEC 7498-2:1989, 3.3.13]

**3.5**
**element**
DSRC directory containing application information in the form of attributes

[SOURCE: ISO 14906:2011, 3.11, modified]

**3.6**
**implementation conformance statement**
statement of capabilities and options that have been implemented defining to what extent it is compliant with a given specification

**3.7**
**implementation conformance statement proforma**
document, in the form of a questionnaire, which when completed for an implementation or system becomes an implementation conformance statement (ICS)

[SOURCE: ISO/IEC 9646-1:1994, 3.3.40]

**3.8**
**implementation extra information for testing**
statement containing all of the information related to the implementation under test (IUT) and its corresponding system under test (SUT) which will enable the testing laboratory to run an appropriate test suite against that IUT

[SOURCE: ISO/IEC 19015:2000, 3.20]

**3.9**
**implementation extra information for testing proforma**
document, in the form of a questionnaire, which when completed for an implementation under test (IUT) becomes an implementation extra information for testing (IXIT)

[SOURCE: ISO/IEC 9646-1:1994, 3.3.42]

**3.10**
**on-board equipment**
all required equipment on-board a vehicle for performing required EFC functions and communication services

**3.11**
**on-board unit**
single electronic unit on-board a vehicle for performing specific EFC functions and for communication with external systems

Note 1 to entry: An OBU always includes, in this context, at least the support of the DSRC interface.

**3.12**
**roadside equipment**
equipment located along the road, either fixed or mobile

**3.13**
**service primitive**
elementary communication service provided by the application layer protocol to the application processes

[SOURCE: ISO 14906:2011, 3.18, modified]

**3.14**
**transaction**
whole of the exchange of information between two physically separated communication facilities

[SOURCE: ISO 17575-1 :—, 3.21]

**3.15**
**transaction model**
functional model describing the general structure of electronic payment transactions

[SOURCE: ISO 14906:2011, 3.25, modified]

# 4   Abbreviated terms

For the purposes of this document, the following abbreviated terms and variables apply.

| AC_CR | Access credentials |
| ACn | Acknowledged command/response |
| ADU | Application Data Unit (ISO 14906) |
| APDU | Application Protocol Data Unit (ISO 14906) |
| AP | Application Process (ISO 14906) |
| ARIB | Association of Radio Industries and Businesses |
| ASCII | American Standard Code for Information Interchange |
| AVI | Automatic Vehicle Identification |
| BST | Beacon Service Table (ISO 14906) |
| cf | Confirm |
| DSRC | Dedicated Short-Range Communication |

| | |
|---|---|
| DUT | Device Under Test |
| EID | Element Identifier |
| EFC | Electronic Fee Collection (ISO 17573) |
| FTP | File Transfer Protocol |
| ICS | Implementation Conformance Statement |
| I-Kernel | Initialization Kernel |
| IID | Invoker Identifier |
| ind | Indication |
| IUT | Implementation Under Test |
| IXIT | Implementation eXtra Information for Testing |
| L1 | Layer 1 of DSRC (physical layer) |
| L2 | Layer 2 of DSRC (data link layer) |
| L7 | Application Layer Core of DSRC |
| LID | Logical Link Control Identifier |
| LLC | Logical Link Control |
| LPDU | LLC Protocol Data Unit |
| LSDU | Link Layer Service Data Unit (EN 12795) |
| $M_a$ | ManufacturerID (EN 12834) |
| MAC | Medium Access Control |
| MMI | Man-Machine Interface |
| n.a. | Not applicable |
| NE_OK | Command accepted/Response LSDU not yet available (EN 12795) |
| OBE | On-board equipment |
| OBU | On-board unit |
| ORSE | Organization for Road System Enhancement |
| $P_{a,b,c,d}$ | Profile, example $P_0$ denotes Profile 0. |
| PDU | Protocol Data Unit |
| PoC | Point of Control |
| PoO | Point of Observation |
| PPDU | Physical Layer Protocol Data Unit |
| PrWA | Private Window Allocation (EN 12795) |
| PrWRq | Private Window Request (EN 12795) |
| req | Request |
| rs | Response |
| RSE | Roadside Equipment |
| SAM | Secure Application Module |
| T-APDU | Transfer-Application Protocol Data Unit |
| T-ASDU | Transfer-Application Service Data Unit |
| T-Kernel | Transfer Kernel |
| TTI | Traffic and Traveller Information |
| VST | Vehicle Service Table |

## 5   OBU and supporting information

The supplier shall provide the OBU, i.e. the DUT, and the associated information, including:

— OBUs personalized to be able to perform tests according to the ICS and IXIT as defined in 5.1 and 5.2, respectively. At least five samples shall be submitted for test. More samples may be needed if several different data structures and data contents are required in the tests;

— user's manual for the OBU, which shall include instructions how to handle the equipment, and may include further detailed information about the protocol functions;

— implementation conformance statement according to 5.1. The ICS shall include statements regarding the following:

  — layer 7 services that are implemented in the OBU;

  — EFC functions (action types) that are implemented in the OBU;

  — whether or not data elements are used;

— implementation extra information for testing according to 5.2. The IXIT shall, if applicable, include:

  — a statement regarding which layer 2 services shall be used to transfer the L7 services (and EFC services);

  — a description of security calculations in the OBU including a specification of the encryption algorithm used;

  — values of the test Master Keys for calculation and verification of OBU security data such as authenticators and access credentials.

The supplier should also provide configuration/personalization equipment for the OBU if that ensures effective testing.

### 5.1   ICS

The ICS is a statement made by the supplier that claims conformance to a certain specification. The ICS states which capabilities have been implemented in the specifications. It also states possible limitations in the implementation of the specification.

This Technical Specification describes testing of implementations according to the following standards:

— EN 12834;

— ISO 14906.

Annex A contains the ICS proforma that shall be used for the ICS.

### 5.2   IXIT

The IXIT is a 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 DUT and its testing environment. The IXIT enables the test laboratory to run an appropriate test suite against the DUT.

In this Technical Specification, the IXIT specifies the services in the lower communication layers that shall be used to perform the services to be tested. These services are described e.g. in EN 12795, EN 12253 and EN 13372.