
**Intelligent transport systems —
Communications access for land mobiles
(CALM) — Application management —
Part 2:
Conformance test**

iTeh STANDARD PREVIEW
*Systemes intelligents de transport — Accès aux communications des
services mobiles terrestres (CALM) — Gestion d'application —
Partie 2: Essai de conformité*
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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.

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 24101-2 was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems*.

ISO 24101 consists of the following parts, under the general title *Intelligent transport systems — Communications access for land mobiles (CALM) — Application management*:

— *Part 1: General requirements*

— *Part 2: Conformance test*

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Introduction

This part of ISO 24101 is part of a family of International Standards for communications access for land mobiles (CALM) which determine a common architecture, network protocols and air interface definitions for wireless communications using cellular second generation, cellular third generation, 5 GHz, millimeter, and infrared communications. Other air interfaces can be added at a later date. Air interfaces included in the CALM International Standards provide facilities for broadcast, point-to-point, vehicle-to-vehicle, and vehicle-to-point communications in the intelligent transport systems (ITS) sector.

The application management (AM), as defined in ISO 24101-1:2008, is the function to install, uninstall and modify the ITS applications in a reliable and secure manner, and it addresses the following requirements:

- a) installation of applications on CALM equipment after the equipment has been deployed;
- b) updating of applications, including uninstalling, on on-board equipment (OBE) as well as wireless access equipment (WAE) after the equipment has been deployed;
- c) providing a standardized interface and functionality so that application developers and system operators can successfully perform the functions in a) and b).

The purpose of this part of ISO 24101 is to specify a standardized conformance test for the AM, which verifies that the function of the developed AM complies with the requirements specified in ISO 24101-1:2008. See Figure 1.

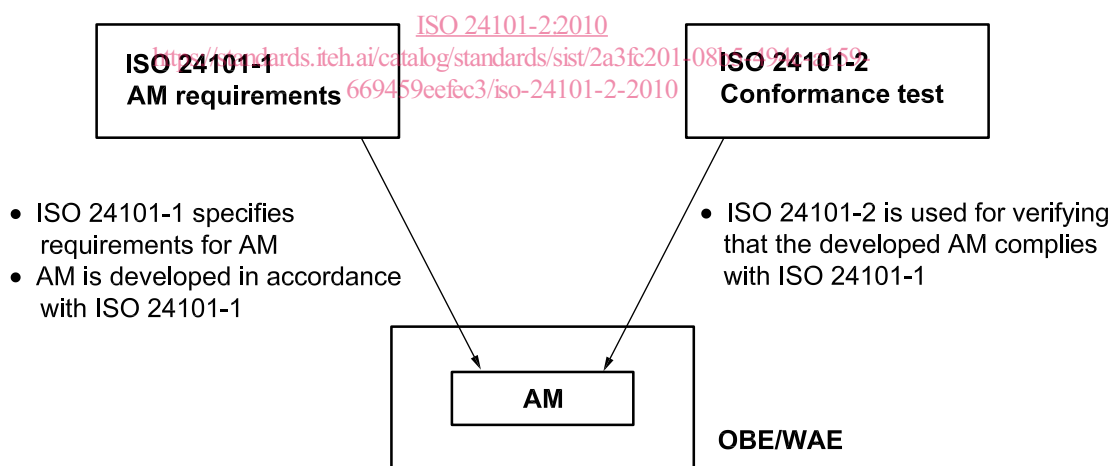


Figure 1

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Intelligent transport systems — Communications access for land mobiles (CALM) — Application management —

Part 2: Conformance test

1 Scope

This part of ISO 24101 specifies the test system, test cases, test conditions, test procedures and test results for examining the function of the communications access for land mobiles (CALM) application management (AM).

NOTE Accreditation and certification are outside the scope of this part of ISO 24101.

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 24101-1:2008, *Intelligent transport systems — Communications access for land mobiles (CALM) — Application management — Part 1: General requirements*

3 Terms and definitions

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

3.1 communication station

wireless station that communicates with the equipment under test (EUT) by using the communications access for land mobiles (CALM) medium for the application management (AM) conformance test

3.2 normal operation

coincidence of the test results and the predetermined states, which are defined before the test, when the test application is executed on the equipment under test (EUT)

3.3 test applications

applications that are used for installing, uninstalling or modifying an application and are pre-installed in the equipment under test (EUT) or the test installer for the application management (AM) conformance test

3.4 test installer

installer that is used for the application management (AM) conformance test

- 3.5 test operator**
operator who operates the test installer for the application management (AM) conformance test
- 3.6 verification means**
means that verifies the results of the application management (AM) conformance test and sets the equipment under test (EUT) to the state defined by the test procedures

4 Abbreviated terms

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

AM	Application Management
AME	Application Management Entity
AMT	Application Management Table
API	Application Programming Interface
BER	Bit Error Rate
CALM	Communications Access for Land Mobiles
CPU	Central Processing Unit
ETSI	European Telecommunications Standards Institute
EUT	Equipment Under Test (ISO/IEC 9646-1:1994)
ICS	Implementation Conformance Statement (ISO/IEC 9646-1:1994)
ITS	Intelligent Transport Systems
ITU-T	International Telecommunication Union – Telecommunication Standardization Sector
IUT	Implementation Under Test (ISO/IEC 9646-1:1994)
IXIT	Implementation eXtra Information for Testing (ISO/IEC 9646-1:1994)
OBE	On-Board Equipment
OS	Operating System
PER	Packet Error Rate
RSSI	Received signal strength indication
TS	Test System
TTCN-3	Testing and Test Control Notation Version 3
URL	Uniform Resource Locator
VM	Virtual Machine
WAE	Wireless Access Equipment

5 General

The methodology and concepts of the AM conformance test are based on ISO/IEC 9646-1:1994.

An AM is developed firstly by the service provider in accordance with ISO 24101-1:2008. The developed AM is software and is installed in the equipment under test (EUT), i.e. on-board equipment (OBE) or wireless access equipment (WAE), prior to the AM conformance test.

Figure 2 shows the basic approach to the AM conformance test.

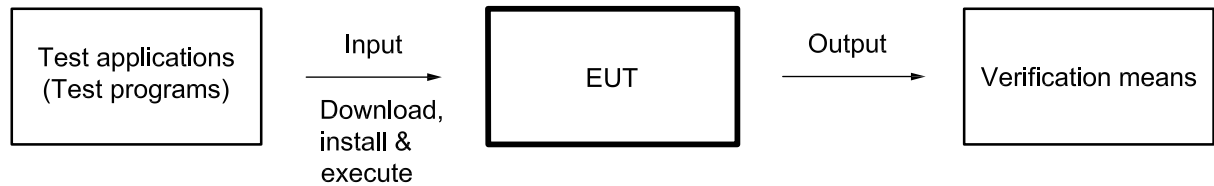


Figure 2 — Basic approach to conformance test

The basic approach is as follows:

- a) collect requirements and specifications for the EUT;
- b) prepare implementation conformance statement(s) (ICS) and implementation eXtra information for testing [IXIT(s)];
- c) prepare some test applications;
- d) prepare test suites, i.e. the set of basic tests and advanced tests, and test system including the verification means, etc.;
- e) install the AM in the EUT, and install the test applications in the EUT and the test installer;
- f) perform the conformance test;
 - 1) download and install the test application into the EUT for installation or modification,
 - 2) execute the test application,
 - 3) confirm the results of the execution by the verification means, and compare the results with the predetermined states, i.e. expected states;
 - i) when all results coincide with the predetermined states: verdict is set into pass,
 - ii) if there are one or more differences: verdict is set into fail;
 - 4) send the command of uninstallation to the EUT and confirm the results of the execution by reading the contents of the application management table (AMT) by the verification means, and
- g) analyse results and prepare the conformance test report.

Figure 3 shows the conformance test process.

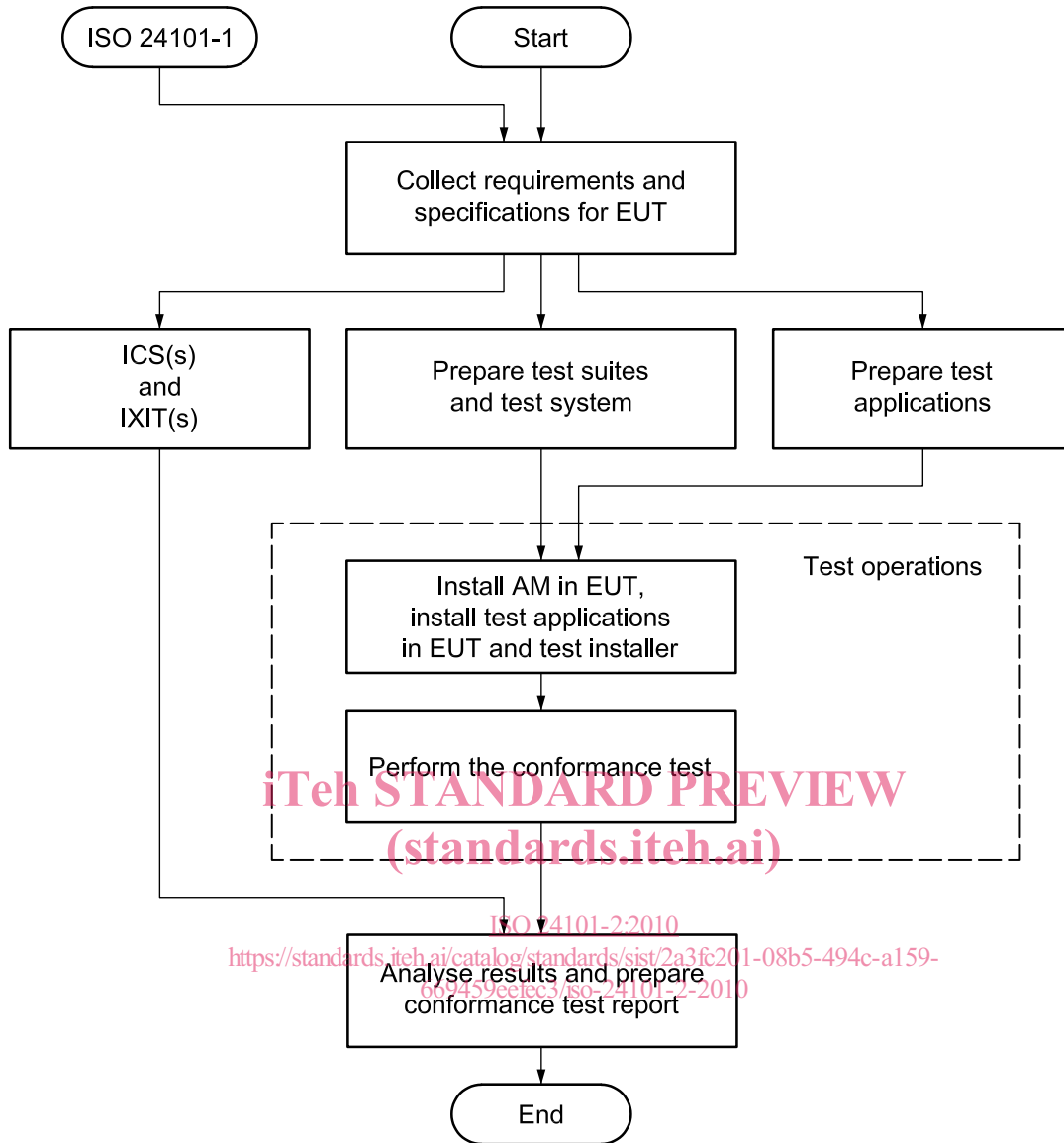


Figure 3 — Conformance test process

6 Test system

Figure 4 shows the test system for the AM conformance test.

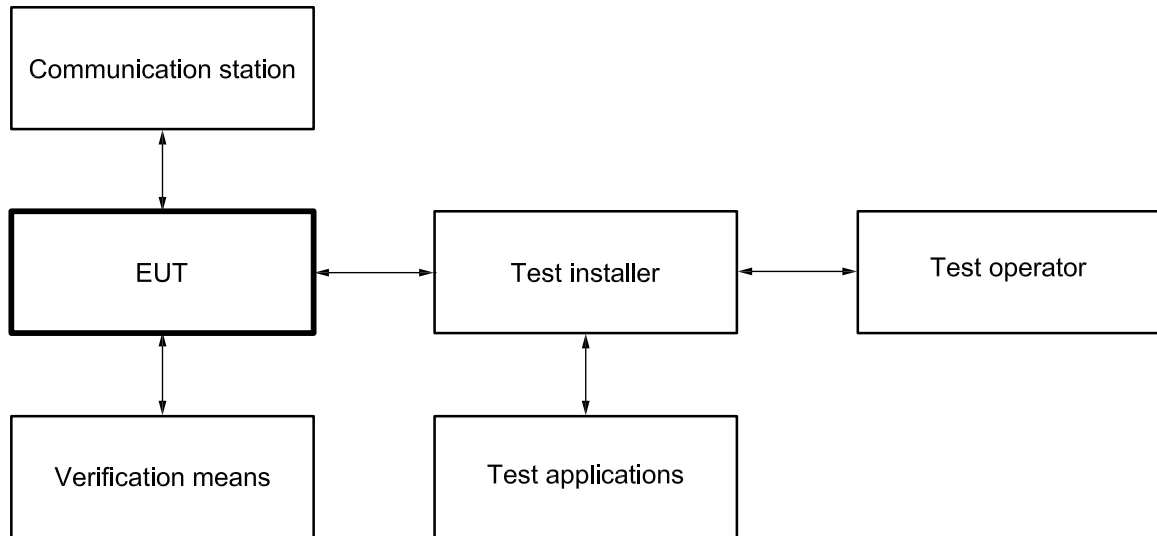


Figure 4 — Test system

7 Functionality of entities

7.1 Test applications

Test applications are pre-installed in the test installer for installation or modification of applications, and also in the EUT for uninstallation. See 9.1 and 9.5.

7.2 Test operator

The test operator installs, uninstalls or modifies the test applications via the test installer, and verifies the test results by the verification means.

7.3 Test installer

7.3.1 OBE/WAE initiated download case

The test installer can be a test server in case of the OBE/WAE initiated download. See ISO 24101-1:2008.

External human machine interfaces (e.g. keyboard and display) may be temporarily connected to the EUT via its external interface (if necessary for the purpose of the AM conformance test) for providing the following operator's human machine interfaces:

- a) inputting commands to the EUT for installation, uninstallation or modification of an application;
- b) display of the command execution results.

EXAMPLE "Under command execution", "The command has successfully completed", "Operator authentication error" and "Manager certificate error" are examples of the display.

7.3.2 Installer initiated download case

In case of installer initiated download, the test installer has the functions specified in 7.3.1 inside.

7.4 Verification means

The verification means has the following functions:

- a) confirming the execution results of the installed or modified application in cooperation with the communication station (e.g. the communication results with the communication station is displayed on the verification means);
- b) reading and confirming the AMT information of the EUT;
- c) rewriting the AMT information for intentional error;
- d) setting the clock data of the EUT for the scheduled update (T-10 in Table 1);
- e) setting the test conditions in the EUT (optional, e.g. halt under program execution).

NOTE The verification means can use a debugger, an emulator or a personal computer, etc. For example, a debugger has useful functions such as the break point function and the contents rewriting function of a specified program address. Also, in a simple case, the verification means can be a test installer (e.g. use of the AMT reading function).

7.5 Communication station

The communication station is used for verifying that applications in the EUT operate normally after installation or modification of an application in cooperation with the verification means. The verification includes wireless communication with CALM media.

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7.6 Connection between entities (standards.itech.ai)

The connection methods between entities are not specified in this part of ISO 24101.

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8 Test cases

8.1 General

Test cases are subdivided into basic tests and advanced tests.

The basic tests verify the basic operations of the AM, and the advanced tests verify that the AM can detect abnormality when the test system is set intentionally in abnormal state.

8.2 Basic tests

Table 1 specifies the test cases of basic tests.

Table 1 — Basic tests

Test number	Test name
T-1	Installation of application
T-2	Modification of application
T-3	Uninstallation of application
T-4	Function of reading application
T-5	Installation of common file
T-6	Modification of common file
T-7	Uninstallation of common file
T-8	Function of reading common file
T-9	Function of reading AMT information
T-10	Function of the scheduled update

The function of each test name is given in ISO 24101-1:2008.

8.3 Advanced tests

Table 2 specifies the test cases of advanced tests.

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Table 2 — Advanced tests
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Test number	Test name
T-11	Operator authentication
T-12	Manager certificate
T-13	The same file name
T-14	Lack of sufficient available memory space
T-15	Prohibition of application management entity (AME) start while an application is running
T-16	Prohibition of application start while AME is running
T-17	Abnormal termination of download
T-18	Archival records
T-19	Restoration function

The function of each test name is given in ISO 24101-1:2008.

9 Test conditions

9.1 Test applications

Test applications shall have the following functions:

- a) communicate with the CALM compliant communication station [*CALM compliant*];
- b) meaning of normal operation is defined beforehand and the test applications are programmed according to the definitions [*Definitions in advance*];

- c) decision criteria of the test results are explicit [*Unambiguity*];
- d) test applications are programmed so that the test results can be confirmed by communication with the communication station and the verification means [*Testability*].

Test applications and verification means should co-operate with each other. Test applications should be programmed to output or display the communication result with the communication station and the state of the EUT to the verification means so that the test operator can confirm the test results by the verification means.

At least two applications with different manager certificates should be installed in the EUT for modification or uninstallation, and at least two applications should be installed in the test installer for installation or modification before the AM conformance test. See Table 3.

9.2 Common files

At least two common files should be installed in the EUT for modification or uninstallation, and at least two common files should be installed in the test installer for installation or modification before the AM conformance test. See Table 3.

9.3 Security information for operator authentication

Security information (e.g. public key) that allows the test installer to authenticate a test operator is stored in the test installer in advance. Mutual authentication of the test operator and test installer shall precede any exchange of application information. See ISO 24101-1:2008, 8.3.1.

The details of operator authentication are not specified in this part of ISO 24101.

9.4 Manager certificate for access control

Manager certificate is a manager's security credential containing information used to verify the identity of the source of the credential. For example a manager certificate is sent by the manager of an application to the OBE/WAE and is used by the AME to authenticate the manager. See ISO 24101-1:2008, 8.3.2.

At least six manager certificates may be set corresponding to the test applications and common files. See Table 3.

9.5 Combination example of test conditions

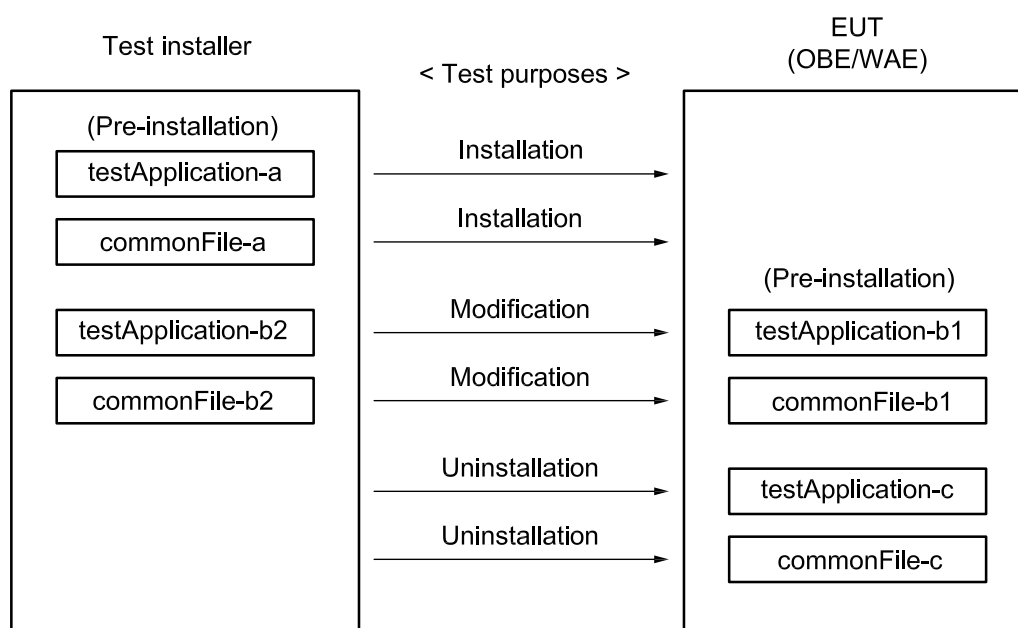
Table 3 shows the kind of test applications and common files that are required for the conformance test, and also shows the combination example of pre-installation place, manager certificate and test purpose for each kind.

Table 3 — Combination example of test conditions

Test application or common file	Pre-installation place	Manager certificate	Test purpose
testApplication-a	Installer	managerCertificate-a	Installation
testApplication-b1	EUT	managerCertificate-b	Modification
testApplication-b2	Installer	managerCertificate-b	Modification
testApplication-c	EUT	managerCertificate-c	Uninstallation
commonFile-a	Installer	managerCertificate-d	Installation
commonFile-b1	EUT	managerCertificate-e	Modification
commonFile-b2	Installer	managerCertificate-e	Modification
commonFile-c	EUT	managerCertificate-f	Uninstallation

NOTE 1 The file names are shown as testApplication-a, -b, -c, etc. The number following it shows a version number.
 NOTE 2 The file names are representatively shown as testApplication-a, etc. The naming method of file names (i.e. identification of the application program) is specified in ISO 24101-1:2008, 8.1, although the file names of test applications can be named by the arbitrary method distinguished mutually if the test applications are test purpose only and they are not installed in the OBE/WAE products. This is applicable also to common files.

Figure 5 shows the test purposes and corresponding pre-installations for test applications (testApplications) and common files (commonFiles).



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Figure 5 — Test purposes and pre-installations
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10 Test procedures

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10.1 Basic tests

Annex A specifies the test procedures for each test case of the basic tests.

10.2 Advanced tests

Annex B specifies the test procedures for each test case of the advanced tests.

10.3 Notation for test procedures

Test procedures are specified in TTCN-3 in Annex A and Annex B. See ITU-T Recommendations Z.161 through to Z.167 and ETSI ES 201 873-1 about TTCN-3.

In TTCN-3, a message is transferred between TS and EUT via a port, i.e. a message is sent to EUT via a port from TS, and TS receives the response message from EUT via the port. The response message is compared with the expected message and verdict is set according to the comparison result. On the other hand, a debugger may be used, for example as the verification means as shown in 7.4 in the implementation. In such a case, from a viewpoint of TTCN-3, it is considered that the connector which connects the debugger to EUT corresponds to the port and it is abstracted that a message is transferred via the port.

10.4 Commands in test procedures

Annex C specifies the commands that can be used for installation, uninstallation and modification in the test procedures of Annex A and Annex B.