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Road vehicles — In-vehicle Ethernet —

Part 10: Transport layer and network layer conformance test plans

Véhicules routiers — Ethernet embarqué —

Partie 10: Plans de test de conformité des couches transport et réseau

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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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 31, *Data communication*.

A list of all parts in the ISO 21111 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The ISO 21111 series includes in-vehicle Ethernet requirements and test plans that are disseminated in other International Standards and complements them with additional test methods and requirements. The resulting requirement and test plans are structured in different documents following the Open Systems Interconnection (OSI) reference model and grouping the documents that depend on the physical media and bit rate used.

In general, the Ethernet requirements are specified in ISO/IEC/IEEE 8802-3. The ISO 21111 series provides supplemental specifications (e.g. wake-up, I/O functionality), which are required for in-vehicle Ethernet applications. In road vehicles, Ethernet networks are used for different purposes requiring different bit-rates. Currently, the ISO 21111 series specifies the 1-Gbit/s optical and 100-Mbit/s electrical physical layer.

The ISO 21111 series contains requirement specifications and test methods related to the in-vehicle Ethernet. This includes requirement specifications for physical layer entity (e.g. connectors, physical layer implementations) providers, device (e.g. electronic control units, gateway units) suppliers, and system (e.g. network systems) designers. Additionally, there are test methods specified for conformance testing and for interoperability testing.

Safety (electrical safety, protection, fire, etc.) and electromagnetic compatibility (EMC) requirements are out of the scope of the ISO 21111 series.

The structure of the specifications given in the ISO 21111 series complies with the Open Systems Interconnection (OSI) reference model specified in ISO/IEC 7498-1[1] and ISO/IEC 10731[2].

ISO 21111-1 defines the terms which are used in this series of standards and provides an overview of the standards for in-vehicle Ethernet including the complementary relations to ISO/IEC/IEEE 8802-3, the document structure, type of physical entities, in-vehicle Ethernet specific functionalities and so on.

ISO 21111-2 specifies the interface between reconciliation sublayer and physical entity including reduced gigabit media independent interface (RGMII), and the common physical entity wake-up and synchronized link sleep functionalities, independent from physical media and bit rate.

ISO 21111-2 specifies supplemental requirements to a physical layer capable of transmitting 1-Gbit/s over plastic optical fibre compliant with ISO/IEC/IEEE 8802-3, with specific application to communications inside road vehicles, and a test plan for physical entity conformance testing.

ISO 21111-4 specifies the optical components requirements and test methods for 1-Gbit/s optical invehicle Ethernet.

ISO 21111-5 specifies, for 1-Gbit/s optical in-vehicle Ethernet, requirements on the physical layer at system level, requirements on the interoperability test set-ups, the interoperability test plan that checks the requirements for the physical layer at system level, requirements on the device-level physical layer conformance test set-ups, and device-level physical layer conformance test plan that checks a set of requirements for the OSI physical layer that are relevant for device vendors.

ISO 21111-6 specifies advanced features of an ISO/IEC/IEEE 8802-3 in-vehicle Ethernet physical layer (often also called transceiver), e.g. for diagnostic purposes for in-vehicle Ethernet physical layers. It specifies advanced physical layer features, wake-up and sleep features, physical layer test suite,

physical layer control requirements and conformance test plan, physical sublayers test suite and physical sublayers requirements and conformance test plan.

ISO 21111-7 specifies the implementation for ISO/IEC/IEEE 8802-3:2021, which defines the interface implementation for automotive applications together with requirements on components used to realize this Bus Interface Network (BIN). ISO 21111-7 also defines further testing and system requirements for systems implemented according to the system specification. In addition, ISO 21111-7 defines the channels for tests of transceivers with a test wiring harness that simulates various electrical communication channels.

ISO 21111-8 specifies the transmission media, the channel performance and the tests for ISO/IEC/IEEE 8802-3 in-vehicle Ethernet.

ISO 21111-9 specifies the data link layer requirements. It specifies the requirements for devices and systems with bridge functionality.

This document specifies the transport layer and network layer requirements and conformance test plans. It specifies the conformance test plans for devices and systems that include functionality related with OSI layers from 4 and 3.

ISO 21111-11 specifies the application layer to session layer requirements and conformance test plans. It specifies the conformance test plans for devices and systems that include functionality related with OSI layers from 7 to 5.

Figure 1 shows the parts of the ISO 21111 series and the document structure.

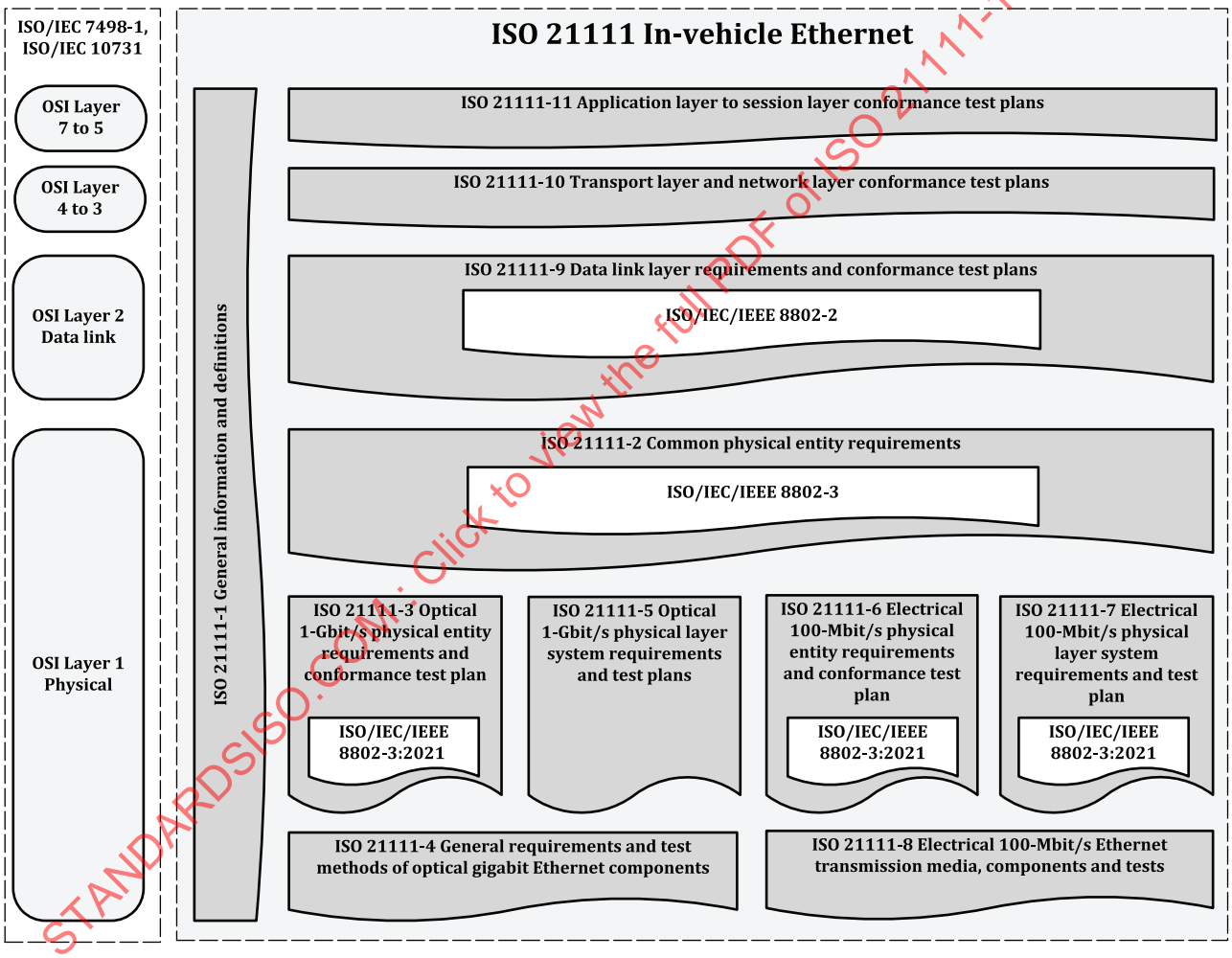


Figure 1 — In-vehicle Ethernet documents reference according to OSI model

Road vehicles — In-vehicle Ethernet —

Part 10:
Transport layer and network layer conformance test plans

1 Scope

This document specifies in-vehicle Ethernet transport layer and network layer conformance test plans (CTP) for electronic control units (ECUs). This document is a collection of all conformance test cases which are recommended to be considered for automotive use and should be referred by car manufacturers within their quality control processes.

The document includes conformance test plans for the address resolution protocol, Internet control message protocol version 4, Internet protocol version 4, Internet protocol version 4 auto configuration, user datagram protocol, transport control protocol, and dynamic host configuration protocol version 4.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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/IEC 9646-1, *Information technology — Open Systems Interconnection — Conformance testing methodology and framework — Part 1: General concepts*

ISO 21111-1, *Road vehicles — In-vehicle Ethernet — Part 1: General information and definitions*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 21111-1, ISO/IEC 9646-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
REPEAT
pseudo code command for an iteration

3.2
full-sized segment
segment with size equal to the effective send MSS

3.3
result code
value attributed to a result

3.4
generic result code
specific and universal value attributed to a result

3.5
full-window operation
IUT's TCP has reached a state where it is allowed to send data segments of size of test system Host-1's entire receive without getting any acknowledgement from the test system Host-1

4 Symbols and abbreviated terms

4.1 Symbols

—	empty table cell or feature undefined
V_{BAT}	voltage of the battery
$t_{ARP\text{-}Dynamic\text{-}Cache\text{-}Timeout}$	time for which a dynamic entry is present in the ARP cache
$t_{ARP\text{-}Dynamic\text{-}Cache\text{-}Tolerance}$	tolerance time for the ARP dynamic cache of the IUT to get refreshed
$t_{ARP\text{-}Tolerance}$	IUT: tolerance time for the ARP cache of the IUT to get refreshed LT: time variance associated to any wait-event
$t_{Valid\text{-}Time\text{-}To\text{-}Live}$	time interval of IP datagram send
$t_{Listen\text{-}Time}$	maximum time interval for which the LT waits for an ICMP reply segment
$t_{Fragment\text{-}Reassemly\text{-}Timeout}$	fragment reassembly timeout
$t_{Valid\text{-}Time\text{-}To\text{-}Live}$	value used in IP datagram send
t_{Probe_Min}	value of PROBE_MIN constant
t_{Probe_Max}	value of PROBE_MAX constant
$t_{Announce\_Wait}$	value of ANNOUNCE_WAIT constant
$t_{Announce\_Interval}$	value of ANNOUNCE_INTERVAL constant
$t_{Rate\_Limit\_Interval}$	value of RATE_LIMIT_INTERVAL constant
$t_{Defend\_Interval}$	value of DEFEND_INTERVAL constant

4.2 Abbreviated terms

ACK	acknowlege
Addr	address
AL	application layer
ANVL	automated network validation library
ARL	address resolution lookup
ARP	address resolution protocol
ASP	abstract service primitive
CTC	conformance test case

CTP	conformance test plan
EMC	electromagnetic compatibility
EOP	end of option
ETS	enhanced testability service
FIF	filtering of incoming frames
FIN	finish control flag
FINWAIT	finish wait
GEN	general requirements
GND	ground
ICMP	internet control message protocol
IHL	Internet header length
IUT	implementation under test
IUT-Iface	IUT physical layer interface
ISN	initial sequence number
LT	lower tester
LT-Iface	LT physical layer interface
MSL	maximum segment lifetime
MSS	maximum segment size
MTU	maximum transmission unit
Mv	manipulated value
NL	network layer
NOP	no operation
PCO	points of control and observation
PHY	physical layer
PSH	push
QOS	qualitiy of service and audio/video bridging
RCVD	received
RCV.NXT	receive next
RPC	remote procedure call
RST	reset
RTO	retransmission timeout

SEQ	sequence
SL	session layer
SUT	system under test
SYN	synchronize control flag
SYN-RCVD	SYN received
SYN-SENT	SYN sent
TCP	transmission control protocol
TIME	time synchronisation
TL	transport layer
UDP	user datagram protocol
UT	upper tester

5 Conventions

This document is based on OSI service conventions as specified in ISO/IEC 10731[2].

6 CTP test system set-up and CTC structure

6.1 General

This document specifies a CTP according to the requirements as specified in the ISO/IEC 9646 series. A CTP does not provide qualification of test results but expected responses of the IUT. A CTP is used by a test house to develop a conformance test specification specific for the test system used in their lab environment.

The CTCs specified in this document are organized in such a manner as to simplify the identification of information related to a test and to facilitate in the actual testing process. CTCs are organized into groups, primarily in order to reduce set-up time in the lab environment. The different groups typically also tend to focus on specific aspects of device functionality.

A CTC reference name, e.g. "ARP_03 – ARP entry learned on ARP request (no ARP request)" is used to organize the CTC name, where:

— CTC indicates that this is a conformance test case;

— name/subject of CTC;

— supplemental name, e.g. ARP, which is address resolution protocol;

— CTC number;

— after the hyphen a descriptive name of the CTC follows.

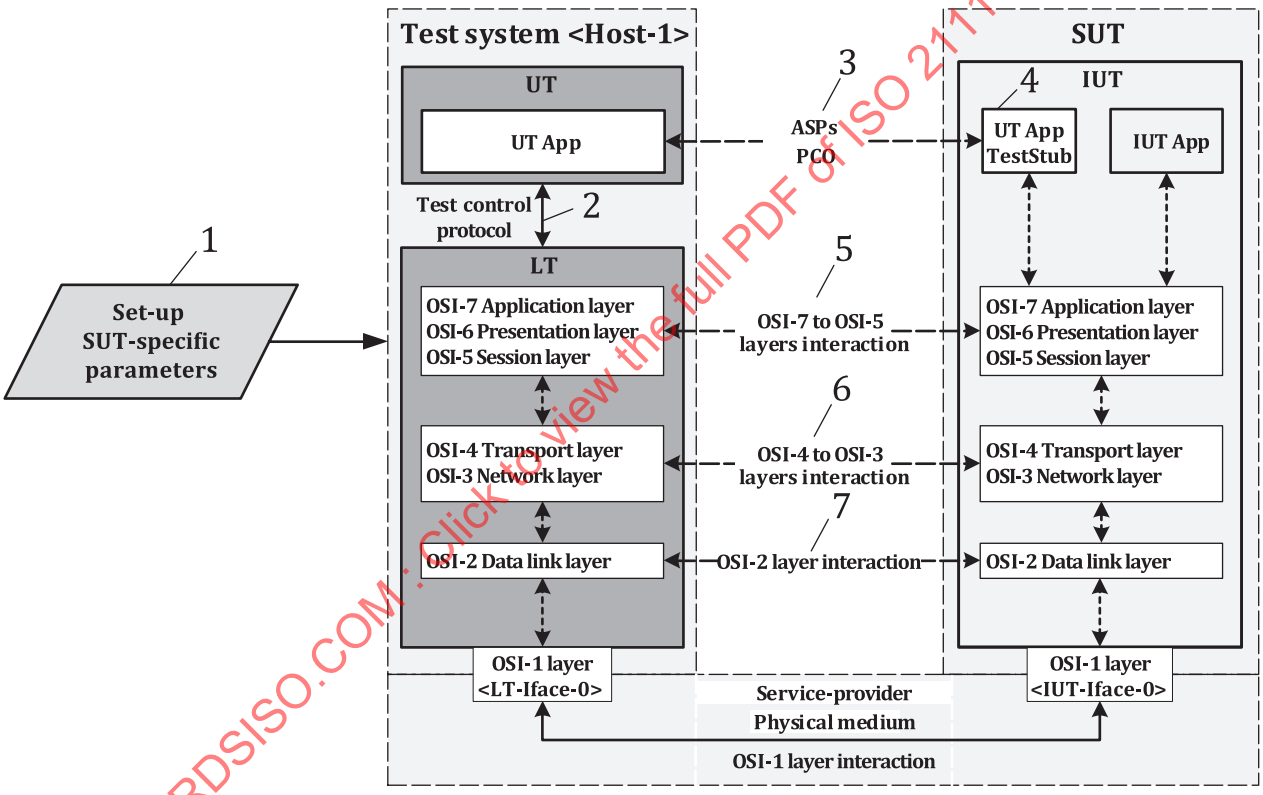
The CTC definitions themselves are intended to provide a high-level description of the purpose, references, prerequisite, steps/procedures, expected responses, remarks, and methodologies pertinent to each test (see 6.3).

6.2 Test system set-up

The test system topology follows ISO/IEC 9646-1 and consists of a test set-up which consists of a test system and a system under test (SUT) connected via the physical medium. The test system implements a UT and an LT. The UT uses the test control protocol (Figure 2, key 2) to control the LT. The LT supports the functionality required to test the OSI layer (Figure 2, key 5, key 6, and key 7) of the IUT. The test system uses IUT-specific set-up parameters (Figure 2, key 1) for testing the communication with the IUT.

The control and measurement functionality is provided by direct logical access to the service interface (dashed line) (Figure 2, key 3) and the associated parameters of the OSI layer. The UT in the IUT (Figure 2, key 4) supports an equivalent part of the abstract service interface (ASPs, PCO) (dashed line) (Figure 2, key 3) and the associated parameters to control and measure the state(s) of the IUT.

The UT conformance test controller in the test system manipulates the service primitive interface parameters in the IUT via the ASPs (ETSs) and PCO of the OSI layers to fulfil the purpose of each CTC.



Key

1 set-up parameters (node's electronic data sheet)

2 test control protocol

3 points of control and observation (PCO) and abstract service primitives (ASPs) based on enhanced testability services (ETS)

4 UT application with ETS interface

5 OSI layer 7 to 5 protocol

6 OSI layer 4 to 3 protocol

7 OSI layer 2 protocol

Figure 2 — Test system set-up

6.3 CTC definition

CTCs are independent of one another. Each CTC checks the behaviour of the IUT for a particular purpose of this document. CTCs, which require variations of individual parameters, shall be repeated for each value of the parameter. Each CTC is specified according to a common CTC structure as shown in Table 1.

Table 1 — CTC structure

Item	Content
CTC # – Title	CTC_x.y.z-a – CTC structure
Purpose	The purpose is a brief statement outlining what the test attempts are to achieve. The test is written at the functional level. It is recommended to begin the description of purpose with "This CTC verifies ...".
Reference	The purpose of reference is to specify source material external to the test suite, including any other references that might be helpful in understanding the test methodology and/or test results. External sources are always referenced by number when mentioned in the test description. Any other references not specified by number are stated with respect to the test suite document itself. EXAMPLE AUTOSAR SOME/IP Protocol Specification, R20-11 [13] PRS_SOMEIP_00042; PRS_SOMEIP_00099; ...
Prerequisite	The purpose of prerequisites is to specify the test hardware and/or software needed to perform the CTC. This is generally expressed in terms of minimum requirements. In some cases, specific equipment manufacturer/model information may be provided. EXAMPLE The IUT is running and offering the enhanced testability service.
Set-up	The purpose of set-up is to describe the initial configuration of the test environment. Small changes in the configuration should not be included here and are generally covered in the test procedure below. EXAMPLE The test system set-up shall be in accordance with Figure 3.
Step	The test procedure includes the test description, which contains the systematic instructions for carrying out the test. It provides a cookbook approach to testing and may be interspersed with observable results. Each test step shall have a numeric number in ascending order. 1. Configure the IUT as master or as slave. 2. Establish a valid link with the IUT. 3. Monitor the transmissions from the IUT and cause the management to request a PMA reset while simultaneously ceasing transmissions from the test system.
Iteration	The purpose of test iterations is to include test procedure definitions, which are repeated more than once. a) REPEAT step 2 to step 3 with the IUT configured as master, 1 time. b) REPEAT step 2 to step 3 with the IUT configured as slave, 1 time.
Expected response	The purpose of expected response is to describe the expected results to be examined by the test system Host-1 in order to verify that the IUT is operating. When multiple values for an observable are possible, this description provides a short discussion on how to interpret them. The determination of a pass or fail outcome for a particular test is generally based on the successful (or unsuccessful) detection of a specific observable. After iteration a): The IUT stops transmitting with tx_mode = SEND_N and starts transmitting with tx_mode = SEND_I for 1 iteration a). The IUT sets link_status = FAIL. After iteration b): The IUT stops transmitting for 1 iteration b). The IUT sets link_status = FAIL.
Remark	The purpose of remarks is to describe known issues with the test procedure, which can affect test results in certain situations. It can also refer the reader to test suite annexes and/or white papers that can provide more detail regarding these issues.

6.4 Terminology used in CTCs

Table 2 specifies the terminology used in CTCs.

Table 2 — Terminology used in CTCs

Name	Content
Upper tester (UT)	Entity which is responsible for controlling the LT via the test control protocol and the IUT UT ETS via the abstract service primitives (ASPs).
Lower tester (LT)	Entity which is responsible for validating the implementation under test (IUT).
IUT_CONFIGURE	This entry causes the IUT to configure/execute various commands for clearing cache, adding static address, send echo request, etc.
IUT	Implementation under test in the SUT.
CLEANUP	This is a command, which causes the IUT to remove the static entry from its ARP cache.

6.5 IUT prerequisites – TCP/IP TestStub

6.5.1 General

The TCP/IP TestStub defines interfaces required to test the TCP/IP communication stack functionality.

The protocol parts covered by the TCP/IP TestStub include:

— UDP and TCP – socket connection establishment and termination;

— UDP and TCP – message transmission and reception.

The TCP/IP TestStub is specified in Reference [14] (AUTOSAR). This document references a subset of the AUTOSAR specification.

6.5.2 TCP/IP TestStub service primitives

Table 3 references *AUTOSAR Testability Protocol and Service Primitives, TC Release 1.1.0*, '6.10 Service Primitives'[14]. A subset of service primitives are supported by the UT to observe and control the TCP/IP UT TestStub in the IUT.

Table 3 provides an overview of the service primitives, the identifier, applicability and applicability of UDP and TCP.

Table 3 — TCP/IP TestStub methods (service primitives)

Method name (service primitive)	Identifier	Applicability	UDP	TCP
GET_VERSION	1_{16}	optional	—	—
START_TEST	2_{16}	mandatory	—	—
END_TEST	3_{16}	mandatory	—	—
CLOSE_SOCKET	0_{16}	—	mandatory	mandatory
CREATE_AND_BIND	1_{16}	—	mandatory	mandatory
SEND_DATA	2_{16}	—	mandatory	mandatory
RECEIVE_AND_FORWARD	3_{16}	—	mandatory	mandatory
LISTEN_AND_ACCEPT	4_{16}	—	—	mandatory
CONNECT	5_{16}	—	—	mandatory
SHUTDOWN	7_{16}	—	—	optional
Key — empty cell/undefined				

6.5.3 Result codes

Due to different stack implementations there is no generic way to retrieve specific result codes. Only generic result codes are supported. The generic result codes of the TCP/IP TestStub methods (see Table 3) are E_OK and E_NOK.

7 Network and transport layers CTCs

7.1 NL – Address resolution protocol (ARP)

7.1.1 General

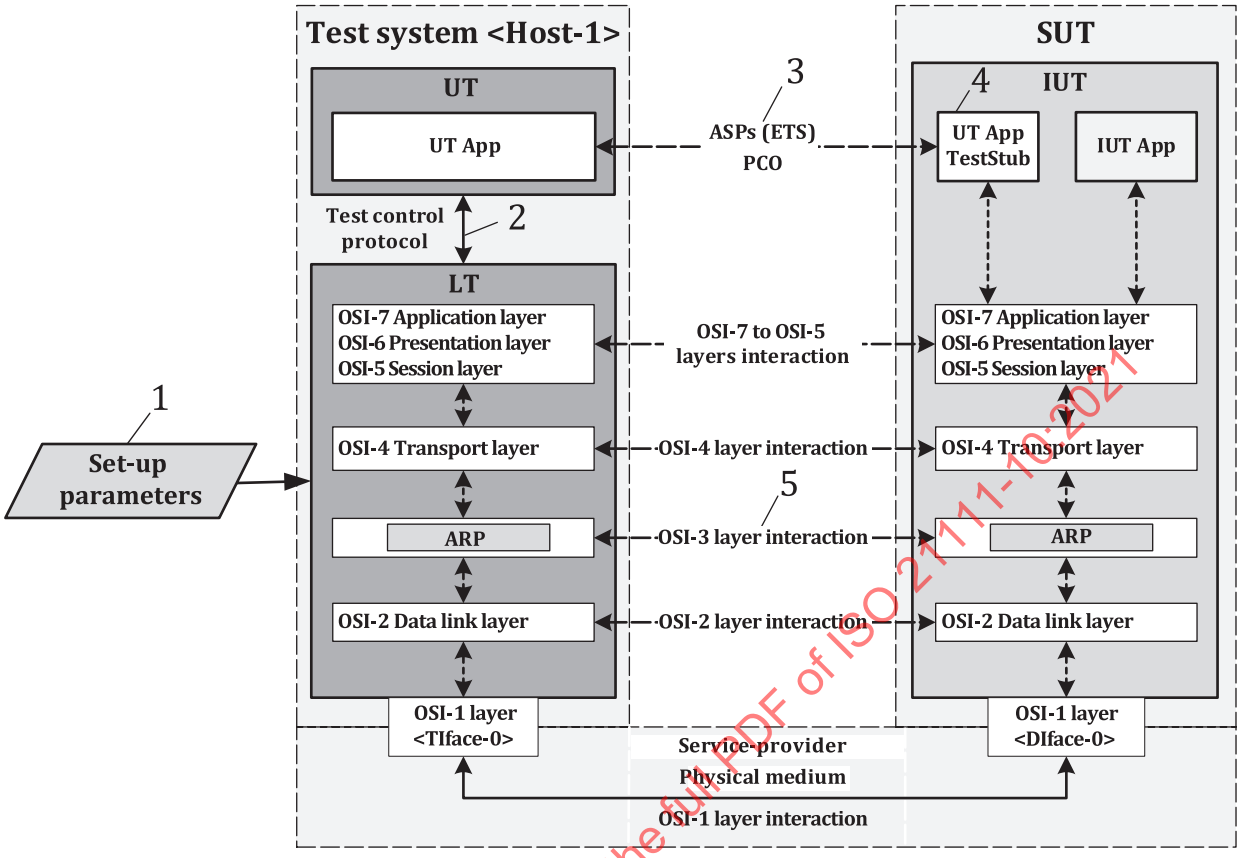
The objective of this subclause is to specify CTCs for the ARP from RFC 826:1982[8].

7.1.2 Referenced specification

RFC 826:1982[8] specifies an Ethernet address resolution protocol. All CTCs in 7.1 are in accordance with this RFC.

7.1.3 Test system topology – NL – ARP

Figure 3 shows the test system topology – NL – ARP.



Key

1 IUT-specific set-up parameters (electronic data sheet)
2 test control protocol
3 PCO and ASPs based on ETS
4 UT TestStub application
5 OSI layer 3 ARP interaction

Figure 3 — Test system topology – NL – ARP

7.1.4 Test system topology and related CTC configuration

Test system Host-1 configuration required for the tests in the following sections pertaining to ARP tests.

— Correct IUT MAC address for the IUT interface (IUT-Iface-0) connected to LT interface (LT-Iface-0).

— All CTCs that use an IP interface need to perform ARP packet exchange. This ARP fragment exchange is performed after the IUT interface is configured with an IP address. Using this fragment exchange the LT automatically learns the MAC address of IUT. The learned MAC address is then used in the CTCs to send segments to the IUT.

— All CTCs in this conformance test plan require the IUT to be configured with only one IP interface (IUT-Iface-0).

7.1.5 CTC ARP overview

Table 4 shows the CTC ARP overview.

Table 4 — CTC ARP overview

Specification document	Subclause number	Test category	Test number (s)
RFC 826: an Ethernet address resolution protocol, Packet generation	7.1.7.1	Packet generation	CTC_ARP_01 to CTC_ARP_15
RFC 826: an Ethernet address resolution protocol, Packet reception	7.1.7.2	Packet reception	CTC_ARP_16 to CTC_ARP_49

7.1.6 ARP parameters used in CTCs

7.1.6.1 User defined configuration parameters for IUT

The configuration parameter values are user defined. Table 5 defines the user defined configuration parameters for IUT.

Table 5 — User defined configuration parameters for IUT

Parameter used in CTCs	Content
$t_{\text{ARP-Dynamic-Cache-Timeout}}$	This is the time for which a dynamic entry is present in the ARP cache. This timeout is only effective if it has been configured using the script named ARP IUT configure ARP dynamic cache entry timeout command.
$t_{\text{ARP-Tolerance}}$	This is the tolerance time for the ARP cache of the IUT to get refreshed.
$t_{\text{ARP-Dynamic-Cache-Tolerance}}$	This is the tolerance time for the ARP dynamic cache of the IUT to get refreshed.

$t_{\text{ARP-Dynamic-Cache-Tolerance}}$ is specified in Formula (1).

$$t_{\text{ARP-Dynamic-Cache-Tolerance}} = t_{\text{ARP-Tolerance}} + t_{\text{ARP-Dynamic-Cache-Timeout}} \quad (1)$$

7.1.6.2 User defined configuration parameters for LT

The configuration set-up parameter values are user defined. Table 6 specifies the user defined configuration parameters for the LT.

Table 6 — User defined configuration parameters for LT

Parameter used in CTCs	Content
Host-1	This denotes ARP Host-1 simulated in the LT.
Host-1-IP	This denotes IP address of Host-1.
IUT-Iface-0	This denotes the IUT interface to which the LT Host-1 is connected.
IUT-Iface-0-IP	This denotes IP address of IUT-Iface-0.
Param-Listen-Time	This is the maximum time interval for which the LT waits for a fragment for cases when a certain event has been triggered on the IUT either by some protocol timer or using some external mechanism.
MAC-Addr-1	The first unused MAC address that the LT can use for emulating specific topologies needed in the CTC.
MAC-Addr-2	The second unused MAC address that the LT can use for emulating specific topologies needed in test. This is auto generated as consecutive to MAC-Addr-1.
MAC-Addr-3	The third unused MAC address that the LT can use for emulating specific topologies needed in the CTC. This is auto generated as consecutive to MAC-Addr-2.
IUT-Iface-0-MAC-Addr	This is the MAC address of IUT-Iface-0 of the IUT.
Arbitrary-MAC-Addr	This indicates an arbitrary MAC address. This value is equal to 12:34:56:78:90:00.

Table 6 *(continued)*

Parameter used in CTCs	Content
Unknown-ARP-Hardware-Type	This indicates an unknown/wrong value of a hardware type resolution segment.
Unknown-Hardware-Addr-Len	This indicates an unknown/wrong length of a hardware address.
Unknown-ARP-Prot-Type	This indicates an unknown/wrong value of a protocol type.
Unknown-Prot-Addr-Len	This indicates an unknown/wrong length of a protocol address.
$t_{\text{ARP-Tolerance}}$	This value depicts the time variance associated to any wait-event.
Eth-Addr-Len	The length in bytes of the Ethernet MAC address that has the value 6.
Arbit-MAC-Addr	This indicates an arbitrary MAC address.
ARP-Hardware-Eth	This indicates the ARP hardware type "Ethernet" (0001_{16}).
MAC-Addr-1	MAC address 1
ARP-Hardware-Type-Unknown	This indicates an unknown ARP hardware type.
ARP-Protocol-IP	This indicates the ARP protocol type "IP" (0800_{16}).
ARP-Protocol-Unknown	This indicates an unknown ARP protocol type.
IP-First-Unused_Addr-Iface-1	This indicates an IP address that is currently not assigned to the IUT interface IUT-Iface-0.
Operation-Request	This indicates the ARP operation code "Request" (0001_{16}).
Operation-Response	This indicates the ARP operation code "Response" (0002_{16}).

7.1.7 ARP CTCs

7.1.7.1 CTC_ARP – Packet generation

Table 7 specifies the ARP_03 – ARP entry learned on ARP request (no ARP request) test case.

Table 7 — ARP_03 – ARP entry learned on ARP request (no ARP request)

Item	Content
CTC # – Title	CTC_ARP_03 – ARP entry learned on ARP request (no ARP request)
Purpose	This CTC verifies that when the LT sends an ARP request to the IUT, an entry of Host-1-IP, MAC-Addr-1 gets added to the IUT's ARP cache. When the UT causes the IUT to send a UDP datagram using the new ARP cache entry, the IUT does not send any ARP request.
Reference	RFC 826:1982,[8] Packet generation
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.

Table 7 *(continued)*

Item	Content
Step	1. The UT shall configure the IUT to clear the dynamic entries in the ARP cache of IUT-Iface-0 containing: — IP address Host-1-IP. 2. The LT shall send the ARP request to the IUT through IUT-Iface-0 containing: — ARP sender IP address set to Host-1-IP; — ARP target IP address set to IUT-Iface-0-IP; — Ethernet source address set to MAC-Addr-1. 3. The LT shall wait $t_{ARP\text{-}Tolerance}$ second(s) for the ARP cache of the IUT to get refreshed. 4. The UT shall configure the IUT to send a UDP datagram from IUT-Iface-0 with: — ARP sender IP address set to IUT-Iface-0-IP; — ARP target IP address set to Host-1-IP. 5. The LT shall listen Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 5: The IUT shall not send an ARP request.
Remark	—

Table 8 specifies the ARP_04 – ARP entry learned on ARP request (ARP entry used).

Table 8 — ARP_04 – ARP entry learned on ARP request (ARP entry used)

Item	Content
CTC # – Title	CTC_ARP_04 – ARP entry learned on ARP request (ARP entry used)
Purpose	This CTC verifies that when the LT sends an ARP request to the IUT, an entry of Host-1-IP, MAC-Addr-1 gets added to the IUT's ARP cache. When the UT causes the IUT to send a UDP datagram using the new ARP cache entry, the IUT sends the expected UDP datagram.
Reference	RFC 826:1982,[8] Packet generation
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.

Table 8 *(continued)*

Item	Content
Step	1. The UT shall configure the IUT to clear the dynamic entries in the ARP cache of IUT-Iface-0 containing: — IP address Host-1-IP. 2. The LT shall send ARP request to IUT through IUT-Iface-0 containing: — ARP sender IP address set to Host-1-IP; — ARP target IP address set to IUT-Iface-0-IP; — Ethernet source address set to MAC-Addr-1. 3. The LT shall wait up to $t_{ARP\text{-}Tolerance}$ second(s) for the ARP cache of IUT to get refreshed. 4. The UT shall configure the IUT to send a UDP datagram from IUT-Iface-0 with: — source IP address set to IUT-Iface-0-IP; — destination IP address set to Host-1-IP. 5. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 5: The IUT sends the UDP datagram.
Remark	—

Table 9 specifies the ARP_05 – ARP entry learned on gratuitous ARP response (no ARP request).

Table 9 — ARP_05 – ARP entry learned on gratuitous ARP response (no ARP request)

Item	Content
CTC # – Title	CTC_ARP_05 – ARP entry learned on gratuitous ARP response (no ARP request)
Purpose	This CTC verifies that when the LT sends a gratuitous ARP response to the IUT, an entry of Host-1-IP, MAC-Addr-1 gets added to the IUT's ARP cache. When the UT causes the IUT to send a UDP datagram using the new ARP cache entry, the IUT does not send any ARP request.
Reference	RFC 826:1982,[8] Packet generation
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.

Table 9 *(continued)*

Item	Content
Step	1. The UT shall configure the IUT to clear the dynamic entries in the ARP cache of IUT-Iface-0 containing: — IP address Host-1-IP. 2. The LT shall send gratuitous ARP response to IUT through IUT-Iface-0 containing: — ARP sender IP address set to Host-1-IP; — ARP target IP address set to IUT-Iface-0-IP; — Ethernet source address set to MAC-Addr-1; — Ethernet destination address set to Eth-Broadcast-Addr. 3. The LT shall wait up to $t_{ARP\text{-}Tolerance}$ second(s) for the ARP cache of IUT to get refreshed. 4. The UT shall configure the IUT to send a UDP datagram from IUT-Iface-0 with: — source IP address set to IUT-Iface-0-IP; — destination IP address set to Host-1-IP. 5. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 5: The IUT shall not send an ARP request.
Remark	—

Table 10 specifies the ARP_06 – ARP entry learned on gratuitous ARP response (ARP entry used).

Table 10 — ARP_06 – ARP entry learned on gratuitous ARP response (ARP entry used)

Item	Content
CTC # – Title	CTC_ARP_06 – ARP entry learned on gratuitous ARP response (ARP entry used)
Purpose	This CTC verifies that when the LT sends a gratuitous ARP response to the IUT, an entry of Host-1-IP, MAC-Addr-1 gets added to the IUT's ARP cache. When the UT causes the IUT to send a UDP datagram using the new ARP cache entry, the IUT sends the expected UDP datagram.
Reference	RFC 826:1982,[8] Packet generation
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.

Table 10 *(continued)*

Item	Content
Step	1. The UT shall configure the IUT to clear the dynamic entries in the ARP cache of IUT-Iface-0 containing: — IP address Host-1-IP. 2. The LT shall send gratuitous ARP response to IUT through DIFACE-0 containing: — ARP sender IP address set to Host-1-IP; — ARP target IP address set to IUT-Iface-0-IP; — Ethernet source address set to MAC-Addr-1. 3. The LT shall wait up to $t_{ARP\text{-}Tolerance}$ second(s) for the ARP cache of IUT to get refreshed. 4. The UT shall configure the IUT to send a UDP datagram from IUT-Iface-0 with: — source IP address set to IUT-Iface-0-IP; — destination IP address set to Host-1-IP. 5. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 5: The IUT sends the UDP datagram.
Remark	—

Table 11 specifies the ARP_07 – ARP request sending (ARP request send on missing entry).

Table 11 — ARP_07 – ARP request sending (ARP request send on missing entry)

Item	Content
CTC # – Title	CTC_ARP_07 – ARP request sending (ARP request send on missing entry)
Purpose	This CTC verifies that when the UT causes the IUT to send a UDP datagram to destination IP address Host-1-IP and there is no entry related to Host-1-IP in the IUT's ARP cache, then the IUT sends as ARP request.
Reference	RFC 826:1982,[8] Packet generation
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.
Step	1. The UT shall configure the IUT to clear the dynamic entries in the ARP cache of IUT-Iface-0 containing: — IP address Host-1-IP. 2. The UT shall configure the IUT to send a UDP datagram from IUT-Iface-0 with: — source IP address set to IUT-Iface-0-IP; — destination IP address set to Host-1-IP. 3. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 3: The IUT sends an ARP request.

Table 11 *(continued)*

Item	Content
Remark	—

Table 12 specifies the ARP_08 – ARP request sending (hardware type check).

Table 12 — ARP_08 – ARP request sending (hardware type check)

Item	Content
CTC # – Title	CTC_ARP_08 – ARP request sending (hardware type check)
Purpose	This CTC verifies that the hardware type of ARP request packets sent by the IUT is set correctly.
Reference	RFC 826:1982,[8] Packet generation;
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.
Step	1. The UT shall configure the IUT to clear the dynamic entries in the ARP cache of IUT-Iface-0 containing: — IP address Host-1-IP. 2. The UT shall configure the IUT to send a UDP datagram from IUT-Iface-0 with: — source IP address set to IUT-Iface-0-IP; — destination IP address set to Host-1-IP. 3. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 3: The IUT sends an ARP request. After step 3: The LT shall verify that the received ARP request contains the hardware type set to ARP-Hardware-Eth.
Remark	—

Table 13 specifies the ARP_09 – ARP request sending (protocol type check).

Table 13 — ARP_09 – ARP request sending (protocol type check)

Item	Content
CTC # – Title	CTC_ARP_09 – ARP request sending (protocol type check)
Purpose	This CTC verifies that the protocol type of ARP request packets sent by the IUT is set correctly.
Reference	RFC 826:1982,[8] Packet generation
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.

Table 13 *(continued)*

Item	Content
Step	1. The UT shall configure the IUT to clear the dynamic entries in the ARP cache of IUT-Iface-0 containing: — IP address Host-1-IP. 2. The UT shall configure the IUT to send a UDP datagram from IUT-Iface-0 with: — source IP address set to IUT-Iface-0-IP; — destination IP address set to Host-1-IP. 3. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 3: The IUT sends an ARP request. After step 3: The LT shall verify that the received ARP request contains the protocol type set to ARP-Protocol-IP.
Remark	—

Table 14 specifies the ARP_10 – ARP request sending (hardware address length check).

Table 14 — ARP_10 – ARP request sending (hardware address length check)

Item	Content
CTC # – Title	CTC_ARP_10 – ARP request sending (hardware address length check)
Purpose	This CTC verifies that the hardware address length of ARP request packets sent by the IUT is set correctly.
Reference	RFC 826:1982,[8] Packet generation
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.
Step	1. The UT shall configure the IUT to clear the dynamic entries in the ARP cache of IUT-Iface-0 containing: — IP address Host-1-IP. 2. The UT shall configure the IUT to send a UDP datagram from IUT-Iface-0 with: — source IP address set to IUT-Iface-0-IP; — destination IP address set to Host-1-IP. 3. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 3: The IUT sends an ARP request. After step 3: The LT shall verify that the received ARP request contains the hardware address length set to Eth-Addr-Len.
Remark	—

Table 15 specifies the ARP_11 – ARP request sending (protocol address length check).

Table 15 — ARP_11 – ARP request sending (protocol address length check)

Item	Content
CTC # – Title	CTC_ARP_11 – ARP request sending (protocol address length check)
Purpose	This CTC verifies that the protocol address length of ARP request packets sent by the IUT is set correctly.
Reference	RFC 826:1982,[8] Packet generation
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.
Step	1. The UT shall configure the IUT to clear the dynamic entries in the ARP cache of IUT-Iface-0 containing: — IP address Host-1-IP. 2. The UT shall configure the IUT to send a UDP datagram from IUT-Iface-0 with: — source IP address set to IUT-Iface-0-IP; — destination IP address set to Host-1-IP. 3. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 3: The IUT sends an ARP request. After step 3: The LT shall verify that the received ARP request contains the protocol address length set to IP_ADDR_LEN.
Remark	—

Table 16 specifies the ARP_12 – ARP request sending (operation code check).

Table 16 — ARP_12 – ARP request sending (operation code check)

Item	Content
CTC # – Title	CTC_ARP_12 – ARP request sending (operation code check)
Purpose	This CTC verifies that the operation code of ARP request packets sent by the IUT is set correctly.
Reference	RFC 826:1982,[8] Packet generation;
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.
Step	1. The UT shall configure the IUT to clear the dynamic entries in the ARP cache of IUT-Iface-0 containing: — IP address Host-1-IP. 2. The UT shall configure the IUT to send a UDP datagram from IUT-Iface-0 with: — source IP address set to IUT-Iface-0-IP; — destination IP address set to Host-1-IP. 3. The LT shall listen up to Param-Listen-Time on LT-Iface-0.

Table 16 *(continued)*

Item	Content
Iteration	Not applicable
Expected response	After step 3: The IUT sends an ARP request. After step 3: The LT verifies that the received ARP request contains the operation code set to Operation-Request.
Remark	—

Table 17 specifies the ARP_13 – ARP request sending (ARP sender hardware address check).

Table 17 — ARP_13 – ARP request sending (ARP sender hardware address check)

Item	Content
CTC # – Title	CTC_ARP_13 – ARP request sending (ARP sender hardware address check)
Purpose	This CTC verifies that the sender hardware address of ARP request packets sent by the IUT is set correctly.
Reference	RFC 826:1982,[8] Packet generation;
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.
Step	1. The UT shall configure the IUT to clear the dynamic entries in the ARP cache of IUT-Iface-0 containing: — IP address Host-1-IP. 2. The UT shall configure the IUT to send a UDP datagram from IUT-Iface-0 with: — source IP address set to IUT-Iface-0-IP; — destination IP address set to Host-1-IP. 3. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 3: The IUT sends an ARP request. After step 3: The LT verifies that the received ARP request contains the ARP sender hardware address set to IUT-Iface-0-MAC-Addr.
Remark	—

Table 18 specifies the ARP_14 – ARP request sending (sender IP address check).

Table 18 — ARP_14 – ARP request sending (sender IP address check)

Item	Content
CTC # – Title	CTC_ARP_14 – ARP request sending (sender IP address check)
Purpose	This CTC verifies that the sender IP address of ARP request packets sent by the IUT is set correctly.
Reference	RFC 826:1982,[8] Packet generation
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.

Table 18 *(continued)*

Item	Content
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.
Step	1. The UT shall configure the IUT to clear the dynamic entries in the ARP cache of IUT-Iface-0 containing: — IP address Host-1-IP. 2. The UT shall configure the IUT to send a UDP datagram from IUT-Iface-0 with: — source IP address set to IUT-Iface-0-IP; — destination IP address set to Host-1-IP. 3. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 3: The IUT sends an ARP request. After step 3: The LT verifies that the received ARP request contains the sender IP address set to IUT-Iface-0-IP.
Remark	—

Table 19 specifies the ARP_15 – ARP request sending (target IP address correct).

Table 19 — ARP_15 – ARP request sending (target IP address correct)

Item	Content
CTC # – Title	CTC_ARP_15 – ARP request sending (target IP address correct)
Purpose	This CTC verifies that the target IP address of ARP request packets sent by the IUT is set correctly.
Reference	RFC 826:1982,[8] Packet generation
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.
Step	1. The UT shall configure the IUT to clear the dynamic entries in the ARP cache of IUT-Iface-0 containing: — IP address Host-1-IP. 2. The UT shall configure the IUT to send a UDP datagram from IUT-Iface-0 with: — source IP address set to IUT-Iface-0-IP; — destination IP address set to Host-1-IP. 3. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 3: The IUT sends an ARP request. After step 3: The LT verifies that the received ARP request contains the target IP address set to Host-1-IP.
Remark	—

7.1.7.2 CTC_ARP – Packet reception

Table 20 specifies the ARP_16 – ARP request reception (ARP target hardware address = 00:00:00:00:00:00) test case.

Table 20 — ARP_16 – ARP request reception (ARP target hardware address = 00:00:00:00:00:00)

Item	Content
CTC # – Title	CTC_ARP_16 – ARP request reception (ARP target hardware address = 00:00:00:00:00:00)
Purpose	This CTC verifies that when the LT sends an ARP request with ARP target hardware address set to all zeroes to the IUT, then the IUT sends an ARP response.
Reference	RFC 826:1982,[8] Packet generation
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.
Step	1. The LT shall send ARP request to IUT though IUT-Iface-0 containing: — ARP sender IP address set to Host-1-IP; — ARP target IP address set to IUT-Iface-0-IP; — ARP target hardware address set to all-zeroes. 2. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 2: The IUT sends an ARP response.
Remark	—

Table 21 specifies the ARP_17 – ARP request reception (ARP target hardware address = FF:FF:FF:FF:FF:FF in hexadecimal format).

Table 21 — ARP_17 – ARP request reception (ARP target hardware address = ff:ff:ff:ff:ff:ff)

Item	Content
CTC # – Title	CTC_ARP_17 – ARP request reception (ARP target hardware address = ff:ff:ff:ff:ff:ff)
Purpose	This CTC verifies that when the LT sends an ARP request with ARP target hardware address set to Ethernet Broadcast address, then the IUT sends an ARP response.
Reference	RFC 826:1982,[8] Packet generation
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.

Table 21 *(continued)*

Item	Content
Step	1. The LT shall send ARP request to IUT though IUT-Iface-0 containing: — ARP sender IP address set to Host-1-IP; — ARP target IP address set to IUT-Iface-0-IP; — ARP target hardware address set to Eth-Broadcast-Addr. 2. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 2: The IUT sends an ARP response.
Remark	—

Table 22 specifies the ARP_18 – ARP request reception (ARP target hardware address = random).

Table 22 — ARP_18 – ARP request reception (ARP target hardware address = random)

Item	Content
CTC # – Title	CTC_ARP_18 – ARP request reception (ARP target hardware address = random)
Purpose	This CTC verifies that when the LT sends an ARP request with the ARP target hardware address set to an arbitrary value, then the IUT sends an ARP response.
Reference	RFC 826:1982,[8] Packet generation
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.
Step	1. The LT shall send ARP request to IUT though IUT-Iface-0 containing: — ARP sender IP address set to Host-1-IP; — ARP target IP address set to IUT-Iface-0-IP; — ARP target hardware address set to Arbit-MAC-Addr. 2. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 2: The IUT sends an ARP response.
Remark	—

Table 23 specifies the ARP_19 – ARP request reception (ARP target hardware address = address of IUT).

Table 23 — ARP_19 – ARP request reception (ARP target hardware address = address of IUT)

Item	Content
CTC # – Title	CTC_ARP_19 – ARP request reception (ARP target hardware address = address of IUT)
Purpose	This CTC verifies that when the LT sends an ARP request with the ARP target hardware address set to the IUT MAC address and Ethernet destination address set to the Ethernet broadcast address, then the IUT sends an ARP response.
Reference	RFC 826:1982,[8] Packet generation

Table 23 *(continued)*

Item	Content
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.
Step	1. The LT shall send ARP request to IUT though IUT-Iface-0 containing: — ARP sender IP address set to Host-1-IP; — ARP target IP address set to IUT-Iface-0-IP; — ARP target hardware address set to IUT-Iface-0-MAC-Addr; — Ethernet destination address set to Eth-Broadcast-Addr. 2. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 2: The IUT sends an ARP response.
Remark	—

Table 24 specifies the ARP_20 – ARP request reception (hardware type correct).

Table 24 — ARP_20 – ARP request reception (hardware type correct)

Item	Content
CTC # – Title	CTC_ARP_20 – ARP request reception (hardware type correct)
Purpose	This CTC verifies that when the LT sends an ARP request with the hardware type set to Ethernet, then the IUT sends an ARP response.
Reference	RFC 826:1982,[8] Packet generation
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.
Step	1. The UT shall configure the IUT to clear the dynamic entries in the ARP cache of IUT-Iface-0 containing: — IP address Host-1-IP. 2. The LT shall send ARP request to IUT though IUT-Iface-0 containing: — ARP sender IP address set to Host-1-IP; — ARP target IP address set to IUT-Iface-0-IP; — ARP hardware type set to ARP-Hardware-Eth; — Ethernet source address set to MAC-Addr-1. 3. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 3: The IUT sends an ARP response.

Table 24 *(continued)*

Item	Content
Remark	—

Table 25 specifies the ARP_21 – ARP request reception (hardware type wrong).

Table 25 — ARP_21 – ARP request reception (hardware type wrong)

Item	Content
CTC # – Title	CTC_ARP_21 – ARP request reception (hardware type wrong)
Purpose	This CTC verifies that when the LT sends an ARP request with the hardware type set to ARP-Hardware-Type-Unknown, then the IUT does not send an ARP response.
Reference	RFC 826:1982,[8] Packet generation
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.
Step	1. The UT shall configure the IUT to clear the dynamic entries in the ARP cache of IUT-Iface-0 containing: — IP address Host-1-IP. 2. The LT shall send ARP request to IUT though IUT-Iface-0 containing: — ARP sender IP address set to Host-1-IP; — ARP target IP address set to IUT-Iface-0-IP; — ARP hardware type set to ARP-Hardware-Type-Unknown. 3. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 3: The IUT does not send an ARP response.
Remark	—

Table 26 specifies the ARP_22 – ARP response reception (hardware type wrong).

Table 26 — ARP_22 – ARP response reception (hardware type wrong)

Item	Content
CTC # – Title	CTC_ARP_22 – ARP response reception (hardware type wrong)
Purpose	This CTC verifies that when the LT sends a gratuitous ARP response to the IUT with the hardware type field set ARP-Hardware-Type-Unknown, an entry of Host-1-IP, MAC-Addr-1 does not get added to the IUT's ARP cache. When the UT causes the IUT to send a UDP datagram with destination IP address set to Host-1-IP, the IUT sends an ARP request.
Reference	RFC 826:1982,[8] Packet generation
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.

Table 26 *(continued)*

Item	Content
Step	1. The UT shall configure the IUT to clear the dynamic entries in the ARP cache of IUT-Iface-0 containing: — IP address Host-1-IP. 2. The LT shall send ARP response to IUT though IUT-Iface-0 containing: — ARP sender IP address set to Host-1-IP; — ARP target IP address set to IUT-Iface-0-IP; — ARP hardware type set to ARP-Hardware-Type-Unknown; — ARP sender hardware address set to MAC-Addr-1; — ARP target hardware address set to Eth-Broadcast-Addr. 3. The test system Host-1 shall wait up to $t_{\text{ARP-Tolerance}}$ second(s) for the ARP cache of IUT to get refreshed. 4. The UT shall configure the IUT to send a UDP datagram from of IUT-Iface-0 with: — source IP address set to IUT-Iface-0-IP; — destination IP address set to Host-1-IP. 5. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 5: The IUT sends an ARP request.
Remark	—

Table 27 specifies the ARP_26 – ARP request reception (protocol type correct).

Table 27 — ARP_26 – ARP request reception (protocol type correct)

Item	Content
CTC # – Title	CTC_ARP_26 – ARP request reception (protocol type correct)
Purpose	This CTC verifies that when the LT sends an ARP request with the protocol type field set to type IP, then the IUT sends an ARP response.
Reference	RFC 826:1982,[8] Packet generation
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.

Table 27 *(continued)*

Item	Content
Step	1. The UT shall configure the IUT to clear the dynamic entries in the ARP cache of IUT-Iface-0 containing: — IP address Host-1-IP. 2. The LT shall send ARP request to IUT though IUT-Iface-0 containing: — ARP sender IP address set to Host-1-IP; — ARP target IP address set to IUT-Iface-0-IP; — ARP protocol type set to ARP-Protocol-IP. 3. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 3: The IUT sends an ARP response.
Remark	—

Table 28 specifies the ARP_27 – ARP request reception (protocol type wrong).

Table 28 — ARP_27 – ARP request reception (protocol type wrong)

Item	Content
CTC # – Title	CTC_ARP_27 – ARP request reception (protocol type wrong)
Purpose	This CTC verifies that when the LT sends an ARP request with the protocol type field set to an unknown protocol type value, then the IUT does not send an ARP response.
Reference	RFC 826:1982,[8] Packet generation
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.
Step	1. The UT shall configure the IUT to clear the dynamic entries in the ARP cache of IUT-Iface-0 containing: — IP address Host-1-IP. 2. The LT shall send ARP request to IUT though IUT-Iface-0 containing: — ARP sender IP address set to Host-1-IP; — ARP target IP address set to IUT-Iface-0-IP; — ARP protocol type set to ARP-Protocol-Unknown. 3. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 3: The IUT does not send an ARP response.
Remark	—

Table 29 specifies the ARP_28 – ARP response reception (protocol type wrong).

Table 29 — ARP_28 – ARP response reception (protocol type wrong)

Item	Content
CTC # – Title	CTC_ARP_28 – ARP response reception (protocol type wrong)
Purpose	This CTC verifies that the UT configures the IUT to clear its ARP cache entries. The LT then sends an ARP response with the protocol type field set to an unknown protocol value. All the other fields in the ARP response fragment are set to their correct values. The UT then causes the IUT to send an ICMP echo request and the LT expects that the IUT sends an ARP request. This CTC verifies that when the LT sends a gratuitous ARP response to the IUT with the protocol type field set to an unknown protocol value, an entry of Host-1-IP, MAC-Addr-1 does not get added to the IUT's ARP cache. When the UT causes the IUT to send a UDP datagram with destination IP address set to Host-1-IP, the IUT sends an ARP request.
Reference	RFC 826:1982, [8] Packet generation
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.
Step	1. The UT shall configure the IUT to clear the dynamic entries in the ARP cache of IUT-Iface-0 containing: — IP address Host-1-IP. 2. The LT shall send ARP response to IUT though IUT-Iface-0 containing: — ARP sender IP address set to Host-1-IP; — ARP target IP address set to IUT-Iface-0-IP; — ARP protocol type set to ARP-Protocol-Unknown; — ARP sender hardware address set to MAC-Addr-1; — ARP target hardware address set to Eth-Broadcast-Addr. 3. The LT shall wait up to $t_{ARP\text{-}Tolerance}$ second(s) for the ARP cache of IUT to get refreshed. 4. The LT shall configure the IUT to send a UDP datagram from IUT-Iface-0 with: — source IP address set to IUT-Iface-0-IP; — destination IP address set to Host-1-IP. 5. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 5: The IUT sends an ARP request.
Remark	—

Table 30 specifies the ARP_32 – ARP entry update (request/request).

Table 30 — ARP_32 – ARP entry update (request/request)

Item	Content
CTC # – Title	CTC_ARP_32 – ARP entry update (request/request)
Purpose	This CTC verifies that when the LT sends an ARP request to the IUT, an entry of Host-1-IP, MAC-Addr-1 gets added to the IUT's ARP cache. When the LT then sends another ARP request to the IUT with ARP sender hardware address set to MAC-Addr-2, the ARP cache gets updated.

Table 30 *(continued)*

Item	Content
Reference	RFC 826:1982, [8] Packet generation
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.
Step	1. The UT shall configure the IUT to clear the dynamic entries in the ARP cache of IUT-Iface-0 containing: — IP address Host-1-IP. 2. The LT shall send ARP request to IUT though IUT-Iface-0 containing: — ARP sender IP address set to Host-1-IP; — ARP target IP address set to IUT-Iface-0-IP; — ARP sender hardware address set to MAC-Addr-1. 3. The LT shall send ARP request to IUT through IUT-Iface-0 containing: — ARP sender IP address set to Host-1-IP; — ARP target IP address set to IUT-Iface-0-IP; — ARP sender hardware address set to MAC-Addr-2; — Ethernet source address set to MAC-Addr-2. 4. The LT shall wait up to $t_{ARP\text{-}Tolerance}$ second(s) for the ARP cache of IUT to get refreshed. 5. The UT shall configure the IUT to send a UDP datagram from IUT-Iface-0 with: — source IP address set to IUT-Iface-0-IP; — destination IP address set to Host-1-IP. 6. The LT shall listen up to Param-Listen-Time on LT-Iface-0 with: — destination IP address set to Host-1-IP; — Ethernet destination address set to MAC-Addr-2.
Iteration	Not applicable
Expected response	After step 6: The sends the UDP datagram.
Remark	—

Table 31 specifies the ARP_33 – ARP entry update (response/response).

Table 31 — ARP_33 – ARP entry update (response/response)

Item	Content
CTC # – Title	CTC_ARP_33 – ARP entry update (response/response)
Purpose	This CTC verifies that when the LT sends an ARP response to the IUT, an entry of Host-1-IP, MAC-Addr-1 gets added to the IUT's ARP cache. When the LT then sends another ARP response to the IUT with ARP sender hardware address set to MAC-Addr-2, the ARP cache gets updated.
Reference	RFC 826:1982, [8] Packet generation

Table 31 *(continued)*

Item	Content
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.
Step	1. The UT shall configure the IUT to clear the dynamic entries in the ARP cache of IUT-Iface-0 containing: — IP address Host-1-IP. 2. The LT shall send ARP response to IUT though IUT-Iface-0 containing: — ARP sender IP address set to Host-1-IP; — ARP target IP address set to IUT-Iface-0-IP; — ARP sender hardware address set to MAC-Addr-1; — ARP target hardware address set to Eth-Broadcast-Addr. 3. The LT shall send ARP response to IUT through IUT-Iface-0 containing: — ARP sender IP address set to Host-1-IP; — ARP target IP address set to IUT-Iface-0-IP; — ARP sender hardware address set to MAC-Addr-2; — ARP target hardware address set to Eth-Broadcast-Addr. 4. The LT shall wait up to $t_{ARP\text{-}Tolerance}$ second(s) for the ARP cache of IUT to get refreshed. 5. The UT shall configure the IUT to send a UDP datagram from IUT-Iface-0 with: — source IP address set to IUT-Iface-0-IP; — destination IP address set to Host-1-IP. 6. The LT shall listen up to Param-Listen-Time on LT-Iface-0 with: — destination IP address set to Host-1-IP; — Ethernet destination address set to MAC-Addr-2.
Iteration	Not applicable
Expected response	After step 6: The IUT sends the UDP datagram.
Remark	—

Table 32 specifies the ARP_34 – ARP entry update (request/response).

Table 32 — ARP_34 – ARP entry update (request/response)

Item	Content
CTC # – Title	CTC_ARP_34 – ARP entry update (request/response)
Purpose	This CTC verifies that when the LT sends an ARP request to the IUT, an entry of Host-1-IP, MAC-Addr-1 gets added to the IUT's ARP cache. When the LT then sends an ARP response to the IUT with ARP sender hardware address set to MAC-Addr-2, the ARP cache gets updated.
Reference	RFC 826:1982,[8] Packet generation

Table 32 *(continued)*

Item	Content
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.
Step	1. The UT shall configure the IUT to clear the dynamic entries in the ARP cache of IUT-Iface-0 containing: — IP address Host-1-IP. 2. The LT shall send ARP request to IUT though IUT-Iface-0 containing: — ARP sender IP address set to Host-1-IP; — ARP target IP address set to IUT-Iface-0-IP; — ARP sender hardware address set to MAC-Addr-1. 3. The LT shall send ARP response to IUT through IUT-Iface-0 containing: — ARP sender IP address set to Host-1-IP; — ARP target IP address set to IUT-Iface-0-IP; — ARP sender hardware address set to MAC-Addr-2; — ARP target hardware address set to Eth-Broadcast-Addr. 4. The LT shall wait up to $t_{ARP\text{-}Tolerance}$ second(s) for the ARP cache of IUT to get refreshed. 5. The UT shall configure the IUT to send a UDP datagram from IUT-Iface-0 with: — source IP address set to IUT-Iface-0-IP; — destination IP address set to Host-1-IP. 6. The LT shall listen up to Param-Listen-Time on LT-Iface-0 with: — destination IP address set to Host-1-IP; — Ethernet destination address set to MAC-Addr-2.
Iteration	Not applicable
Expected response	After step 6: The IUT sends the UDP datagram.
Remark	—

Table 33 specifies the ARP_35 – ARP entry update (response/request).

Table 33 — ARP_35 – ARP entry update (response/request)

Item	Content
CTC # – Title	CTC_ARP_35 – ARP entry update (response/request)
Purpose	This CTC verifies that when the LT sends an ARP response to the IUT, an entry of Host-1-IP, MAC-Addr-1 gets added to the IUT's ARP cache. When the LT then sends an ARP request to the IUT with ARP sender hardware address set to MAC-Addr-2, the ARP cache gets updated.
Reference	RFC 826:1982,[8] Packet generation

Table 33 *(continued)*

Item	Content
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.
Step	1. The UT shall configure the IUT to clear the dynamic entries in the ARP cache of IUT-Iface-0 containing: — IP address Host-1-IP. 2. The LT shall send ARP response to IUT though IUT-Iface-0 containing: — ARP sender IP address set to Host-1-IP; — ARP target IP address set to IUT-Iface-0-IP; — ARP sender hardware address set to MAC-Addr-1; — ARP target hardware address set to Eth-Broadcast-Addr. 3. The LT shall send ARP request to IUT through IUT-Iface-0 containing: — ARP sender IP address set to Host-1-IP; — ARP target IP address set to IUT-Iface-0-IP; — ARP sender hardware address set to MAC-Addr-2. 4. The LT shall wait up to $t_{ARP\text{-}tolerance}$ second(s) for the ARP cache of IUT to get refreshed. 5. The UT shall configure the IUT to send a UDP datagram from IUT-Iface-0 with: — source IP address set to IUT-Iface-0-IP; — destination IP address set to Host-1-IP. 6. The LT shall listen up to Param-Listen-Time on LT-Iface-0 with; — destination IP address set to Host-1-IP; — Ethernet destination address set to MAC-Addr-2.
Iteration	Not applicable
Expected response	After step 6: The IUT sends the UDP datagram.
Remark	—

Table 34 specifies the ARP_36 – ARP request reception (target protocol address correct).

Table 34 — ARP_36 – ARP request reception (target protocol address correct)

Item	Content
CTC # – Title	CTC_ARP_36 – ARP request reception (target protocol address correct)
Purpose	This CTC verifies that when the LT sends an ARP request with target protocol address field set to IUT-Iface-0-IP, then the IUT sends an ARP response.
Reference	RFC 826:1982,[8] Packet generation
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.

Table 34 *(continued)*

Item	Content
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.
Step	1. The UT shall configure the IUT to clear the dynamic entries in the ARP cache of IUT-Iface-0 containing: — IP address Host-1-IP. 2. The LT shall send ARP request to IUT though IUT-Iface-0 containing: — ARP sender IP address set to Host-1-IP; — ARP target IP address set to IUT-Iface-0-IP. 3. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 3: The sends an ARP response.
Remark	—

Table 35 specifies the ARP_37 – ARP request reception (target protocol address wrong).

Table 35 — ARP_37 – ARP request reception (target protocol address wrong)

Item	Content
CTC # – Title	CTC_ARP_37 – ARP request reception (target protocol address wrong)
Purpose	This CTC verifies that when the LT sends an ARP request with the the target protocol address field set IP-First-Unused_Addr-Iface-1, then the IUT does not send an ARP response.
Reference	RFC 826:1982,[8] Packet generation
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.
Step	1. The UT shall configure the IUT to clear the dynamic entries in the ARP cache of IUT-Iface-0 containing: — IP address Host-1-IP. 2. The LT shall send ARP request to IUT though IUT-Iface-0 containing: — ARP sender IP address set to Host-1-IP; — ARP target IP address set to IP-First-Unused_Addr-Iface-1. 3. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 3: The IUT does not send an ARP response.
Remark	—

Table 36 specifies the ARP_38 – ARP response reception (target protocol address wrong).

Table 36 — ARP_38 – ARP response reception (target protocol address wrong)

Item	Content
CTC # – Title	CTC_ARP_38 – ARP response reception (target protocol address wrong)
Purpose	This CTC verifies that when the LT sends an ARP response to the IUT with the target IP address set to IP-First-Unused_Addr-Iface-1, an entry of Host-1-IP, MAC-Addr-1 does not get added to the IUT's ARP cache. When the UT causes the IUT to send a UDP datagram with destination IP address set to Host-1-IP, the IUT sends an ARP request.
Reference	RFC 826:1982, [8] Packet generation
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.
Step	1. The UT shall configure the IUT to clear the dynamic entries in the ARP cache of IUT-Iface-0 containing: — IP address Host-1-IP. 2. The LT shall send ARP response to IUT though IUT-Iface-0 containing: — ARP source IP address set to Host-1-IP; — ARP target IP address set to IP-First-Unused_Addr-Iface-1; — Ethernet source address set to MAC-Addr-1; — Ethernet destination address set to Eth-Broadcast-Addr. 3. The LT shall wait up to (1) second(s) for the ARP cache of IUT to get refreshed. 4. The UT shall configure the IUT to send a UDP datagram from IUT-Iface-0 with — source IP address set to IUT-Iface-0-IP; — destination IP address set to Host-1-IP. 5. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 5: The IUT sends an ARP request.
Remark	

Table 37 specifies the ARP_39 – ARP learning (request answers request).

Table 37 — ARP_39 – ARP learning (request answers request)

Item	Content
CTC # – Title	CTC_ARP_39 – ARP learning (request answers request)
Purpose	This CTC verifies that when the IUT sends an ARP request and the LT also sends an ARP request in return, then the IUT creates an ARP cache entry for the sender IP address and sender hardware address of the LT's ARP request.
Reference	RFC 826:1982,[8] Packet generation
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.

Table 37 *(continued)*

Item	Content
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.
Step	1. The UT shall configure the IUT to clear the dynamic entries in the ARP cache of IUT-Iface-0 containing: — IP address Host-1-IP. 2. The UT shall configure the IUT to send a UDP datagram from IUT-Iface-0 with: — source IP address set to IUT-Iface-0-IP; — destination IP address set to Host-1-IP.1. 3. The LT shall listen up to Param-Listen-Time on LT-Iface-0. 4. The LT shall send ARP request to IUT though IUT-Iface-0 containing: — ARP sender IP address set to Host-1-IP; — ARP target IP address set to IUT-Iface-0-IP; — ARP sender hardware address set to MAC-Addr-2. 5. The LT shall wait up to $t_{\texttt{ARP-Tolerance}}$ second(s) for the ARP cache of IUT to get refreshed. 6. The UT shall configure the IUT to send a UDP datagram from IUT-Iface-0 with: — source IP address set to IUT-Iface-0-IP; — destination IP address set to Host-1-IP. 7. The LT shall listen up to Param-Listen-Time on LT-Iface-0 with: — destination IP address set to Host-1-IP; — Ethernet destination address set to MAC-Addr-2.
Iteration	Not applicable
Expected response	After step 3: The IUT sends an ARP request. After step 7: The IUT sends the UDP datagram.
Remark	—

Table 38 specifies the ARP_40 – ARP learning (response answers request).

Table 38 — ARP_40 – ARP learning (response answers request)

Item	Content
CTC # – Title	CTC_ARP_40 – ARP learning (response answers request)
Purpose	This CTC verifies that when the IUT sends an ARP request and the LT sends an ARP response in return, then the IUT creates an ARP cache entry for the sender IP address and sender hardware address of the LT's ARP response.
Reference	RFC 826:1982, [8] Packet generation
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.

Table 38 *(continued)*

Item	Content
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.
Step	1. The UT shall configure the IUT to clear the dynamic entries in the ARP cache of IUT-Iface-0 containing: — IP address Host-1-IP. 2. IUT CONFIGURE: Configure IUT to send a UDP datagram from IUT-Iface-0 with: — source IP address which shall be set to IUT-Iface-0-IP; — destination IP address which shall be set to Host-1-IP. 3. The LT shall listen up to Param-Listen-Time on LT-Iface-0. 4. The LT shall send ARP response to IUT though IUT-Iface-0 containing: — ARP sender IP address set to Host-1-IP; — ARP target IP address set to IUT-Iface-0-IP; — ARP sender hardware address set to MAC-Addr-3; — ARP target hardware address set to Eth-Broadcast-Addr. 5. The LT shall wait up to $t_{ARP\text{-}Tolerance}$ second(s) for the ARP cache of IUT to get refreshed. 6. The UT shall configure the IUT to send a UDP datagram from IUT-Iface-0 with: — source IP address set to IUT-Iface-0-IP; — destination IP address set to Host-1-IP. 7. The LT shall listen up to Param-Listen-Time on LT-Iface-0 with: — destination IP address set to Host-1-IP; — Ethernet destination address set to MAC-Addr-3.
Iteration	Not applicable
Expected response	After step 3: The IUT sends an ARP request. After step 7: The IUT sends the UDP datagram.
Remark	—

Table 39 specifies the ARP_41 – ARP responding (response answers request).

Table 39 — ARP_41 – ARP responding (response answers request)

Item	Content
CTC # – Title	CTC_ARP_41 – ARP responding (response answers request)
Purpose	This CTC verifies that when the LT sends an ARP request, then the IUT sends an ARP response with the operation code field set to response.
Reference	RFC 826:1982,[8] Packet generation
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.

Table 39 *(continued)*

Item	Content
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.
Step	1. The LT shall send an ARP request to the IUT through the IUT-Iface-0 containing: — ARP sender IP address set to Host-1-IP; — ARP target IP address set to IUT-Iface-0-IP; — ARP sender hardware address set to MAC-Addr-1. 2. The LT shall listen up to Param-Listen-Time on LT-Iface-0 with: — for ARP packet with operation code set to response.
Iteration	Not applicable
Expected response	After step 2: The IUT sends the ARP response.
Remark	—

Table 40 specifies the ARP_42 – ARP responding (no response to response).

Table 40 — ARP_42 – ARP responding (no response to response)

Item	Content
CTC # – Title	CTC_ARP_42 – ARP responding (no response to response)
Purpose	This CTC verifies that when the LT sends an ARP packet with the opcode field set to Operation-Response, then the IUT does not send any ARP response.
Reference	RFC 826:1982,[8] Packet generation
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.
Step	1. The LT shall send ARP response to IUT though IUT-Iface-0 containing: — ARP sender IP address set to Host-1-IP; — ARP target IP address set to IUT-Iface-0-IP; — operation code set to Operation-Response. 2. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 2: The IUT does not send an ARP response.
Remark	—

Table 41 specifies the ARP_43 – ARP response (Ethernet source hardware address check).

Table 41 — ARP_43 – ARP response (Ethernet source hardware address check)

Item	Content
CTC # – Title	CTC_ARP_43 – ARP response (Ethernet source hardware address check)

Table 41 *(continued)*

Item	Content
Purpose	This CTC verifies that when the LT sends an ARP request, the IUT sends an ARP response with Ethernet source hardware address set to IUT-Iface-0-MAC-Addr.
Reference	RFC 826:1982, [8] Packet generation
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.
Step	1. The LT shall send ARP request to IUT though IUT-Iface-0 containing: — source IP address set to Host-1-IP; — destination IP address set to IUT-Iface-0-IP. 2. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 2: The IUT sends the ARP response. After step 2: The LT verifies that the received ARP response contains the Ethernet source hardware address set to IUT-Iface-0-MAC-Addr.
Remark	—

Table 42 specifies the ARP_44 – ARP response (sender IP address check).

Table 42 — ARP_44 – ARP response (sender IP address check)

Item	Content
CTC # – Title	CTC_ARP_44 – ARP response (sender IP address check)
Purpose	This CTC verifies that when the LT sends an ARP request, the IUT sends an ARP response with sender IP address set to IUT-Iface-0-IP.
Reference	RFC 826:1982, [8] Packet generation
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.
Step	1. The LT shall send ARP request to IUT though IUT-Iface-0 containing: — ARP sender IP address set to Host-1-IP; — ARP target IP address set to IUT-Iface-0-IP; — ARP sender hardware address set to MAC-Addr-1. 2. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 2: The IUT sends the ARP response. After step 2: The LT verifies that the received ARP response contains the sender IP address set to IUT-Iface-0-IP.
Remark	—

Table 43 specifies the ARP_45 – ARP response (ARP target hardware address check).

Table 43 — ARP_45 – ARP response (ARP target hardware address check)

Item	Content
CTC # – Title	CTC_ARP_45 – ARP response (ARP target hardware address check)
Purpose	This CTC verifies that when the LT sends an ARP request, the IUT sends an ARP response with ARP target hardware address set to ARP sender hardware address of the LT's ARP request.
Reference	RFC 826:1982,[8] Packet generation
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.
Step	1. The UT shall configure the IUT to clear the dynamic entries in the ARP cache of IUT-Iface-0 containing: — IP address Host-1-IP. 2. The LT shall send ARP request to IUT though IUT-Iface-0 containing: — ARP sender IP address set to Host-1-IP; — ARP target IP address set to IUT-Iface-0-IP; — ARP sender hardware address set to MAC-Addr-1. 3. The LT shall listen up to Param-Listen-Time on LT-Iface-0. 4. The LT shall send ARP request to IUT through IUT-Iface-0 containing: — ARP sender IP address set to Host-1-IP; — ARP target IP address set to IUT-Iface-0-IP; — ARP sender hardware address set to MAC-Addr-2. 5. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 3: The IUT sends the ARP response. After step 3: The LT verifies that the received ARP response contains the ARP target hardware address set to MAC-Addr-1. After step 5: The IUT sends the ARP response. After step 5: The LT verifies that the received ARP response contains the ARP target hardware address set to MAC-Addr-2.
Remark	—

Table 44 specifies the ARP_46 – ARP response (hardware type check).

Table 44 — ARP_46 – ARP response (hardware type check)

Item	Content
CTC # – Title	CTC_ARP_46 – ARP response (hardware type check)
Purpose	This CTC verifies that when the LT sends an ARP request, the IUT sends an ARP response with hardware type set to ARP-Hardware-Eth.
Reference	RFC 826:1982,[8] Packet generation
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.

Table 44 *(continued)*

Item	Content
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.
Step	1. The LT shall send ARP request to IUT though IUT-Iface-0 containing: — ARP sender IP address set to Host-1-IP; — ARP target IP address set to IUT-Iface-0-IP; — ARP sender hardware address set to MAC-Addr-1. 2. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 2: The IUT sends the ARP response. After step 2: The LT verifies that the received ARP response contains the hardware type set to ARP-Hardware-Eth.
Remark	—

Table 45 specifies the ARP_47 – ARP response (hardware address length check).

Table 45 — ARP_47 – ARP response (hardware address length check)

Item	Content
CTC # – Title	CTC_ARP_47 – ARP response (hardware address length check)
Purpose	This CTC verifies that when the LT sends an ARP request, the IUT sends an ARP response with hardware address length set to Eth-Addr-Len.
Reference	RFC 826:1982,[8] Packet generation
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.
Step	1. The LT shall send ARP request to IUT though IUT-Iface-0 containing: — ARP sender IP address set to Host-1-IP; — ARP target IP address set to IUT-Iface-0-IP; — ARP sender hardware address set to MAC-Addr-1. 2. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 2: The IUT sends the ARP response. After step 2: The LT verifies that the received ARP response contains the hardware address length set to Eth-Addr-Len.
Remark	—

Table 46 specifies the ARP_48 – ARP timeout (idle).

Table 46 — ARP_48 – ARP timeout (idle)

Item	Content
CTC # – Title	CTC_ARP_48 – ARP timeout (idle)
Purpose	This CTC verifies that the IUT deletes an entry of its dynamic ARP cache which relates to the LT after $t_{\text{ARP-Dynamic-Cache-Timeout}}$ has timed out if the LT does not send any datagrams during $t_{\text{ARP-Dynamic-Cache-Timeout}}$.
Reference	RFC 826:1982,[8] Related issue
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.
Step	1. The UT shall configure the IUT to clear the dynamic entries in the ARP cache of IUT-Iface-0 containing: — IP address Host-1-IP. 2. The UT shall configure the IUT to set a timeout of $t_{\text{ARP-Dynamic-Cache-Timeout}}$ seconds for the dynamic entries in the ARP cache of IUT-Iface-0. 3. The LT shall send ARP request to IUT though IUT-Iface-0 containing: — ARP sender IP address set to Host-1-IP; — ARP target IP address set to IUT-Iface-0-IP; — ARP sender hardware address set to MAC-Addr-1. 4. The LT shall wait up to $t_{\text{ARP-Tolerance}}$ second(s) for the ARP cache of IUT to get refreshed. 5. The UT shall configure the IUT to send a UDP datagram from IUT-Iface-0 with: — source IP address set to IUT-Iface-0-IP; — destination IP address set to Host-1-IP. 6. The LT shall listen up to Param-Listen-Time on LT-Iface-0 with: — ARP target IP address set to Host-1-IP ; — Ethernet destination address set to MAC-Addr-1. 7. The LT shall wait up to $t_{\text{ARP-Dynamic-Cache-Tolerance}}$ second(s) for the ARP cache of IUT to get refreshed. 8. The UT shall configure the IUT to send a UDP datagram from IUT-Iface-0 with: — source IP address set to IUT-Iface-0-IP; — destination IP address set to Host-1-IP. 9. The LT shall listen up to Param-Listen-Time on LT-Iface-0. 10. CLEANUP: Configure the IUT to clear a timeout of $t_{\text{ARP-Dynamic-Cache-Timeout}}$ seconds for the dynamic entries in the ARP cache of IUT-Iface-0.
Iteration	Not applicable
Expected response	After step 6: The IUT sends the UDP datagram. After step 9: The IUT sends an ARP request.
Remark	—

Table 47 specifies the ARP_49 – ARP timeout (busy).

Table 47 — ARP_49 – ARP timeout (busy)

Item	Content
CTC # – Title	CTC_ARP_49 – ARP timeout (busy)
Purpose	This CTC verifies that the IUT deletes an entry of its dynamic ARP cache which relates to the LT after $t_{ARP\text{-}Dynamic\text{-}Cache\text{-}Timeout}$ has timed out if the LT does not send any datagrams during $t_{ARP\text{-}Dynamic\text{-}Cache\text{-}Timeout}$, even when the ARP entry is used during $t_{ARP\text{-}Dynamic\text{-}Cache\text{-}Timeout}$.
Reference	RFC 826:1982,[8] Related issue
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 3. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.1.6.1 and 7.1.6.2.
Step	1. The UT shall configure the IUT to clear the dynamic entries in the ARP cache of IUT-Iface-0 containing: — IP address Host-1-IP. 2. The UT shall configure the IUT to set a timeout of $t_{ARP\text{-}Dynamic\text{-}Cache\text{-}Timeout}$ seconds for the dynamic entries in the ARP cache of IUT-Iface-0. 3. The LT shall send ARP request to IUT though IUT-Iface-0 containing: — ARP sender IP address set to Host-1-IP; — ARP target IP address set to IUT-Iface-0-IP; — ARP sender hardware address set to MAC-Addr-1. 4. The LT shall wait up to $t_{ARP\text{-}Tolerance}$ second(s) for the ARP cache of IUT to get refreshed. 5. The UT shall configure the IUT to send a UDP datagram from IUT-Iface-0 with: — source IP address set to IUT-Iface-0-IP; — destination IP address set to Host-1-IP. 6. The LT shall listen up to Param-Listen-Time on LT-Iface-0 with: — destination IP address set to Host-1-IP; — Ethernet destination address set to MAC-Addr-1. 7. The LT shall wait up to 0,5 × $t_{ARP\text{-}Dynamic\text{-}Cache\text{-}Timeout}$ second(s) for the ARP cache of IUT to get refreshed. 8. The UT shall configure the IUT to send a UDP datagram from IUT-Iface-0 with: — source IP address set to IUT-Iface-0-IP; — destination IP address set to Host-1-IP. 9. The LT shall listen up to Param-Listen-Time on LT-Iface-0 with: — destination IP address set to Host-1-IP; — Ethernet destination address set to MAC-Addr-1. 10. The LT shall wait up to 0,5 × $t_{ARP\text{-}Dynamic\text{-}Cache\text{-}Tolerance}$ second(s) for the ARP cache of IUT to get refreshed.

Table 47 *(continued)*

Item	Content
	11. The UT shall configure the IUT to send a UDP datagram from IUT-Iface-0 with: — source IP address set to IUT-Iface-0-IP; — destination IP address set to Host-1-IP. 12. The LT shall listen up to Param-Listen-Time on LT-Iface-0. 13. The UT shall configure the IUT to clear a timeout of $t_{\text{ARP-Dynamic-Cache-Timeout}}$ seconds for the dynamic entries in the ARP cache of IUT-Iface-0.
Iteration	Not applicable
Expected response	After step 6: The IUT sends the UDP datagram. After step 9: The IUT sends the UDP datagram. After step 12: The IUT sends an ARP request.
Remark	—

7.2 NL – Internet control message protocol version 4 (ICMPv4)

7.2.1 General

The objective of this subclause is to specify CTCs for the ICMPv4.

7.2.2 Referenced specification

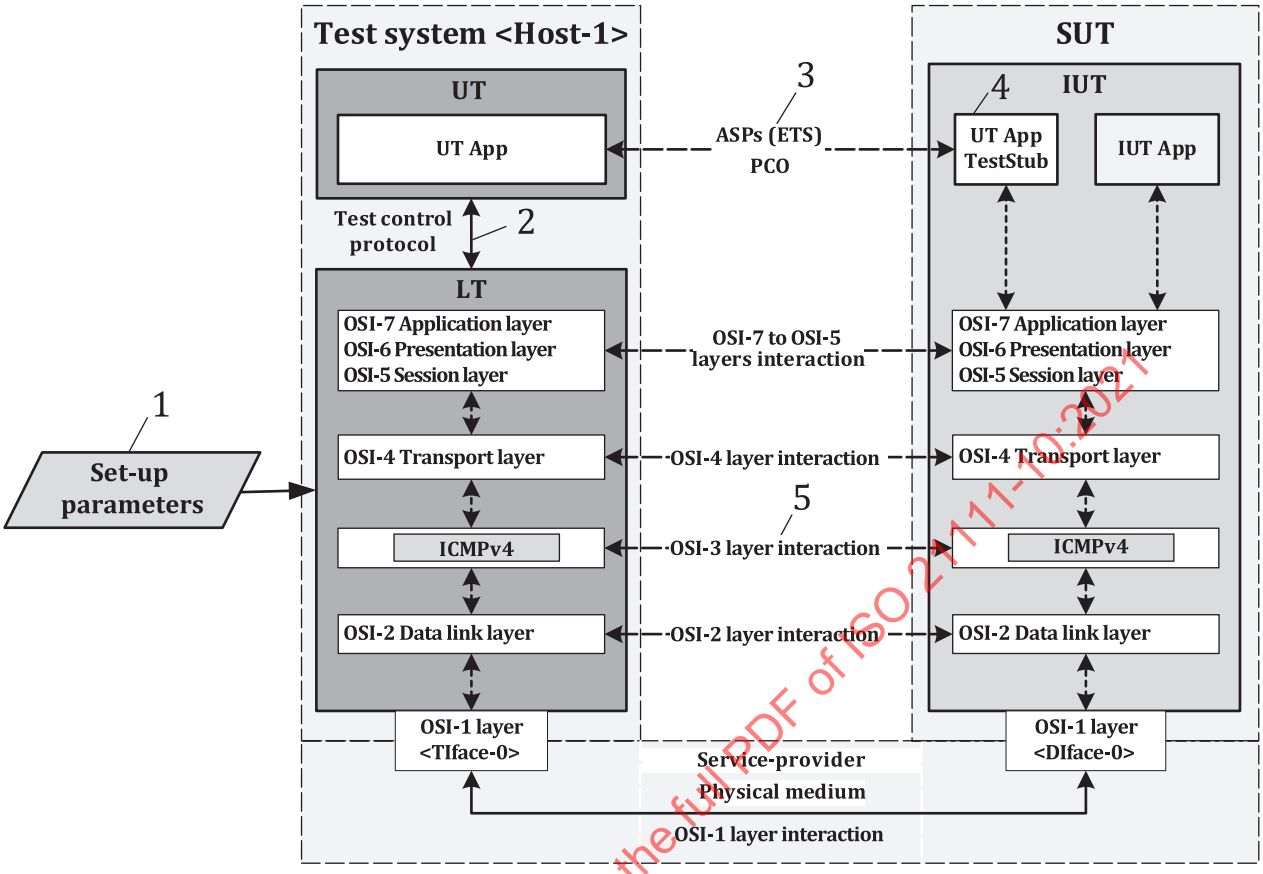
All CTCs in 7.2 are in accordance with these RFCs:

— RFC 792:1981[6],

— RFC 1122:1989[9].

7.2.3 Test system topology – NL – ICMPv4

Figure 4 shows the test system topology – NL – ICMPv4.



Key

1 IUT-specific set-up parameters (electronic data sheet)
2 test control protocol
3 PCO and ASPs based on ETS
4 UT TestStub application
5 OSI layer 3 ICMPv4 interaction

Figure 4 — Test system topology – NL – ICMPv4

7.2.4 Test system topology and related CTC configuration

The CTCs specified in Clause 7 shall be executed against an IP stack. All CTCs run with one interface.

7.2.5 ICMPv4 parameters used in CTCs

Table 48 specifies the parameters used in ICMPv4 CTCs.

Table 48 — Parameters used in ICMPv4 CTCs

Parameter used in CTCs	Content
ICMP-Datagram-Id	Identifier to reference an ICMP datagram
Seq-No	Sequence number to identify an ICMP datagram
Broadcast-Addr	IP broadcast address
Originate-Timestamp-Value	Time the sender last touched a message before sending it. It is 32 bits of milli-seconds since midnight UTC.

Table 48 *(continued)*

Parameter used in CTCs	Content
Invalid-Checksum	This is the checksum which is different from the calculated checksum, i.e. different from 16 bit one's complement of the one's complement sum of the ICMP datagram starting with the ICMP type.
$t_{Listen-Time}$	This is the maximum time interval for which LT waits for an ICMP reply segment. This defaults to 3 s unless the IUT configuration specifies otherwise.
$t_{Fragment-Reassemly-Timeout}$	The fragment reassembly timeout, this defaults to 15 s.
IUT-Supports-IP-Options	Automotive ECUs may not support IP options, either for performance or security reasons. TRUE indicates IUT supports IP options. FALSE indicates IUT does not support IP options. Default: TRUE
Unsupported-Protocol	This is an IP protocol number that is not supported by the IUT.
Invalid-ICMP-Type	This defines an invalid ICMP type.

As a general test pattern it can be assumed that all events are guarded by a timer, e.g. receiving or non-receiving of message. Due to the difference nature of guarding, different default values can be assumed:

— guarding user interactions: 30 s;

— guarding awaiting of response: 3 s;

— guarding awaiting of no response: 10 s.

The protocol should be mentioned in the respective CTCs.

7.2.6 ICMPv4 CTCs

7.2.6.1 CTC_ICMPv4_ERROR – Error handling

Table 49 specifies the CTC_ICMPv4_ERROR_02 – ICMP datagrams are only sent for fragment 0 test case.

Table 49 — CTC_ICMPv4_ERROR_02 – ICMP datagrams are only sent for fragment 0

Item	Content
CTC # – Title	CTC_ICMPv4_ERROR_02 – ICMP datagrams are only sent for fragment 0
Purpose	This CTC verifies that the ICMP datagrams are only sent about errors in handling fragment zero of fragmented datagrams. ICMP error message is sent on receiving the fragment having fragment offset field set to zero. This test is ran when IUT-Supports-IP-Options is TRUE.
Reference	RFC 1122:1989,[9] Introduction
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 4. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.2.5.

Table 49 *(continued)*

Item	Content
Step	1. The LT shall construct an ICMP echo request. Send an IP datagram to IUT-Iface-0 containing: — source address field set to address of Host-1; — destination address field set to address of IUT; — fragment offset field set to zero; — flags field containing: — MF bit set to 1; — IP options containing: — one Internet timestamp option containing: — length field set to 10; — pointer field set to 9; — one timestamp value; — first half of the constructed ICMP datagram. 2. The LT shall listen for up to $t_{\text{Listen-Time}}$ seconds on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 2: The IUT sends one ICMP parameter problem message. After step 2: The LT verifies that the received ICMP parameter problem message contains the pointer field set to 22 (basic IP header length (20) + third octet (pointer field of timestamp option).
Remark	—

Table 50 specifies the CTC_ICMPv4_ERROR_03 – ICMP datagrams are not sent when fragment not 0.

Table 50 — CTC_ICMPv4_ERROR_03 – ICMP datagrams are not sent when fragment not 0

Item	Content
CTC # – Title	CTC_ICMPv4_ERROR_03 – ICMP datagrams are not sent when fragment not 0
Purpose	This CTC verifies that the ICMP datagrams are only sent about errors in handling fragment zero of fragmented datagrams. An ICMP error message is not sent on receiving non-zero fragment i.e. fragment offset field set to non-zero value. This test is ran when IUT-Supports-IP-Options is TRUE.
Reference	RFC 1122:1989,[9] Introduction
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 4. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.2.5.

Table 50 *(continued)*

Item	Content
Step	1. The LT shall construct an ICMP echo request. Send an IP datagram to IUT-Iface-0 containing: — source address field set to address of Host-1; — destination address field set to address of IUT; — fragment offset field set to zero; — flags field containing: — MF bit set to 1; — IP options containing: — one Internet timestamp option containing: — length field set to 12; — pointer field set to 9; — one timestamp value; — first half of the constructed ICMP datagram; 2. The LT shall send an IP datagram to IUT-Iface-0 containing: — source address field set to address of Host-1; — destination address field set to address of IUT; — fragment offset field set to data size sent in first IP datagram in unit of 8-octets; — flags first containing: — MF bit set to zero; — IP options containing: — one Internet timestamp option containing: — length field set to 10; — pointer field set to 9; — one timestamp value; — last half of the constructed ICMP datagram. 3. The LT shall listen for up to $t_{\texttt{Listen-Time}}$ seconds on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 3: The IUT sends an ICMP parameter problem messages.
Remark	—

Table 51 specifies the CTC_ICMPv4_ERROR_04 – ICMP datagrams are not sent for broadcast address.

Table 51 — CTC_ICMPv4_ERROR_04 – ICMP datagrams are not sent for broadcast address

Item	Content
CTC # – Title	CTC_ICMPv4_ERROR_04 – ICMP datagrams are not sent for broadcast address

Table 51 *(continued)*

Item	Content
Purpose	This CTC verifies that an ICMP error message shall not be sent as the result of receiving a datagram destined to an IP broadcast. This CTC is ran when IUT-Supports-IP-Options is TRUE.
Reference	RFC 1122:1989,[9] 3.2.2
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 4. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.2.5.
Step	1. The LT shall send an ICMP echo request to IUT-Iface-0 containing: — IP source address field set to address of Host-1; — IP destination address field set to Broadcast-Addr; — IP options containing: — one Internet timestamp option containing: — length field set to 10; — pointer field set to 9; — one timestamp value; 2. The LT shall listen for up to $t_{Listen\text{-}Time}$ seconds on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 2: The IUT sends an ICMP parameter problem message.
Remark	—

Table 52 specifies the CTC_ICMPv4_ERROR_05 – Uknown ICMP datagram types are ignored.

Table 52 — CTC_ICMPv4_ERROR_05 – Uknown ICMP datagram types are ignored

Item	Content
CTC # – Title	CTC_ICMPv4_ERROR_05 – Uknown ICMP datagram types are ignored
Purpose	This CTC verifies that if an ICMP datagram of unknown type is received it is silently discarded.
Reference	RFC 1122:1989,[9] 3.2.2
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 4. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.2.5.
Step	1. The LT shall send an ICMP datagram to IUT-Iface-0 containing: — IP source address field set to address of Host-1; — IP destination address field set to address of IUT; — type field set to Invalid-ICMP-Type. 2. The LT shall listen for up to $t_{Listen\text{-}Time}$ seconds on LT-Iface-0.

Table 52 *(continued)*

Item	Content
Iteration	Not applicable
Expected response	After step 2: The IUT does not send any ICMP datagram.
Remark	—

7.2.6.2 CTC_ICMPv4_TYPE – Types

Table 53 specifies the CTC_ICMPv4_TYPE_04 – Do not send ICMP time exceeded message if missing fragment 0 test case.

Table 53 — CTC_ICMPv4_TYPE_04 – Do not send ICMP time exceeded message if missing fragment 0

Item	Content
CTC # – Title	CTC_ICMPv4_TYPE_04 – Do not send ICMP time exceeded message if missing fragment 0
Purpose	This CTC verifies that if fragment zero is not available then no time exceeded needs to be sent at all.
Reference	RFC 1122:1989,[9] Time Exceeded Message
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 4. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.2.5.
Step	1. The LT shall construct an ICMP echo request. Send an IP datagram to IUT-Iface-0 containing: — source address field set to address of Host-1; — destination address field set to address of IUT; — fragment offset field set to half of the constructed ICMP fragment in unit of 8 octets; — flags field containing the MF bit set to zero; — last half of the constructed ICMP datagram. 2. The LT shall wait for $t_{\texttt{Fragment-Reassemly-Timeout}}$ seconds. 3. The LT shall listen for up to $t_{\texttt{Listen-Time}}$ seconds on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 3: The IUT sends an ICMP time exceeded message.
Remark	—

Table 54 specifies the CTC_ICMPv4_TYPE_05 – Discard messages with header parameter problem.

Table 54 — CTC_ICMPv4_TYPE_05 – Discard messages with header parameter problem

Item	Content
CTC # – Title	CTC_ICMPv4_TYPE_05 – Discard messages with header parameter problem
Purpose	This CTC verifies that if the IUT processes a datagram and finds a problem in the header parameters such that it cannot complete processing of the datagram then it discards the datagram. This CTC is ran when IUT-Supports-IP-Options is TRUE.

Table 54 *(continued)*

Item	Content
Reference	RFC 792:1981,[6] Parameter Problem Message
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 4. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.2.5.
Step	1. The LT shall send an ICMP echo request to IUT-Iface-0 containing: — IP source address field set to address of Host-1; — IP destination address field set to address of IUT; — IP options containing: — one Internet timestamp option containing: — length field set to 10; — pointer field set to 9; — one timestamp value. 2. The LT shall listen for up to $t_{Listen\text{-}Time}$ seconds on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 2: The IUT discards the ICMP echo request and does not send an ICMP echo reply.
Remark	—

Table 55 specifies the CTC_ICMPv4_TYPE_08 – ICMP echo reply message data field.

Table 55 — CTC_ICMPv4_TYPE_08 – ICMP echo reply message data field

Item	Content
CTC # – Title	CTC_ICMPv4_TYPE_08 – ICMP echo reply message data field
Purpose	This CTC verifies that the data received in the echo message shall be returned in the echo reply message.
Reference	RFC 792:1981,[6] Echo or Echo Reply Message
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 4. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.2.5.
Step	1. The LT shall send an ICMP echo request to IUT-Iface-0 containing: — IP source address field set to address of Host-1; — IP destination address field set to address of IUT; — data field set to text string "ECU NETWORK VALIDATION TEST". 2. The LT shall listen for up to $t_{Listen\text{-}Time}$ seconds on LT-Iface-0.
Iteration	Not applicable

Table 55 *(continued)*

Item	Content
Expected response	After step 1: The IUT sends an ICMP echo reply. After step 2: The LT verifies that the received ICMP echo reply contains the data field including text string "ECU NETWORK VALIDATION TEST".
Remark	—

Table 56 specifies the CTC_ICMPv4_TYPE_09 – ICMP echo reply message id and sequence field.

Table 56 — CTC_ICMPv4_TYPE_09 – ICMP echo reply message id and sequence field

Item	Content
CTC # – Title	CTC_ICMPv4_TYPE_09 – ICMP echo reply message id and sequence field
Purpose	This CTC verifies that the identifier and sequence number may be used by the echo sender to aid in matching the replies with the echo requests.
Reference	RFC 792:1981,[6] Echo or Echo Reply Message
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 4. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.2.5.
Step	1. The LT shall send an ICMP echo request to IUT-Iface-0 containing: — IP source address field set to address of Host-1; — IP destination address field set to address of IUT; — identifier field set to ICMP-Datagram-Id; — sequence number field set to Seq-No. 2. The LT shall listen for up to $t_{Listen-Time}$ seconds on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 1: The IUT sends an ICMP echo reply. After step 2: The LT verifies that the received ICMP echo reply contains: — identifier field set to ICMP-Datagram-Id; — sequence number field set to Seq-No.
Remark	—

Table 57 specifies the CTC_ICMPv4_TYPE_10 – CMP checksum is checked.

Table 57 — CTC_ICMPv4_TYPE_10 – CMP checksum is checked

Item	Content
CTC # – Title	CTC_ICMPv4_TYPE_10 – CMP checksum is checked
Purpose	This CTC verifies that the IUT does not send an ICMP echo reply if ICMP checksum in the ICMP echo request is incorrect.
Reference	RFC 792:1981,[6] Echo or Echo Reply Message
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.

Table 57 *(continued)*

Item	Content
Set-up	The test system set-up shall be in accordance with Figure 4. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.2.5.
Step	1. The LT shall send an ICMP echo request to IUT-Iface-0 containing: — IP source address field set to address of Host-1; — IP destination address field set to address of IUT; — checksum field set to Invalid-Checksum. 2. The LT shall listen for up to $t_{Listen\text{-}Time}$ seconds on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 2: The IUT does not send an ICMP echo reply.
Remark	—

Table 58 specifies the CTC_ICMPv4_TYPE_11 – ICMP timestamp reply message content.

Table 58 — CTC_ICMPv4_TYPE_11 – ICMP timestamp reply message content

Item	Content
CTC # – Title	CTC_ICMPv4_TYPE_11 – ICMP timestamp reply message content
Purpose	This CTC verifies that the data received (a timestamp) in the message is returned in the reply together with an additional timestamp.
Reference	RFC 792:1981,[6] Timestamp or Timestamp Reply Message
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 4. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.2.5.
Step	1. The LT shall send an ICMP timestamp message to IUT-Iface-0 containing: — IP source address field set to address of Host-1; — IP destination address field set to address of IUT; — originate timestamp field set to Originate-Timestamp-Value; — receive timestamp field set to zero. 2. The LT shall listen for up to $t_{Listen\text{-}Time}$ seconds on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 1: The IUT sends an ICMP timestamp reply. After step 2: The LT verifies that the received ICMP timestamp reply contains: — originate timestamp field set to Originate-Timestamp-Value; — receive timestamp field set to non-zero; — transmit timestamp field set to non-zero.
Remark	—

Table 59 specifies the CTC_ICMPv4_TYPE_12 – ICMP timestamp reply ICMP-Datagram-Id and sequence field.

Table 59 — CTC_ICMPv4_TYPE_12 – ICMP timestamp reply ICMP-Datagram-Id and sequence field

Item	Content
CTC # – Title	CTC_ICMPv4_TYPE_12 – ICMP timestamp reply ICMP-Datagram-Id and sequence field
Purpose	This CTC verifies that the identifier and sequence number may be used by the echo sender to aid in matching the replies with the requests.
Reference	RFC 792:1981,[6] Timestamp or Timestamp Reply Message
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 4. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.2.5.
Step	1. The LT shall send an ICMP timestamp message to IUT-Iface-0 containing: — IP source address field set to address of Host-1; — IP destination address field set to address of IUT; — identifier field set to ICMP-Datagram-Id; — sequence number field set to Seq-No. 2. The LT shall listen for up to $t_{Listen\text{-}Time}$ seconds on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 1: The IUT sends an ICMP timestamp reply. After step 2: The LT verifies that the received ICMP timestamp reply contains: — identifier field set to ICMP-Datagram-Id; — sequence number field set to Seq-No.
Remark	—

Table 60 specifies the CTC_ICMPv4_TYPE_16 – Ensure that the IUT does not accept an ICMP information request and does not generate an ICMP information reply.

Table 60 — CTC_ICMPv4_TYPE_16 – Ensure that the IUT does not accept an ICMP information request and does not generate an ICMP information reply

Item	Content
CTC # – Title	CTC_ICMPv4_TYPE_16 – Ensure that the IUT does not accept an ICMP information request and does not generate an ICMP information reply
Purpose	This CTC verifies that the IUT does not implement an ICMP information request or information reply message when the LT sends an information request or information reply message.
Reference	RFC 792:1981,[6] Information Request or Information Reply Message; RFC 1122:1989,[9] 3.2.2.7.
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 4. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.2.5.

Table 60 *(continued)*

Item	Content
Step	1. The LT shall send an ICMP information request to IUT-Iface-0 containing: — IP source address field set to network portion of IP address of Host-1; — IP destination address field set to zero; — identifier field set to ICMP-Datagram-Id; — sequence number field set to Seq-No. 2. The LT shall listen for up to $t_{Listen\text{-}Time}$ seconds on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 2: The IUT does not send an ICMP information reply.
Remark	—

Table 61 specifies the CTC_ICMPv4_TYPE_18 – Send ICMP destination unreachable for unknown protocol.

Table 61 — CTC_ICMPv4_TYPE_18 – Send ICMP destination unreachable for unknown protocol

Item	Content
CTC # – Title	CTC_ICMPv4_TYPE_18 – Send ICMP destination unreachable for unknown protocol
Purpose	This CTC verifies that the IUT responds to an IP datagram containnig an unsupported protocol by sending a destination unreachable message including the protocol unreachable code.
Reference	RFC 792:1981,[6] Destination Unreachable Message; RFC 1122:1989,[9] 3.2.2.1.
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 4. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.2.5.
Step	1. The LT shall send an ICMP fragment with protocol value of Unsupported-Protocol.
Iteration	Not applicable
Expected response	After step 1: The IUT sends an ICMP destination unreachable datagram indicating protocol unreachable.
Remark	—

Table 62 specifies the CTC_ICMPv4_TYPE_22 – Send ICMP echo reply on receiving ICMP echo request.

Table 62 — CTC_ICMPv4_TYPE_22 – Send ICMP echo reply on receiving ICMP echo request

Item	Content
CTC # – Title	CTC_ICMPv4_TYPE_22 – Send ICMP echo reply on receiving ICMP echo request
Purpose	This CTC verifies that the IUT responds to all ICMP echo requests sent to it, by sending an ICMP echo reply back to the sender of the ICMP echo request.
Reference	RFC 792:1981,[6] Echo or Echo Reply Message
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.

Table 62 *(continued)*

Item	Content
Set-up	The test system set-up shall be in accordance with Figure 4. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.2.5.
Step	1. The LT shall send an ICMP echo request to IUT-Iface-0 containing: — IP source address field set to address of Host-1; — IP destination address field set to address of IUT. 2. The LT shall listen for up to $t_{\texttt{Listen-Time}}$ seconds on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 2: The IUT sends an ICMP echo reply.
Remark	—

7.3 NL – Internet protocol version 4 (IPv4)

7.3.1 General

The objective of this subclause is to specify CTCs for Internet protocol version 4 (IPv4).

7.3.2 Referenced specification

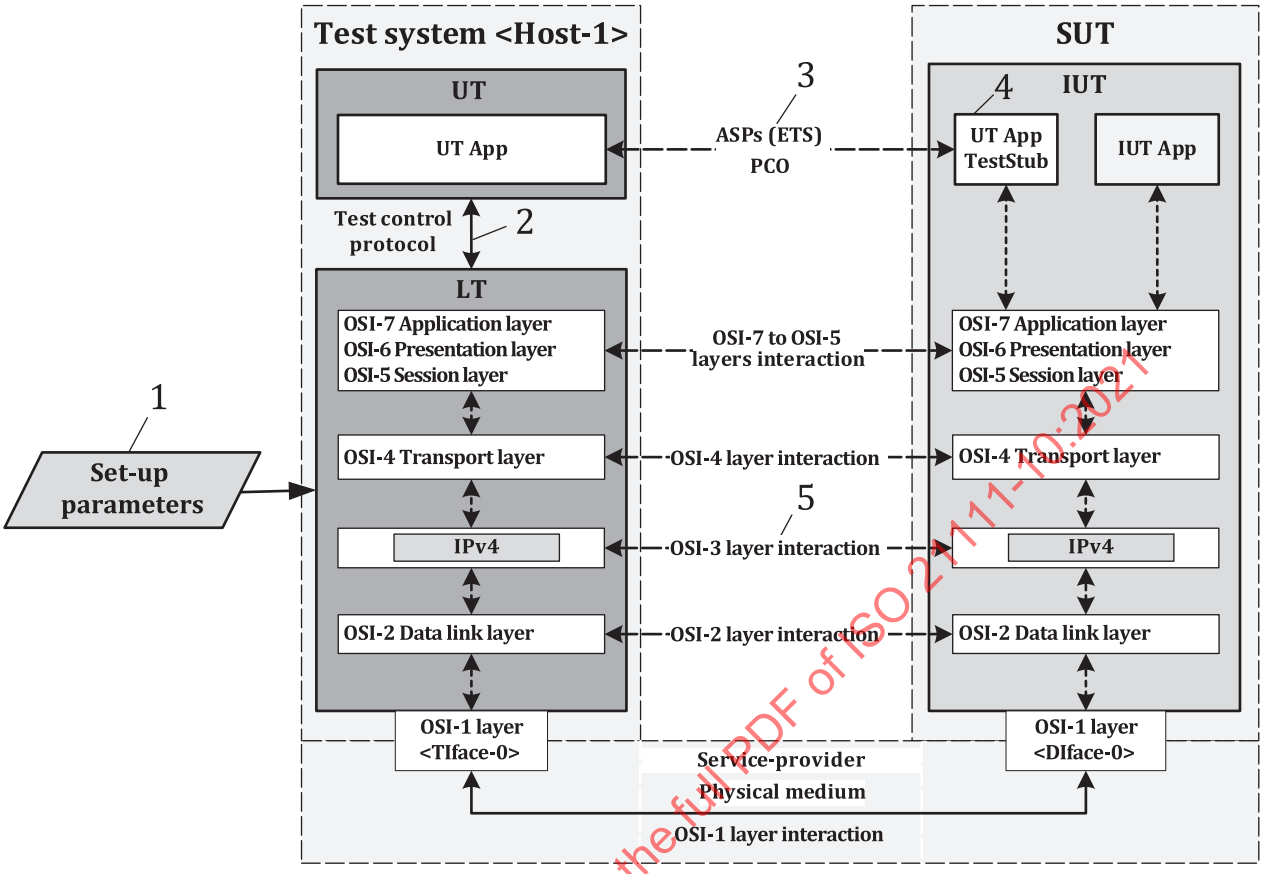
All CTCs in 7.3 are in accordance with these RFCs:

— RFC 791:1981[5],

— RFC 1122:1989[9].

7.3.3 Test system topology – NL – IPv4

Figure 5 shows the test system topology – NL – IPv4.



Key

1 IUT-specific set-up parameters (electronic data sheet)
2 test control protocol
3 PCO and ASPs based on ETS
4 UT TestStub application
5 OSI layer 3 IPv4 interaction

Figure 5 — Test system – NL – IPv4

7.3.4 Test system topology and related CTC configuration

This test suite expects to be running against an IP stack as illustrated in Figure 5, key 4.

7.3.5 IPv4 parameters used in CTCs

Table 63 specifies the parameters used in IPv4 CTCs.

Table 63 — Parameters used in IPv4 CTCs

Parameter used in CTCs	Content
$t_{\texttt{Valid-Time-To-Live}}$	Time to live field value used in IP datagram to be sent. If the datagram is to be forwarded then this value shall be greater than 2 s.
Invalid-Checksum	This is the checksum which is different from the calculated checksum, i.e. different from 16-bit one's complement of the one's complement sum of all 16-bit words in the header.
IP-Datagram-Id	Identification of the IP datagram

Table 63 *(continued)*

Parameter used in CTCs	Content
Limited-Broadcast-Addr	The limited broadcast address addresses every node on the connected physical network. {-1, -1} - 255.255.255.255
Directed-Broadcast-Addr	The directed broadcast address addresses a specific group in the network. {network-number, -1}, e.g. 192.168.255.255
Loop-Back-Addr	The internal loopback address, e.g. 127.0.0.1
MTU	The maximum transmission unit size
IPv4	Default value: 45_{16} Indicates that IPv4 is used in the current message.
IP-Type-ICMP	Default value: 01_{16} Indicates the following protocol type, in this case ICMP.
IP-Init-Reassemble-Timeout	Default value: depends on used controller Time to wait for cleaning of the buffer with fragmented and malfored messages.
IP-Type-TCP	Default value: 06_{16} Indicates the following protocol type, in this case TCP.
Port-1	Port number of the UT used for UDP communication

As a general test pattern it can be assumed that all events are guarded by a timer, e.g. receiving or non-receiving of message. Due to the difference nature of guarding, different default values can be assumed:

— guarding user interactions: 30 s;

— guarding awaiting of response: 3 s;

— guarding awaiting of no response: 10 s.

The protocol should be mentioned in the respective CTCs.

7.3.6 IPv4 CTCs

7.3.6.1 CTC_IPv4_HEADER – IPv4 header

Table 64 specifies the CTC_IPv4_HEADER_01 – Ensure that the IUT generates an IP datagram with a total length greater than or equal to 20 test case.

Table 64 — CTC_IPv4_HEADER_01 – Ensure that the IUT generates an IP datagram with a total length greater than or equal to 20

Item	Content
CTC # – Title	CTC_IPv4_HEADER_01 – Ensure that the IUT generates an IP datagram with a total length greater than or equal to 20
Purpose	This CTC verifies that when an IUT is requested to generate an IP datagram, then the IUT generates an IP datagram containing: an IP header, a total length indicating a value greater than or equal to 20.
Reference	RFC 791:1981,[5] 3.1
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.

Table 64 *(continued)*

Item	Content
Set-up	The test system set-up shall be in accordance with Figure 5. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.3.5.
Step	1. The LT shall send an ICMP echo request.
Iteration	Not applicable
Expected response	After step 1: The IUT generates an ICMP echo reply including a total length frame in the IP header greater or equal to 20.
Remark	—

Table 65 specifies the CTC_IPv4_HEADER_02 – Ensure that the IUT discards an IP datagram with an invalid header length.

Table 65 — CTC_IPv4_HEADER_02 – Ensure that the IUT discards an IP datagram with an invalid header length

Item	Content
CTC # – Title	CTC_IPv4_HEADER_02 – Ensure that the IUT discards an IP datagram with an invalid header length
Purpose	This CTC verifies that when an IUT receives an IP datagram containing: an IP header, a header length indicating a value less than 20, then the IUT discards the IP datagram.
Reference	RFC 791:1981,[5] 3.1
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 5. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.3.5.
Step	1. The LT shall send an ICMP echo request with a header length indicating a value less than 20.
Iteration	Not applicable
Expected response	After step 1: The IUT does not send an ICMP echo reply.
Remark	—

Table 66 specifies the CTC_IPv4_HEADER_03 – Ensure that the IUT generates an IP datagram with the source address being one of its IP addresses.

Table 66 — CTC_IPv4_HEADER_03 – Ensure that the IUT generates an IP datagram with the source address being one of its IP addresses

Item	Content
CTC # – Title	CTC_IPv4_HEADER_03 – Ensure that the IUT generates an IP datagram with the source address being one of its IP addresses
Purpose	This CTC verifies that when an IUT is requested to generate an IP datagram then the IUT shall send an IP datagram containing: an IP header, a source address indicating one of its defined IP addresses.

Table 66 *(continued)*

Item	Content
Reference	RFC 791:1981,[5] 3.1, 3.2; RFC 1122:1989,[9] 3.2.1.3.
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 5. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.3.5.
Step	1. The LT shall send an ICMP echo request.
Iteration	Not applicable
Expected response	After step 1: The IUT generates an ICMP echo reply with source address being one of its defined IP addresses.
Remark	—

Table 67 specifies the CTC_IPv4_HEADER_04 – Ensure that the IUT discards an IP datagram with an incorrect destination address.

Table 67 — CTC_IPv4_HEADER_04 – Ensure that the IUT discards an IP datagram with an incorrect destination address

Item	Content
CTC # – Title	CTC_IPv4_HEADER_04 – Ensure that the IUT discards an IP datagram with an incorrect destination address.
Purpose	This CTC verifies that when an IUT receives an IP datagram containing: an IP header, a destination address, indicating a value different from the IUT's IP address and is not a broadcast or multicast address, then the IUT discards the IP datagram.
Reference	RFC 791:1981,[5] 3.1, 3.2; RFC 1122:1989,[9] 3.2.1.3.
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 5. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.3.5.
Step	1. The LT shall send an ICMP echo request with the destination address different than the IUT's IP address.
Iteration	Not applicable
Expected response	After step 1: The IUT does not send an ICMP echo reply.
Remark	—

Table 68 specifies the CTC_IPv4_HEADER_05: – IP maximum datagram length check.

Table 68 — CTC_IPv4_HEADER_05: – IP maximum datagram length check

Item	Content
CTC # – Title	CTC_IPv4_HEADER_05: – IP maximum datagram length check

Table 68 *(continued)*

Item	Content
Purpose	This CTC verifies that all hosts are prepared to accept IP datagrams of up to 576 octets.
Reference	RFC 791:1981,[5] 3.1
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 5. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.3.5.
Step	1. The LT shall send an ICMP echo request to IUT-Iface-0 containing: — IP source address field set to address of Host-1; — IP destination address field set to address of IUT; — IP total length field set to 576; — IP payload field containing 556 byte of data. 2. The LT shall listen for up to $t_{Listen\text{-}Time}$ seconds on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 2: The IUT sends an ICMP echo reply. After step 2: The LT verifies that identifier, sequence number, and data of the ICMP echo reply are the same as those of the ICMP echo request sent.
Remark	—

Table 69 specifies the CTC_IPv4_HEADER_08 – IP header length validation.

Table 69 — CTC_IPv4_HEADER_08 – IP header length validation

Item	Content
CTC # – Title	CTC_IPv4_HEADER_08 – IP header length validation
Purpose	This CTC verifies that the IUT discards a datagram with total length smaller than implied by the Internet header length (IHL) value.
Reference	RFC 791:1981,[5] 3.1
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 5. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.3.5.
Step	1. The LT shall send an ICMP echo request to IUT-Iface-0 containing: — IP source address field set to address of Host-1; — IP destination address field set to address of IUT; — data field set to text string "ECU NETWORK VALIDATION TEST"; — IP IHL field set to 13. 2. The LT shall listen for up to $t_{Listen\text{-}Time}$ seconds on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 2: The IUT does not send an ICMP echo reply.

Table 69 *(continued)*

Item	Content
Remark	—

Table 70 specifies the CTC_IPv4_HEADER_09 – IP total length validation.

Table 70 — CTC_IPv4_HEADER_09 – IP total length validation

Item	Content
CTC # – Title	CTC_IPv4_HEADER_09 – IP total length validation
Purpose	This CTC verifies that the IUT discards a fragment with total length bigger than the actual transmitted data.
Reference	RFC 791:1981,[5] 3.1
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 5. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.3.5.
Step	1. The LT shall send an ICMP echo request to IUT-Iface-0 containing: — IP source address field set to address of Host-1; — IP destination address field set to address of IUT; — data field set to text string "ECU NETWORK VALIDATION TEST"; — IP total length field set to 48. 2. The LT shall listen for up to $t_{Listen\text{-}Time}$ seconds on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 2: The IUT does not send an ICMP echo reply.
Remark	—

7.3.6.2 CTC_IPv4_CHECKSUM – Checksum

Table 71 specifies the CTC_IPv4_CHECKSUM_02 – IP checksum service primitive validation on receiving test case.

Table 71 — CTC_IPv4_CHECKSUM_02 – IP checksum service primitive validation on receiving

Item	Content
CTC # – Title	CTC_IPv4_CHECKSUM_02 – IP checksum service primitive validation on receiving
Purpose	This CTC verifies that if the header checksum verification fails, the IP datagram is discarded by the IUT.
Reference	RFC 791:1981,[5] 3.1; RFC 1122:1989,[9] 3.2.1.2.
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 5. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.3.5.

Table 71 *(continued)*

Item	Content
Step	1. The LT shall send an ICMP echo request with header checksum indicating Invalid-Checksum.
Iteration	Not applicable
Expected response	After step 1: The IUT does not send an ICMP echo reply.
Remark	—

Table 72 specifies the CTC_IPv4_CHECKSUM_05 – IP checksum service primitive validation.

Table 72 — CTC_IPv4_CHECKSUM_05 – IP checksum service primitive validation

Item	Content
CTC # – Title	CTC_IPv4_CHECKSUM_05 – IP checksum service primitive validation
Purpose	This CTC verifies that the IUT uses the checksum calculation service primitive according to RFC.
Reference	RFC 791:1981,[5] 3.1
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 5. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.3.5.
Step	1. The LT shall send an ICMP echo request to IUT-Iface-0 containing: — IP source address field set to address of Host-1; — IP destination address field set to address of IUT; — IP checksum field set to the 16-bit one's complement of the one's complement sum of all 16-bit words in the header. 2. The LT shall listen for up to $t_{\text{Listen-Time}}$ seconds on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 2: The IUT sends an ICMP echo reply. After step 2: The LT verifies that the received ICMP echo reply contains an IP checksum field set to the 16-bit one's complement of the one's complement sum of all 16-bit words in the header.
Remark	—

7.3.6.3 CTC_IPv4_TTL – $t_{\text{Time-To-Live}}$

Table 73 specifies the CTC_IPv4_TTL_01 where a Host-1 does not send a datagram with a $t_{\text{Time-To-Live}}$ value of zero test case.

Table 73 — CTC_IPv4_TTL_01 – Datagram with a $t_{\text{Time-To-Live}}$ value of zero

Item	Content
CTC # – Title	CTC_IPv4_TTL_01 – A host Host-1 does not send a datagram with a $t_{\text{Time-To-Live}}$ value of zero
Purpose	This CTC verifies that the IUT does not send a datagram with a $t_{\text{Time-To-Live}}$ value of zero.
Reference	RFC 791:1981,[5] 3.1, 3.2; RFC 1122:1989,[9] 3.2.1.7.
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.

Table 73 *(continued)*

Item	Content
Set-up	The test system set-up shall be in accordance with Figure 5. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.3.5.
Step	1. The LT shall send an ICMP echo request segment.
Iteration	Not applicable
Expected response	After step 1: The IUT sends an ICMP echo reply datagram with a $t_{\text{Time-To-Live}}$ value greater than 0.
Remark	—

Table 74 specifies the CTC_IPv4_TTL_05 – Packets with 0 or 1 $t_{\text{Time-To-Live}}$ are not discarded by hosts.

Table 74 — CTC_IPv4_TTL_05 – Packets with 0 or 1 $t_{\text{Time-To-Live}}$ are not discarded by hosts

Item	Content
CTC # – Title	CTC_IPv4_TTL_05 – Packets with 0 or 1 $t_{\text{Time-To-Live}}$ are not discarded by hosts
Purpose	This CTC verifies that the IUT does not discard a datagram just because it was received with $t_{\text{Time-To-Live}}$ less than 2.
Reference	RFC 791:1981,[5] 3.2; RFC 1122:1989,[9] 3.2.1.7.
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 5. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.3.5.
Step	1. The LT shall send an ICMP echo request to IUT-Iface-0 containing: — IP source address field set to address of Host-1; — IP destination address field set to address of IUT; — IP $t_{\text{Time-To-Live}}$ field set to $t_{\text{Time-To-Live}}$. 2. The LT shall listen for up to $t_{\text{Listen-Time}}$ seconds on LT-Iface-0.
Iteration	a) case: $t_{\text{Time-To-Live}} = 0$ b) case: $t_{\text{Time-To-Live}} = 1$
Expected response	After step 2 case a): The IUT sends an ICMP echo reply. After step 2 case b): The IUT sends an ICMP echo reply.
Remark	—

7.3.6.4 CTC_IPv4_VERSION – Version number

Table 75 specifies the CTC_IPv4_VERSION_01 – Ensure that the IUT accepts an IPv4 datagram with a valid version 4 test case.

Table 75 — CTC_IPv4_VERSION_01 – Ensure that the IUT accepts an IPv4 datagram with a valid version 4

Item	Content
CTC # – Title	CTC_IPv4_VERSION_01 – Ensure that the IUT accepts an IP datagram with a valid version 4

Table 75 *(continued)*

Item	Content
Purpose	This CTC verifies that when the IUT receives an IP datagram, containing an IP header and a version indicating a value of 4, then the IUT accepts the IP datagram.
Reference	RFC 791:1981,[5] 3.1; RFC 1122:1989,[9] 3.2.1.1.
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 5. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.3.5.
Step	1. The LT shall send an ICMP echo request with version 4.
Iteration	Not applicable
Expected response	After step 1: The IUT sends an ICMP echo reply.
Remark	—

Table 76 specifies the CTC_IPv4_VERSION_03 – Ensure that the IUT generates a IP datagram with a valid version 4.

Table 76 — CTC_IPv4_VERSION_03 – Ensure that the IUT generates a IP datagram with a valid version 4

Item	Content
CTC # – Title	CTC_IPv4_VERSION_03 – Ensure that the IUT generates a IP datagram with a valid version 4
Purpose	This CTC verifies that when the IUT generates an IP datagram, then the IUT shall send an IP datagram containing an IP header and a version indicating a value of 4.
Reference	RFC 791:1981,[5] 3.1; RFC 1122:1989,[9] 3.2.1.1.
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 5. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.3.5.
Step	1. The LT shall send an ICMP echo request.
Iteration	Not applicable
Expected response	After step 1: The IUT sends an ICMP echo reply containing a valid version 4.
Remark	—

Table 77 specifies the CTC_IPv4_VERSION_04 – IP version validation.

Table 77 — CTC_IPv4_VERSION_04 – IP version validation

Item	Content
CTC # – Title	CTC_IPv4_VERSION_04 – IP version validation
Purpose	This CTC verifies that a datagram whose version number is not 4 is silently discarded.
Reference	RFC 791:1981,[5] 3.1; RFC 1122:1989,[9] 3.2.1.1.

Table 77 *(continued)*

Item	Content
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 5. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.3.5.
Step	1. The LT shall send an ICMP echo request to IUT-Iface-0 containing: — IP source address field set to address of Host-1; — IP destination address field set to address of IUT; — IP version field set to other than IP. 2. The LT shall listen for up to $t_{Listen\text{-}Time}$ seconds on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 2: The IUT discards the ICMP echo request and does not send an ICMP echo reply.
Remark	—

7.3.6.5 CTC_IPv4_ADDRESSING – Addressing

Table 78 specifies the CTC_IPv4_ADDRESSING_01 – Ensure that the IUT receives an IP datagram with a destination address being a limited broadcast address test case.

Table 78 — CTC_IPv4_ADDRESSING_01 – Ensure that the IUT receives an IP datagram with a destination address being a limited broadcast address

Item	Content
CTC # – Title	CTC_IPv4_ADDRESSING_01 – Ensure that the IUT receives an IP datagram with a destination address being a limited broadcast address
Purpose	This CTC verifies that when the IUT receives an IP datagram: containing an IP header, containing a destination address, indicating a value of limited broadcast, then the IUT accepts the IP datagram.
Reference	RFC 791:1981,[5] 3.2; RFC 1122:1989,[9] 3.2.1.3.
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 5. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.3.5.
Step	1. The LT shall send a UDP datagram with the destination address being Limited-Broadcast-Addr.
Iteration	Not applicable
Expected response	After step 1: The UT verifies that the IUT received a UDP datagram with the destination address Limited-Broadcast-Addr.
Remark	—

Table 79 specifies the CTC_IPv4_ADDRESSING_02 – Ensure that the IUT discards an IP datagram with a destination address being a directed broadcast address.

Table 79 — CTC_IPv4_ADDRESSING_02 – Ensure that the IUT discards an IP datagram with a destination address being a directed broadcast address

Item	Content
CTC # – Title	CTC_IPv4_ADDRESSING_02 – Ensure that the IUT discards an IP datagram with a destination address being a directed broadcast address
Purpose	This CTC verifies that when the IUT receives an IP datagram, containing an IP header, containing a destination address, indicating a value of directed broadcast, then the IUT discards the IP datagram silently.
Reference	RFC 791:1981,[5] 3.2; RFC 1122:1989,[9] 3.2.1.3.
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 5. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.3.5.
Step	1. The LT shall send a UDP datagram with the destination address being directedBroadcastAddress.
Iteration	Not applicable
Expected response	After step 2: The UT verifies that the IUT does not receive a UDP datagram with the destination address directedBroadcastAddress.
Remark	—

Table 80 specifies the CTC_IPv4_ADDRESSING_03 – Ensure that the IUT discards an IP datagram with a destination address being a loop back address.

Table 80 — CTC_IPv4_ADDRESSING_03 – Ensure that the IUT discards an IP datagram with a destination address being a loop back address

Item	Content
CTC # – Title	CTC_IPv4_ADDRESSING_03 – Ensure that the IUT discards an IP datagram with a destination address being a loop back address
Purpose	This CTC verifies that when the IUT receives an IP datagram: containing an IP header, containing a destination address, indicating a value of loop back, then the IUT discards the IP datagram silently.
Reference	RFC 791:1981,[5] 3.2; RFC 1122:1989,[9] 3.2.1.3.
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 5. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.3.5.

Table 80 *(continued)*

Item	Content
Step	1. The LT shall send an ICMP echo request with the destination address being Loop-Back-Addr.
Iteration	Not applicable
Expected response	After step 1: The IUT does not send an ICMP echo reply.
Remark	—

7.3.6.6 CTC_IPv4_FRAGMENTS – Fragments

Table 81 specifies the CTC_IPv4_FRAGMENTS_01 – IP reconstruct fragments validation test case.

Table 81 — CTC_IPv4_FRAGMENTS_01 – IP reconstruct fragments validation

Item	Content
CTC # – Title	CTC_IPv4_FRAGMENTS_01 – IP reconstruct fragments validation
Purpose	This CTC verifies that the IUT assembles the fragments if the IP-Datagram-Id is the same in all fragments.
Reference	RFC 791:1981,[5] 2.3, 3.2; RFC 1122:1989,[9] 3.3.2.
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 5. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.3.5.

Table 81 *(continued)*

Item	Content
Step	1. The LT shall construct an ICMP echo request and send an IP datagram to IUT-Iface-0 containing: — source address field set to address of Host-1; — destination address field set to address of IUT; — identification field set to IP-Datagram-Id; — protocol field set to IP-Type-ICMP; — fragment offset field set to zero; — flags containing: — MF bit set to 1; — first half of the constructed ICMP datagram. 2. The LT shall send an IP datagram to IUT-Iface-0 containing: — source address field set to address of Host-1; — destination address field set to address of IUT; — identification field set to IP-Datagram-Id; — protocol field set to IP-Type-ICMP; — fragment offset field set to data size sent in first IP datagram in unit of 8 octets; — flags containing: — MF bit set to zero; — last half of the constructed ICMP datagram. 3. The LT shall listen for up to $t_{Listen\text{-}Time}$ seconds on LT-Iface-0.
Iteration	Not applicable.
Expected response	After step 3: The IUT sends an ICMP echo reply. After step 3: The LT verifies that identifier, sequence number, and data of the ICMP echo reply are the same as those of the ICMP echo request sent in two fragments.
Remark	—

Table 82 specifies the CTC_IPv4_FRAGMENTS_02 – IP reconstruct fragments, negative test on IP-Datagram-Id.

Table 82 — CTC_IPv4_FRAGMENTS_02 – IP reconstruct fragments, negative test on IP-Datagram-Id

Item	Content
CTC # – Title	CTC_IPv4_FRAGMENTS_02 – IP reconstruct fragments, negative test on IP-Datagram-Id
Purpose	This CTC verifies that the IUT does not assemble the fragments if the IP-Datagram-Id is different in all fragments.
Reference	RFC 791:1981,[5] 2.3
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.

Table 82 *(continued)*

Item	Content
Set-up	The test system set-up shall be in accordance with Figure 5. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.3.5.
Step	1. The LT shall construct an ICMP echo request and shall send an IP datagram to the IUT-Iface-0 containing: — source address field set to address of Host-1; — destination address field set to address of IUT; — identification field set to id 1; — protocol field set to IP-Type-ICMP; — fragment offset field set to zero; — flags field containing; — MF bit set to 1; — first half of the constructed ICMP datagram. 2. The LT shall send an IP datagram to IUT-Iface-0 containing: — source address field set to address of Host-1; — destination address field set to address of IUT; — identification field set to id 2; — protocol field set to IP-Type-ICMP; — fragment offset field set to data size sent in first IP datagram in unit of 8 octets; — flags field containing: — MF bit set to zero; — last half of the constructed ICMP datagram. 3. The LT shall listen for up to $t_{Listen\text{-}Time}$ seconds on LT-Iface-0. 4. The LT shall send an IP datagram to IUT-Iface-0 containing: — source address field set to address of Host-1; — destination address field set to address of IUT; — identification field set to id 1; — protocol field set to IP-Type-ICMP; — fragment offset field set to data size sent in first IP datagram in unit of 8 octets; — flags field containing: — MF bit set to zero; — last half of the constructed ICMP datagram. 5. The LT shall listen for up to $t_{Listen\text{-}Time}$ seconds on LT-Iface-0.
Iteration	Not applicable

Table 82 *(continued)*

Item	Content
Expected response	After step 3: The IUT does not send an ICMP echo reply. After step 5: The IUT sends an ICMP echo reply. After step 5: The LT verifies that the identifier, sequence number and data of the ICMP echo reply are the same as those of the ICMP echo request sent in two fragments.
Remark	—

Table 83 specifies the CTC_IPv4_FRAGMENTS_03 – IP reconstruct fragments, negative test on source.

Table 83 — CTC_IPv4_FRAGMENTS_03 – IP reconstruct fragments, negative test on source

Item	Content
CTC # – Title	CTC_IPv4_FRAGMENTS_03 – IP reconstruct fragments, negative test on source
Purpose	This CTC verifies that the IUT does not assemble the fragments if the IP source address is different in the fragments.
Reference	RFC 791:1981,[5] 2.3
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 5. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.3.5.

Table 83 *(continued)*

Item	Content
Step	1. The LT shall construct an ICMP echo request and send an IP datagram to IUT-Iface-0 containing: — source address field set to address of Host-1; — destination address field set to address of IUT; — identification field set to Identifier; — protocol field set to IP-Type-ICMP; — fragment offset field set to zero; — flags field containing: — MF bit set to 1; — first half of the constructed ICMP datagram. 2. The LT shall send an IP datagram to IUT-Iface-0 containing: — source address field set to different address of Host-1; — destination address field set to address of IUT; — identification field set to Identifier; — protocol field set to IP-Type-ICMP; — fragment offset field set to data size sent in first IP datagram in unit of 8 octets; — flags field containing: — MF bit set to zero; — last half of the constructed ICMP datagram. 3. The LT shall listen for up to $t_{\texttt{Listen-Time}}$ seconds on LT-Iface-0. 4. The LT shall send an IP datagram to IUT-Iface-0 containing: — source address field set to address of Host-1; — destination address field set to address of IUT; — identification field set to IP-Datagram-Id; — protocol field set to IP-Type-ICMP; — fragment offset field set to data size sent in first IP datagram in unit of 8 octets; — flags field containing: — MF bit set to zero; — last half of the constructed ICMP datagram. 5. The LT shall listen for up to $t_{\texttt{Listen-Time}}$ seconds on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 3: The IUT does not send an ICMP echo reply. After step 5: The IUT sends an ICMP echo reply. After step 5: The LT verifies that the identifier, sequence number and data of ICMP echo reply are same as those of ICMP echo request sent in two fragments.

Table 83 *(continued)*

Item	Content
Remark	—

Table 84 specifies the CTC_IPv4_FRAGMENTS_04 – IP reconstruct fragments, negative test on protocol.

Table 84 — CTC_IPv4_FRAGMENTS_04 – IP reconstruct fragments, negative test on protocol

Item	Content
CTC # – Title	CTC_IPv4_FRAGMENTS_04 – IP reconstruct fragments, negative test on protocol
Purpose	This CTC verifies that the IUT does not assemble the fragments if the protocol is different in the fragments.
Reference	RFC 791:1981,[5] 2.3
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 5. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.3.5.

Table 84 *(continued)*

Item	Content
Step	1. The LT shall construct an ICMP echo request and send an IP datagram to IUT-Iface-0 containing: — source address field set to address of Host-1; — destination address field set to address of IUT; — identification field set to IP-Datagram-Id; — protocol field set to IP-Type-ICMP; — fragment offset field set to zero; — flags field containing: — MF bit set to 1; — first half of the constructed ICMP datagram. 2. The LT shall send an IP datagram to IUT-Iface-0 containing: — source address field set to address of Host-1; — destination address field set to address of IUT; — identification field set to IP-Datagram-Id; — protocol field set to iptypeTCP; — fragment offset field set to data size sent in first IP datagram in unit of 8 octets; — flags field containing: — MF bit set to zero; — last half of the constructed ICMP datagram. 3. The LT shall listen for up to $t_{\texttt{Listen-Time}}$ seconds on LT-Iface-0. 4. The LT shall send an IP datagram to IUT-Iface-0 containing: — source address field set to address of Host-1; — destination address field set to address of IUT; — identification field set to IP-Datagram-Id; — protocol field set to IP-Type-ICMP; — fragment offset field set to data size sent in first IP datagram in unit of 8 octets; — flags field containing: — MF bit set to zero; — last half of the constructed ICMP datagram. 5. The LT shall listen for up to $t_{\texttt{Listen-Time}}$ seconds on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 3: The IUT does not send an ICMP echo reply. After step 5: The IUT sends an ICMP echo reply. After step 5: The LT verifies that the identifier, sequence number and data of ICMP echo reply are same as those of ICMP echo request sent in two fragments.

Table 84 *(continued)*

Item	Content
Remark	—

Table 85 specifies the CTC_IPv4_FRAGMENTS_05 – IP send unfragmented data validation.

Table 85 — CTC_IPv4_FRAGMENTS_05 – IP send unfragmented data validation

Item	Content
CTC # – Title	CTC_IPv4_FRAGMENTS_05 – IP send unfragmented data validation
Purpose	This CTC verifies that an unfragmented datagram has all zero-fragmentation information (MF = 0, fragment offset = 0).
Reference	RFC 791:1981,[5] 3.2
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 5. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.3.5.
Step	1. The UT shall cause the IUT to send a UDP datagram with UDP-Default-Data from IUT-Iface-0 with: — source IP address set to IUT-Iface-0; — destination IP address set to HOST- 1 IP; — source UDP port field set to Unused-UDP-Dest-Port-1 (20 001); — destination UDP port field set to Unused-UDP-Src-Port (20 000). 2. The LT shall listen for up to $t_{Listen\text{-}Time}$ seconds on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 2: The IUT sends a UDP datagram. After step 2: The LT verifies that the received datagram contains IP flags field containing: — MF bit set to zero; — IP datagram offset field set to zero.
Remark	—

7.3.6.7 CTC_IPv4_REASSEMBLY – Reassembly

Table 86 specifies the CTC_IPv4_REASSEMBLY_04 – Ensure that the IUT reassembles fragments of an IP datagram received in the wrong order test case.

Table 86 — CTC_IPv4_REASSEMBLY_04 – Ensure that the IUT reassembles fragments of an IP datagram received in the wrong order

Item	Content
CTC # – Title	CTC_IPv4_REASSEMBLY_04 – Ensure that the IUT reassembles fragments of an IP datagram received in the wrong order
Purpose	This CTC verifies that when the IUT receives a series of unordered IP datagrams of a large IP datagram then the IUT reassembles and accepts the IP datagram.
Reference	RFC 791:1981,[5] 3.2
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.

Table 86 *(continued)*

Item	Content
Set-up	The test system set-up shall be in accordance with Figure 5. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.3.5.
Step	1. The LT shall send an IP datagram with MF = 1 (more fragments) and offset = 0, containing an ICMP echo request where the total length is less than the MTU. 2. The LT shall send an IP datagram with, MF = 1 (more fragments) and offset correctly incremented, but belonging to the third fragment, and the ID being the same as the first fragment. 3. The LT shall send an IP datagram with MF = 1 (more fragments) and offset correctly incremented, but belonging to the second fragment, and the ID being the same as the first fragment. 4. The LT shall send an IP datagram with MF = 0 (last fragment) and offset correctly incremented, and the ID being the same as the first fragment.
Iteration	Not applicable
Expected response	After step 4: The IUT sends an ICMP echo reply.
Remark	—

Table 87 specifies the CTC_IPv4_REASSEMBLY_06 – Ensure that the IUT does not reassemble fragments of an IP datagram if no first fragment is sent.

Table 87 — CTC_IPv4_REASSEMBLY_06 – Ensure that the IUT does not reassemble fragments of an IP datagram if no first fragment is sent

Item	Content
CTC # – Title	CTC_IPv4_REASSEMBLY_06 – Ensure that the IUT does not reassemble fragments of an IP datagram if no first fragment is sent
Purpose	This CTC verifies that when the IUT receives a series of IP datagrams of a large IP datagram containing an IP header; containing an offset; indicating a value different than 0 but with correct increment; then the IUT does not reassemble and accept the IP datagram.
Reference	RFC 791:1981,[5] 3.2
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 5. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.3.5.
Step	1. The LT shall send an IP datagram with MF = 1 (more fragments) and offset not equal to 0, containing an ICMP echo request where the total length is less than the MTU. 2. The LT shall send an IP datagram with MF = 0 (last fragment) and offset correctly incremented, and the ID being the same as the first fragment.
Iteration	Not applicable
Expected response	After step 2: The IUT does not send an ICMP echo reply.
Remark	—

Table 88 specifies the CTC_IPv4_REASSEMBLY_07 – Ensure that the IUT does not reassemble fragments of an IP datagram if some IP datagrams are missing.

Table 88 — CTC_IPv4_REASSEMBLY_07 – Ensure that the IUT does not reassemble fragments of an IP datagram if some IP datagrams are missing

Item	Content
CTC # – Title	CTC_IPv4_REASSEMBLY_07 – Ensure that the IUT does not reassemble fragments of an IP datagram if some IP datagrams are missing
Purpose	This CTC verifies that when the IUT receives a series of IP datagrams of a large IP datagram including the first and the last fragment but missing some in between then the IUT does not reassemble and accept the IP datagram.
Reference	RFC 791:1981,[5] 3.2
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 5. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.3.5.
Step	1. The LT shall send an IP datagram with MF = 1 (more fragments) and offset = 0, containing an ICMP echo request where the total length is less than the MTU. 2. The LT shall send an IP datagram with MF = 1 (more fragments) and offset correctly incremented, and the ID being the same as the first fragment. 3. The LT shall send an IP datagram with MF = 0 (last fragment) and offset is incremented as if one more fragment would have been sent, and the ID being the same as the first fragment.
Iteration	Not applicable
Expected response	After step 3: The IUT does not send an ICMP echo reply.
Remark	—

Table 89 specifies the CTC_IPv4_REASSEMBLY_09 – Ensure that IUT discards IP datagramMF = 1.

Table 89 — CTC_IPv4_REASSEMBLY_09 – Ensure that IUT discards IP datagramMF = 1

Item	Content
CTC # – Title	CTC # – Title CTC_IPv4_REASSEMBLY_10 – IP reassembly default time check
Purpose	This CTC verifies that when the IUT receives an IP datagram containing an IP header; containing flags; and containing an MF flag; indicating that there are more fragments coming with MF = 1; then the IUT discards the IP datagram silently.
Reference	RFC 791:1981,[5] 3.2
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 5. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.3.5.
Step	1. The LT shall send an ICMP echo request with MF = 1 (more fragments).
Iteration	Not applicable

Table 89 *(continued)*

Item	Content
Expected response	After step 1: The IUT does not send an ICMP echo reply.
Remark	—

Table 90 specifies the CTC_IPv4_REASSEMBLY_10 – IP reassembly default time check.

Table 90 — CTC_IPv4_REASSEMBLY_10 – IP reassembly default time check

Item	Content
CTC # – Title	CTC_IPv4_REASSEMBLY_10 – IP reassembly default time check
Purpose	This CTC verifies that the initial reassembly timeout value of the IUT is set to 15 s.
Reference	RFC 791:1981,[5] 3.2
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 5. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.3.5.

Table 90 *(continued)*

Item	Content
Step	1. The LT shall construct an ICMP echo request and send an IP datagram to IUT-Iface-0 containing: — source address field set to address of Host-1; — destination address field set to address of IUT; — fragment offset field set to zero; — flags field containing: — MF bit set to 1; — time-to-live field set to 15; — first half of the constructed ICMP fragment whose size is multiple of 8 octets. 2. The LT shall wait for (IP-Init-Reassemble-Timeout - ParamToleranceTime) seconds. 3. The LT shall send an IP datagram to IUT-Iface-0 containing: — source address field set to address of Host-1; — destination address field set to address of IUT; — fragment offset field set to data size sent in first IP datagram in unit of 8 octets; — flags field containing: — MF bit set to zero; — $t_{\text{Time-To-Live}}$ field set to 15 s; — last half of the constructed ICMP datagram. 4. The LT shall listen for up to $t_{\text{Listen-Time}}$ seconds on LT-Iface-0. 5. The LT shall send an IP datagram to IUT-Iface-0 containing: — source address field set to address of Host-1; — destination address field set to address of IUT; — fragment offset field set to zero; — flags field containing: — MF bit set to 1; — $t_{\text{Time-To-Live}}$ field set to 15 s; — first half of the constructed ICMP datagram which is multiple of 8 octets. 6. The LT shall wait for (IP-Init-Reassemble-Timeout + Param-Tolerance-Time) seconds. 7. The LT shall send an IP datagram to IUT-Iface-0 containing: — source address field set to address of Host-1; — destination address field set to address of IUT; — fragment offset field set to data size sent in first IP datagram in unit of 8 octets; — flags field containing: — MF bit set to zero; — $t_{\text{Time-To-Live}}$ field set to 15 s; — last half of the constructed ICMP datagram. 8. The LT shall listen for up to $t_{\text{Listen-Time}}$ seconds on LT-Iface-0.
Iteration	Not applicable

Table 90 *(continued)*

Item	Content
Expected response	After step 4: The IUT sends an ICMP echo reply. After step 4: The LT verifies that identifier, sequence number and data of the ICMP echo reply are the same as those of the ICMP echo request sent in two fragments. After step 8: The IUT does not send an ICMP echo reply.
Remark	—

Table 91 specifies the CTC_IPv4_REASSEMBLY_11 – Check fragment with large $t_{\text{Time-To-Live}}$ value.

Table 91 — CTC_IPv4_REASSEMBLY_11 – Check fragment with large $t_{\text{Time-To-Live}}$ value

Item	Content
CTC # – Title	CTC_IPv4_REASSEMBLY_11 – Check fragment with large $t_{\text{Time-To-Live}}$ value
Purpose	This CTC verifies that the IUT increases its reassembly timeout value if the LT sends an ICMP echo request datagram containing a $t_{\text{Time-To-Live}}$ field value which is set > the initial reassembly timeout value of the IUT.
Reference	RFC 791:1981,[5] 3.2
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 5. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.3.5. The initial reassembly timeout value is 15 s.
Step	1. The LT shall construct an ICMP echo request and send an IP datagram to IUT-Iface-0 containing: — source address field set to address of Host-1; — destination address field set to address of IUT; — fragment offset field set to zero; — $t_{\text{Time-To-Live}}$ field set to $t_{\text{Valid-Time-To-Live}}$ > initial reassembly timeout value of the IUT; — flags field contains MF bit set to 1; — first half of the constructed ICMP fragment which is multiple of 8 octets. 2. The LT shall wait for (IP-Init-Reassemble-Timeout + Param-Tolerance-Time) seconds. 3. The LT shall send an IP datagram to IUT-Iface-0 containing: — source address field set to address of Host-1; — destination address field set to address of IUT; — fragment offset field set to data size sent in first IP datagram in unit of 8 octets; — $t_{\text{Time-To-Live}}$ field set to $t_{\text{Valid-Time-To-Live}}$ > initial reassembly timeout value of the IUT; — flags field contains MF bit set to 0; — last half of the constructed ICMP datagram. 4. The LT shall listen for up to $t_{\text{Listen-Time}}$ seconds on LT-Iface-0.
Iteration	Not applicable

Table 91 *(continued)*

Item	Content
Expected response	After step 4: The IUT sends an ICMP echo reply. After step 4: The LT verifies that identifier, sequence number and data of the ICMP echo reply are the same as those of the ICMP echo request sent in two fragments.
Remark	—

Table 92 specifies the CTC_IPv4_REASSEMBLY_12 – Check fragment with low $t_{\text{Time-To-Live}}$ value.

Table 92 — CTC_IPv4_REASSEMBLY_12 – Check fragment with low $t_{\text{Time-To-Live}}$ value

Item	Content
CTC # – Title	CTC_IPv4_REASSEMBLY_12 – Check fragment with low $t_{\text{Time-To-Live}}$ value
Purpose	This CTC verifies that the IUT does not decrease its reassembly timeout value if the LT sends an ICMP echo request datagram containing a $t_{\text{Time-To-Live}}$ field value which is set < the initial reassembly timeout value of the IUT.
Reference	RFC 791:1981,[5] 3.2
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 5. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.3.5. The initial reassembly timeout value is 15 s.
Step	1. The LT shall construct an ICMP echo request and send an IP datagram to IUT-Iface-0 containing: — source address field set to address of Host-1; — destination address field set to address of IUT; — fragment offset field set to zero; — time to live field set to $t_{\text{Valid-Time-To-Live}}$ < initial reassembly timeout value of the IUT; — flags field contains MF bit set to 1; — first half of the constructed ICMP fragment which is multiple of 8 octets. 2. The LT shall wait for (IP-Init-Reassemble-Timeout - Param-Tolerance-Time) seconds. 3. The LT shall send an IP datagram to IUT-Iface-0 containing: — source address field set to address of Host-1; — destination address field set to address of IUT; — fragment offset field set to data size sent in first IP datagram in unit of 8 octets; — time to live field set to $t_{\text{Valid-Time-To-Live}}$ Live < initial reassembly timeout value of the IUT; — flags field contains MF bit set to 0; — last half of the constructed ICMP datagram. 4. The LT shall listen for up to $t_{\text{Listen-Time}}$ seconds on LT-Iface-0.
Iteration	Not applicable

Table 92 *(continued)*

Item	Content
Expected response	After step 4: The IUT sends an ICMP echo reply. After step 4: The LT verifies that identifier, sequence number, and data of ICMP echo reply are same as those of ICMP echo request sent in two fragments.
Remark	—

Table 93 specifies the CTC_IPv4_REASSEMBLY_13 – IP datagrams overlap check.

Table 93 — CTC_IPv4_REASSEMBLY_13 – IP datagrams overlap check

Item	Content
CTC # – Title	CTC_IPv4_REASSEMBLY_13 – IP datagrams overlap check
Purpose	This CTC verifies that in the case that two or more fragments containing the same data either identical or through a partial overlap, the IUT uses the more recently arrived copy in the data buffer and datagram delivered.
Reference	RFC 791:1981,[5] 3.2
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 5. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.3.5.

Table 93 *(continued)*

Item	Content
Step	1. The LT shall construct an ICMP echo request containing: — data field set to text string "ECU NETWORK VALIDATION TEST" Send an IP datagram to DIFACE-0 containing: — source address field set to address of Host-1; — destination address field set to address of IUT; — fragment offset field set to zero; — flags field containing: — MF bit set to 1; — first 16 octets of the constructed ICMP datagram. 2. The LT shall listen for up to 0,25 × $t_{Fragment\text{-}Reassemly\text{-}Timeout}$ seconds on LT-Iface-0. 3. The LT shall send an IP datagram to IUT-Iface-0 containing: — source address field set to address of Host-1; — destination address field set to address of IUT; — fragment offset field set to 2; — flags field containing: — MF bit set to 1; — data field set to "DUPLICATE FRAGMENTS TEST". 4. The LT shall listen for up to 0,25 × $t_{Fragment\text{-}Reassemly\text{-}Timeout}$ seconds on LT-Iface-0. 5. The LT shall send an IP datagram to IUT-Iface-0 containing: — source address field set to address of Host-1; — destination address field set to address of IUT; — fragment offset field set to 2; — flags field containing: — MF bit set to 1; — second 8 octets of the constructed ICMP datagram. 6. The LT shall listen for up to 0,25 × $t_{Fragment\text{-}Reassemly\text{-}Timeout}$ seconds on LT-Iface-0. 7. The LT shall send an IP datagram to IUT-Iface-0 containing: — source address field set to address of Host-1; — destination address field set to address of IUT; — fragment offset field set to 3; — flags field containing: — MF bit set to zero; — remaining portion of the constructed ICMP datagram. 8. The LT shall listen for up to 0,25 × $t_{Fragment\text{-}Reassemly\text{-}Timeout}$ seconds on LT-Iface-0.
Iteration	Not applicable

Table 93 *(continued)*

Item	Content
Expected response	After step 2: The IUT does not send an ICMP echo reply. After step 4: The IUT does not send an ICMP echo reply. After step 6: The IUT does not send an ICMP echo reply. After step 8: The IUT sends an ICMP echo reply. After step 8: The LT verifies that the received ICMP echo reply contains the data field set to text string "ECU NETWORK VALIDATION TEST".
Remark	—

7.4 NL – Dynamic configuration of IPv4 link local address

7.4.1 General

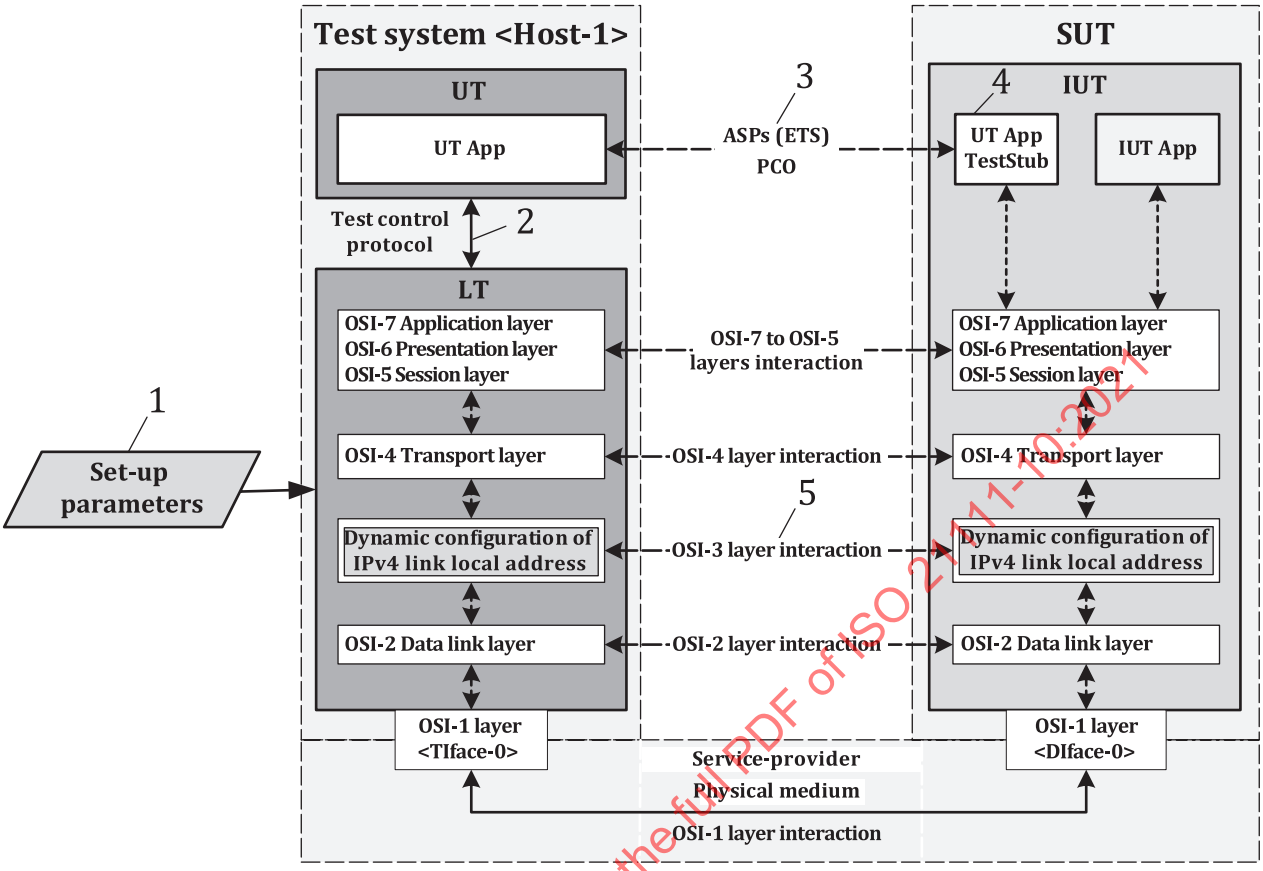
The objective of this subclause is to specify CTCs for the dynamic IPv4 address Autoconfiguration protocol (IPv4 Autoconfig).

7.4.2 Referenced specification

The RFC 3927:2005[10] specifies a dynamic configuration of IPv4 Link-Local addresses. All CTCs in 7.4 are in accordance with this RFC.

7.4.3 Test system topology – NL – Dynamic configuration of IPv4 link local address

Figure 6 shows the test system topology – NL – Dynamic configuration of IPv4 link local address.



Key

1 IUT-specific set-up parameters (electronic data sheet)
2 test control protocol
3 PCO and ASPs based on ETS
4 UT TestStub application
5 OSI layer 3 dynamic configuration of IPv4 link local address interaction

Figure 6 — Test system topology – NL – Dynamic configuration of IPv4 link local address

7.4.4 Test system topology and related CTC configuration

This test suite expects to be running against any IP enabled network interface which supports acquisitions of IP address through the following methods:

— IPv4 link local auto configuration;

— DHCP.

The following information are obtained from the unused IP network configurations on the test system Host-1:

— IP address of all the emulated servers;

— IP address pool to be offered by these emulated DHCP servers.

7.4.5 Dynamic configuration of IPv4 parameters and constants used in CTCs

Table 94 specifies the parameters and constants used in dynamic configuration of IPv4 CTCs.

Table 94 — Parameters and constants used in dynamic configuration of IPv4 CTCs

Parameter used in CTCs	Content
Server-1	This denotes 1st DHCP server simulated by the test system Host-1.
Round-Table-IP-Addr-1	This denotes IP address of 1st DHCP server simulated by test system Host-1.
Round-Table-IP-Addr-2	This denotes IP address offered to the 1st IUT interface by the 1st DHCP server.
IUT-Iface-0-IP-Link-Local-Addr	This denotes Link-local IP address of 1st IUT interface.
All-Iface-0-IP-Link-Local-Addr	This denotes Link local IP address of 1st test system Host-1 interface.
Arbitrary-IP-Link-Local-Addr	This denotes an IP Link-local address with value 169.254.10.10.
Param-Listen-Time	This is the maximum time interval for which test system Host-1 waits for a fragment for cases when a certain event has been triggered on the IUT either by some protocol timer or using some external mechanism (script).
IUT-Iface-0	This denotes 1st IUT interface.
MAC-Addr-1	This value indicates the MAC address of the LT.
IUT-Iface-0-MAC-Addr	This is the MAC address of 1st IUT interface.
Link-Local-Net-Addr	This denotes the Link local network ID, i.e. 169.254.0.0 .
t_{Probe_Min}	This indicates the value of PROBE_MIN constant specified in RFC 3927:2005,[10] page 26, in milliseconds, i.e. the value is 1 000 ms.
t_{Probe_Max}	This indicates the value of PROBE_MAX constant specified in RFC 3927:2005,[10] page 26, in milliseconds, i.e. the value is 2 000 ms.
$t_{Announce\_Wait}$	This indicates the value of ANNOUNCE_WAIT constant specified in RFC 3927:2005,[10] page 26, i.e. the value is 2 s.
$t_{Announce\_Interval}$	This indicates the value of ANNOUNCE_INTERVAL constant specified in RFC 3927:2005,[10] page 26, i.e. the value is 2 s.
$t_{Rate\_Limit\_Interval}$	This indicates the value of RATE_LIMIT_INTERVAL constant specified in RFC 3927:2005,[10] page 26, i.e. the value is 60 s.
$t_{Defend\_Interval}$	This indicates the value of DEFEND_INTERVAL constant specified in RFC 3927:2005,[10] page 26, i.e. the value is 10 s.
Eth-Broadcast-Addr	This indicates the Ethernet Broadcast address. This value is equal to FF:FF:FF:FF:FF:FF.
Null-MAC-Addr	This indicates a MAC address with value 00:00:00:00:00:00.
DHCP-IP-Addr-Lease-Time	Default value: adjustable Indicates the duration of an active DHCP connection.
IUT-Iface-0	Default value: depends on IUT implementation. Connected IUT Ethernet interface.
IUT-Iface-0-MAC-Addr	Default value: IUT MAC Addreess. Indicates the duration of an active DHCP connection.

7.4.6 IPv4 autoconf CTCs

7.4.6.1 CTC_IPv4_AUTOCONF_INTRO – Configurability condition

Table 95 specifies the CTC_IPv4_AUTOCONF_INTRO_01 – Link local address configurability condition (in presence of operable routable address) test case.

Table 95 — CTC_IPv4_AUTOCONF_INTRO_01 – Link local address configurability condition (in presence of operable routable address)

Item	Content
CTC # – Title	CTC_IPv4_AUTOCONF_INTRO_01 – Link local address configurability condition (in presence of operable routable address)

Table 95 *(continued)*

Item	Content
Purpose	This CTC verifies that when an operable routable address is available in an interface, the IUT should not assign an IPv4 link-local address on that interface.
Reference	RFC 3927:2005,[10] 1.9
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 6. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.4.5.
Step	1. The UT shall configure the IUT DHCP client on IUT-Iface-0. 2. The UT shall cause the IUT to bring up IUT-Iface-0. 3. The LT Server-1 shall listen up to Param-Listen-Time on IUT-Iface-0. 4. The LT Server-1 shall send a DHCPOFFER message to IUT through IUT-Iface-0 containing: — source IP address set to Round-Table-IP-Addr-1; — 'yiaddr' field set to Round-Table-IP-Addr-2; — message option containing: — type field set to DHCP-IP-ADDR-LEASE-TIME; — length field set to 4; — value set to PARAM_LISTEN_TIME × 3. 5. The LT Server-1 shall listen up to Param-Listen-Time on IUT-Iface-0. 6. The LT Server-1 shall send DHCPACK message to IUT through IUT-Iface-0 containing: — source IP address set to Round-Table-IP-Addr-1; — 'yiaddr' field set to Round-Table-IP-Addr-2; — message option containing: — type field set to DHCP-IP-ADDR-LEASE-TIME; — length field set to 4; — value set to PARAM_LISTEN_TIME × 3. 7. The LT Server-1 shall listen up to Param-Listen-Time on IUT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr.
Iteration	Not applicable
Expected response	After step 3: The IUT sends a DHCPDISCOVER message. After step 5: The IUT sends a DHCPREQUEST message. After step 7: The IUT does not send an ARP request message.
Remark	—

7.4.6.2 CTC_IPv4_AUTOCONF_ADDRESS_SELECTION – Address selection, defence and delivery

Table 96 specifies the CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_01 – Future use of first 256 and last 256 addresses in the 169.254/16 prefix test case.

Table 96 — CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_01 – Future use of first 256 and last 256 addresses in the 169.254/16 prefix

Item	Content
CTC # – Title	CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_01 – Future use of first 256 and last 256 addresses in the 169.254/16 prefix
Purpose	This CTC verifies that the first 256 and last 256 addresses in the 169.254/16 prefix are reserved for future use and are not selected by the IUT using this dynamic configuration mechanism.
Reference	RFC 3927:2005, 2.1;
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 6. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.4.5.
Step	1. The UT shall configure the IUT DHCP client on IUT-Iface-0. 2. The UT shall cause the IUT to bring up IUT-Iface-0. 3. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0. 4. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr.
Iteration	Not applicable
Expected response	After step 3: The IUT sends a DHCPDISCOVER message. After step 4: The IUT sends an ARP request message. After step 4: The LT verifies that received ARP request message contains: — target IP address greater than 169.254.0.255; — target IP address less than or equal to 169.254.254.255.
Remark	—

Table 97 specifies the CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_03 – Need for probing to detect address already in use.

Table 97 — CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_03 – Need for probing to detect address already in use

Item	Content
CTC # – Title	CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_03 – Need for probing to detect address already in use.
Purpose	This CTC verifies that an IUT probes to see if an address is already in use by broadcasting an ARP request for the desired address. This is an ARP probe request.
Reference	RFC 3927:2005,[10] 2.2.1
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 6. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.4.5.

Table 97 *(continued)*

Item	Content
Step	1. The UT shall configure the IUT DHCP client on IUT-Iface-0. 2. The UT shall cause the IUT to bring up IUT-Iface-0. 3. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0. 4. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr.
Iteration	Not applicable
Expected response	After step 3: The IUT sends a DHCPDISCOVER message. After step 4: The IUT sends an ARP request message. After step 4: The LT verifies that the received ARP request message contains the Ethernet destination hardware address which is set to Eth-Broadcast-Addr.
Remark	—

Table 98 specifies the CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_05 – Sender hardware address field usage.

Table 98 — CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_05 – Sender hardware address field usage

Item	Content
CTC # – Title	CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_05 – Sender hardware address field usage
Purpose	This CTC verifies that the client fills in the sender hardware address field of the ARP request with the hardware address of the interface through which it is sending the packet. This holds true for all kinds of ARP frames: request, response, probe.
Reference	RFC 3927:2005,[10] 2.2.1
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 6. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.4.5.
Step	1. The UT shall configure the IUT DHCP client on IUT-Iface-0. 2. The UT shall cause the IUT to bring up IUT-Iface-0. 3. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0. 4. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr.
Iteration	Not applicable
Expected response	After step 3: The IUT sends a DHCPDISCOVER message. After step 4: The IUT sends an ARP request message. After step 4: The LT verifies that received ARP request message contains the source hardware address which is set to IUT-Iface-0-MAC-Addr.
Remark	—

Table 99 specifies the CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_06 – Sender IP address setting.

Table 99 — CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_06 – Sender IP address setting

Item	Content
CTC # – Title	CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_06 – Sender IP address setting
Purpose	This CTC verifies that the sender IP address field is set to all zeroes. This is testing for the ARP probe frame.
Reference	RFC 3927:2005,[10] 2.2.1
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 6. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.4.5.
Step	1. The UT shall configure the IUT DHCP client on IUT-Iface-0. 2. The UT shall cause the IUT to bring up IUT-Iface-0. 3. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0. 4. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr.
Iteration	Not applicable
Expected response	After step 3: The IUT sends a DHCPDISCOVER message. After step 4: The IUT sends an ARP request message. After step 4: The LT verifies that received ARP request message contains the sender IP address which is set to 0.0.0.0.
Remark	—

Table 100 specifies the CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_07 – Target hardware address setting and receive check.

Table 100 — CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_07 – Target hardware address setting and receive check

Item	Content
CTC # – Title	CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_07 – Target hardware address setting and receive check
Purpose	This CTC verifies that the target hardware address field is ignored and should be set to all zeroes.
Reference	RFC 3927:2005,[10] 2.2.1
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 6. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.4.5.
Step	1. The UT shall configure the IUT DHCP client on IUT-Iface-0. 2. The UT shall cause the IUT to bring up IUT-Iface-0. 3. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0. 4. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr.
Iteration	Not applicable

Table 100 *(continued)*

Item	Content
Expected response	After step 3: The IUT sends a DHCPDISCOVER message. After step 4: The IUT sends an ARP request message. After step 4: The LT verifies that received ARP request message contains the target hardware address which is set to Null-MAC-Addr.
Remark	—

Table 101 specifies the CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_08 – Target IP address field setting.

Table 101 — CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_08 – Target IP address field setting

Item	Content
CTC # – Title	CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_08 – Target IP address field setting
Purpose	This CTC verifies that the target IP address field is set to the address being probed.
Reference	RFC 3927:2005,[10] 2.2.1
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 6. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.4.5.
Step	1. The UT shall configure the IUT DHCP client on IUT-Iface-0. 2. The UT shall cause the IUT to bring up IUT-Iface-0. 3. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0. 4. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr.
Iteration	Not applicable
Expected response	After step 3: The IUT sends a DHCPDISCOVER message. After step 4: The IUT sends an ARP request message.
Remark	—

Table 102 specifies the CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_09 – Probing time interval and packet count I.

Table 102 — CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_09 – Probing time interval and packet count I

Item	Content
CTC # – Title	CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_09 – Probing time interval and packet count I
Purpose	This CTC verifies that the number of ARP probes sent from the IUT in the probing phase is equal to PROBE_NUM.
Reference	RFC 3927:2005,[10] 2.2.1
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 6. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.4.5.

Table 102 *(continued)*

Item	Content
Step	1. The UT shall configure the IUT DHCP client on IUT-Iface-0. 2. The UT shall cause the IUT to bring up IUT-Iface-0. 3. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0. 4. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — source IP address set to 0.0.0.0; — expected network address of target IP address set to Link-Local-Net-Addr.
Iteration	Not applicable
Expected response	After step 3: The IUT sends a DHCPDISCOVER message. After step 4: The IUT sends three ARP request messages.
Remark	—

Table 103 specifies the CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_10 – Probing time interval and packet count II.

Table 103 — CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_10 – Probing time interval and packet count II

Item	Content
CTC # – Title	CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_10 – Probing time interval and packet count II
Purpose	This CTC verifies that the intervals of the ARP probes sent by the IUT in the probing phase stay wihinh the range t_{Probe_Min} to t_{Probe_Max} ± 50 ms.
Reference	RFC 3927:2005,[10] 2.2.1
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 6. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.4.5.
Step	1. The UT shall configure the IUT DHCP client on IUT-Iface-0. 2. The UT shall cause the IUT to bring up IUT-Iface-0. 3. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0. 4. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr.
Iteration	Not applicable
Expected response	After step 3: The IUT sends a DHCPDISCOVER message. After step 4: The IUT sends three ARP request messages. After step 4: The UT verifies that the time interval between reception of last two ARP requests is greater than (t_{Probe_Min} – 50) ms. After step 4: The UT verifies that the time interval between reception of last two ARP requests is less than (t_{Probe_Max} + 50) ms. After step 4: The UT verifies that the time interval between reception of the first ARP request and second last ARP request is greater than (t_{Probe_Min} – 50) ms. After step 4: The UT verifies that the time interval between reception of the first ARP request and second last ARP request is less than (t_{Probe_Max} + 50) ms.

Table 103 *(continued)*

Item	Content
Remark	—

Table 104 specifies the CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_11 – Probing and reception of ARP packet I.

Table 104 — CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_11 – Probing and reception of ARP packet I

Item	Content
CTC # – Title	CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_11 – Probing and reception of ARP packet I
Purpose	This CTC verifies that if the LT sends a conflicting ARP request with the sender IP address equal to the link-local IP address of the IUT's probed address, the IUT sends another ARP probe with a different link-local probe address.
Reference	RFC 3927:2005,[10] 2.2.1
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 6. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.4.5.
Step	1. The UT shall configure the IUT DHCP client on IUT-Iface-0. 2. The UT shall cause the IUT to bring up IUT-Iface-0. 3. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0. 4. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr. 5. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr. 6. The LT Server-1 shall send ARP request message to IUT through IUT-Iface-0 containing: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to 255.255.255.255. 7. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr.
.Iteration	Not applicable
Expected response	After step 3: The IUT sends a DHCPDISCOVER message. After step 4: The IUT sends three ARP request messages. After step 7: The IUT sends an ARP request message. After step 7: The UT verifies that received ARP request message contains the target IP address that is not set to IUT-Iface-0-IP-Link-Local-Addr.
Remark	—

Table 105 specifies the — CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_12 – Probing and reception of ARP packet II.

Table 105 — CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_12 – Probing and reception of ARP packet II

Item	Content
CTC # – Title	CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_12 – Probing and reception of ARP packet II
Purpose	This CTC verifies that if the LT sends a conflicting ARP response with the sender IP address equal to the link-local IP address of the IUT's probed address, the IUT sends another ARP probe with a different link-local probe address.
Reference	RFC 3927:2005,[10] 2.2.1
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 6. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.4.5.
Step	1. The UT shall configure the IUT DHCP client on IUT-Iface-0. 2. The UT shall cause the IUT to bring up IUT-Iface-0. 3. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0. 4. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr. 6. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr. 7. The LT Server-1 shall send ARP response message to IUT through IUT-Iface-0 containing: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to 255.255.255.255. 8. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr.
Iteration	Not applicable
Expected response	After step 3: The IUT sends a DHCPDISCOVER message. After step 4: The IUT sends three ARP request messages. After step 8: The IUT sends an ARP request message. After step 8: The UT verifies that the received ARP request message contains the target IP address that is not set to IUT-Iface-0-IP-Link-Local-Addr.
Remark	—

Table 106 specifies the CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_13 – Probing and reception of ARP packet III.

Table 106 — CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_13 – Probing and reception of ARP packet III

Item	Content
CTC # – Title	CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_13 – Probing and reception of ARP packet III
Purpose	This CTC verifies that if the IUT receives any ARP probe target IP address is set to IUT-Iface-0-IP-Link-Local-Addr, then the IUT treats this as an address conflict and selects a new address.
Reference	RFC 3927:2005,[10] 2.2.1

Table 106 *(continued)*

Item	Content
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 6. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.4.5.
Step	1. The UT shall configure the IUT DHCP client on IUT-Iface-0. 2. The UT shall cause the IUT to bring up IUT-Iface-0. 3. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0. 4. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr. 5. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr. 6. The LT Server-1 shall send ARP request to IUT through IUT-Iface-0 containing: — sender IP address set to 0.0.0.0; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr. 7. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr.
Iteration	Not applicable
Expected response	After step 3: The IUT sends a DHCPDISCOVER message. After step 4: The IUT sends three ARP request messages. After step 7: The IUT sends an ARP request message. After step 7: The UT verifies that the received ARP request message contains the target IP address that is not set to IUT-Iface-0-IP-Link-Local-Addr.
Remark	—

Table 107 specifies the CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_14 – Conflict resolution I.

Table 107 — CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_14 – Conflict resolution I

Item	Content
CTC # – Title	CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_14 – Conflict resolution I
Purpose	This CTC verifies that if the number of conflicts exceeds MAX_CONFLICTS then the IUT limits the rate at which it probes for new addresses and does not probe for an new address within $t_{\texttt{Rate Limit Interval}}$.
Reference	RFC 3927:2005,[10] 2.2.1
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 6. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.4.5.

Table 107 *(continued)*

Item	Content
Step	1. The UT shall configure the IUT DHCP client on IUT-Iface-0. 2. The UT shall cause the IUT to bring up IUT-Iface-0. 3. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0. 4. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr. 5. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr. 6. The LT Server-1 shall send ARP request message to IUT through IUT-Iface-0 containing: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr. 7. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr. 8. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr. 9. The LT Server-1 shall send ARP request message to IUT through IUT-Iface-0 containing: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr. 10. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr. 11. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr. 12. The LT Server-1 shall send ARP request message to IUT through IUT-Iface-0 containing: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr. 13. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr. 14. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr. 15. The LT Server-1 shall send ARP request message to IUT through IUT-Iface-0 containing: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr.

Table 107 *(continued)*

Item	Content
	16. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr. 17. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr. 18. The LT Server-1 shall send ARP request message to IUT through IUT-Iface-0 containing: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr. 19. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr. 20. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr. 21. The LT Server-1 shall send ARP request message to IUT through IUT-Iface-0 containing: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr. 22. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 — expected network address of target IP address set to Link-Local-Net-Addr. 23. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr. 24. The LT Server-1 shall send ARP request message to IUT through IUT-Iface-0 containing: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr. 25. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr. 26. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr. 27. The LT Server-1 shall send ARP request message to IUT through IUT-Iface-0 containing: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr. 28. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr. 29. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr.

Table 107 *(continued)*

Item	Content
	30. The LT Server-1 shall send ARP request message to IUT through IUT-Iface-0 containing: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr. 31. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr. 32. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr. 33. The LT Server-1 shall send ARP request message to IUT through IUT-Iface-0 containing: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — targer IP address set to IUT-Iface-0-IP-Link-Local-Addr. 34. The LT Server-1 shall listen up to $t_{Rate\_Limit\_Interval}$ seconds on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr.
Iteration	Not applicable
Expected response	After step 3: The IUT sends a DHCPDISCOVER message. After step 4: The IUT sends three ARP request messages. After step 7: The IUT sends an ARP request message. After step 7: The UT verifies that the received ARP request message contains the target IP address that is not set to IUT-Iface-0-IP-Link-Local-Addr. After step 10: The IUT sends an ARP request message. After step 10: The UT verifies that received ARP request message contains the target IP address that is not set to IUT-Iface-0-IP-Link-Local-Addr. After step 13: The IUT sends an ARP request message.

Table 107 *(continued)*

Item	Content
	After step 13: The UT verifies that received ARP request message contains the target IP address that is not set to IUT-Iface-0-IP-Link-Local-Addr. After step 16: The IUT sends an ARP request message. After step 16: The UT verifies that received ARP request message contains the target IP address that is not set to IUT-Iface-0-IP-Link-Local-Addr. After step 19: The IUT sends an ARP request message. After step 19: The UT verifies that received ARP request message contains the target IP address that is not set to IUT-Iface-0-IP-Link-Local-Addr. After step 22: The IUT sends an ARP request message After step 22: The UT verifies that received ARP request message contains the target IP address that is not set to IUT-Iface-0-IP-Link-Local-Addr After step 25: The IUT sends an ARP request message. After step 25: The UT verifies that received ARP request message contains the target IP address that is not set to IUT-Iface-0-IP-Link-Local-Addr. After step 28: The IUT sends an ARP request message. After step 28: The UT verifies that received ARP request message contains the target IP address that is not set to IUT-Iface-0-IP-Link-Local-Addr. After step 31: The IUT sends an ARP request message. After step 31: The UT verifies that received ARP request message contains the target IP address that is not set to IUT-Iface-0-IP-Link-Local-Addr. After step 34: The IUT does not send ARP request message.
Remark	—

Table 108 specifies the CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_15 – Conflict resolution II.

Table 108 — CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_15 – Conflict resolution II

Item	Content
CTC # – Title	CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_15 – Conflict resolution II
Purpose	This CTC verifies that if the number of conflicts exceeds MAX_CONFLICTS then the IUT limits the rate at which it probes for new addresses and sends only one ARP probe after $t_{\texttt{Rate\_Limit\_Interval}}$ has elapsed within the next $t_{\texttt{Rate\_Limit\_Interval}}$ seconds.
Reference	RFC 3927:2005, 2.2.1;
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 6. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.4.5.
Step	1. The UT shall configure the IUT DHCP client on IUT-Iface-0. 2. The UT shall cause the IUT to bring up IUT-Iface-0. 3. The LT Server-1 shall listen (up to Param-Listen-Time) on LT-Iface-0. 4. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr. 5. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr.

Table 108 *(continued)*

Item	Content
	6. The LT Server-1 shall send ARP request message to IUT through IUT-Iface-0 containing: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr. 7. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr. 8. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr. 9. The LT Server-1 shall send ARP request message to IUT through IUT-Iface-0 containing: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr. 10. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr. 11. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr. 12. The LT Server-1 shall send ARP request message to IUT through IUT-Iface-0 containing: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr. 13. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr. 14. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr. 15. The LT Server-1 shall send ARP request message to IUT through IUT-Iface-0 containing: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr.

Table 108 *(continued)*

Item	Content
	16. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr. 17. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr. 18. The LT Server-1 shall send ARP request message to IUT through IUT-Iface-0 containing: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr. 19. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr. 20. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr. 21. The LT Server-1 shall send ARP request message to IUT through IUT-Iface-0 containing: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr. 22. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr.

Table 108 *(continued)*

Item	Content
	23. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr. 24. The LT Server-1 shall send ARP request message to IUT through IUT-Iface-0 containing: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr. 25. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr. 26. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr. 27. The LT Server-1 shall send ARP request message to IUT through IUT-Iface-0 containing: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr. 28. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr. 29. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr. 30. The LT Server-1 shall send ARP request message to IUT through IUT-Iface-0 containing: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr. 31. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr.

Table 108 *(continued)*

Item	Content
	32. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr. 33. The LT Server-1 shall send ARP request message to IUT through IUT-Iface-0 containing: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr. 34. The LT Server-1 shall listen (up to $t_{Rate\_Limit\_Interval}$ second) on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr. 35. The LT Server-1 shall listen (up to $t_{Rate\_Limit\_Interval}$ second) on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr. 36. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr. 37. The LT Server-1 shall send ARP request message to IUT through IUT-Iface-0 containing: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr. 38. The LT Server-1 shall listen (up to $t_{Rate\_Limit\_Interval}$ second) on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr.
Iteration	Not applicable
Expected response	After step 3. The IUT sends a DHCPDISCOVER message. After step 4. The IUT sends three ARP request messages. After step 7. The IUT sends an ARP request message. After step 7. The UT verifies that the received ARP request message contains the target IP address that is not set to IUT-Iface-0-IP-Link-Local-Addr. After step 10. The IUT sends an ARP request message. After step 10. The UT verifies that the received ARP request message contains the target IP address that is not set to IUT-Iface-0-IP-Link-Local-Addr. After step 13. The IUT sends an ARP request message. After step 13. The UT verifies that the received ARP request message contains the target IP address that is not set to IUT-Iface-0-IP-Link-Local-Addr.

Table 108 *(continued)*

Item	Content
	After step 16. The IUT sends an ARP request message. After step 16. The UT verifies that the received ARP request message contains the target IP address that is not set to IUT-Iface-0-IP-Link-Local-Addr. After step 19. The IUT sends an ARP request message. After step 19. The UT verifies that the received ARP request message contains the target IP address that is not set to IUT-Iface-0-IP-Link-Local-Addr. After step 22. The IUT sends an ARP request message. After step 22. The UT verifies that the received ARP request message contains the target IP address that is not set to IUT-Iface-0-IP-Link-Local-Addr. After step 25. The IUT sends an ARP request message. After step 25. The UT verifies that the received ARP request message contains the target IP address that is not set to IUT-Iface-0-IP-Link-Local-Addr. After step 28. The IUT sends an ARP request message. After step 28. The UT verifies that the received ARP request message contains the target IP address that is not set to IUT-Iface-0-IP-Link-Local-Addr. After step 31. The IUT sends an ARP request message. After step 31. The UT verifies that the received ARP request message contains the target IP address that is not set to IUT-Iface-0-IP-Link-Local-Addr. After step 34. The IUT does not send ARP request message. After step 35. The IUT sends an ARP request message. After step 35. The UT verifies that the received ARP request message contains the target IP address that is not set to IUT-Iface-0-IP-Link-Local-Addr. After step 38. The IUT does not send ARP request message.
Remark	—

Table 109 specifies the CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_16 – IPv4 Link-Local address claim condition – I.

Table 109 — CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_16 – IPv4 Link-Local address claim condition – I

Item	Content
CTC # – Title	CTC_IPv4_AUTOCONF_ADDRESS_SELECTION_16 – IPv4 Link-Local address claim condition – I
Purpose	This CTC verifies that if the IUT does not receive any conflicting ARP reply or ARP probe within ANNOUNCE_WAIT seconds after the IUT has sent its last ARP probe, then IUT has successfully claimed the desired IPv4 Link-Local address.
Reference	RFC 3927:2005,[10] 2.2.1
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 6. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.4.5.

Table 109 *(continued)*

Item	Content
Step	1. The UT shall configure the IUT DHCP client on IUT-Iface-0. 2. The UT shall cause the IUT to bring up IUT-Iface-0. 3. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0. 4. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr. 5. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr . 6. The LT shall wait till $t_{Announce\_Wait}$ for IUT to assign the link-local address to IUT-Iface-0. 7. The LT Server-1 shall send ARP request message to IUT through IUT-Iface-0 containing: — sender IP address set to All-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr; — sender hardware address set to MAC-Addr-1. 8. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to All-Iface-0-IP-Link-Local-Addr.
Iteration	Not applicable
Expected response	After step 3: The IUT sends a DHCPDISCOVER message. After step 4: The IUT sends three ARP request messages. After step 8: The IUT sends an ARP response message.
Remark	—

7.4.6.3 CTC_IPv4_AUTOCONF_ANNOUNCING – Announcing an address

Table 110 specifies the CTC_IPv4_AUTOCONF_ANNOUNCING_01 – An ARP announcement I test case.

Table 110 — CTC_IPv4_AUTOCONF_ANNOUNCING_01 – An ARP announcement I

Item	Content
CTC # – Title	CTC_IPv4_AUTOCONF_ANNOUNCING_01 – An ARP announcement I
Purpose	This CTC verifies that ANNOUNCE_WAIT seconds after the IUT has sent its last ARP probe, the IUT sends an ARP announcement with Ethernet destination hardware address set to Eth-Broadcast-Addr.
Reference	RFC 3927:2005,[10] 2.4
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 6. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.4.5.

Table 110 *(continued)*

Item	Content
Step	1. The UT shall configure the IUT DHCP client on IUT-Iface-0. 2. The UT shall cause the IUT to bring up IUT-Iface-0. 3. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0. 4. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 (expected network address of target IP address shall be set to Link-Local-Net-Addr). 5. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr. 6. The LT shall wait till $t_{Announce\_Wait}$ - 0,05 ms i.e. the delay time before IUT sends the ARP announcement message. 7. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr.
Iteration	Not applicable
Expected response	After step 3: The IUT sends a DHCPDISCOVER message. After step 4: The IUT sends three ARP request messages. After step 7: The IUT sends an ARP request message. After step 7: The UT verifies that received ARP request message contains the Ethernet destination hardware address which is set to Eth-Broadcast-Addr.
Remark	—

Table 111 specifies the CTC_IPv4_AUTOCONF_ANNOUNCING_02 – An ARP announcement II.

Table 111 — CTC_IPv4_AUTOCONF_ANNOUNCING_02 – An ARP announcement II

Item	Content
CTC # – Title	CTC_IPv4_AUTOCONF_ANNOUNCING_02 – An ARP announcement II
Purpose	This CTC verifies that ANNOUNCE_WAIT seconds after the IUT has sent its last ARP probe, the IUT sends an ARP announcement where sender and target IP addresses are both set to the IUT's newly selected IPv4 address.
Reference	RFC 3927:2005,[10] 2.4
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 6. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.4.5.

Table 111 *(continued)*

Item	Content
Step	1. The UT shall configure the IUT DHCP client on IUT-Iface-0. 2. The UT shall cause the IUT to bring up IUT-Iface-0. 3. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0. 4. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr. 5. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr. 6. The LT shall wait till $t_{Announce\_Wait}$ - 0,05 ms for IUT to send ARP announcement message. 7. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr.
Iteration	Not applicable
Expected response	After step 3: The IUT sends a DHCPDISCOVER message. After step 4: The IUT sends three ARP request messages. After step 7: The IUT sends an ARP request message. After step 7: The UT verifies that received ARP request message contains: — target IP address set to IUT-Iface-0-IP-Link-Local-Addr; — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr.
Remark	—

Table 112 specifies the CTC_IPv4_AUTOCONF_ANNOUNCING_03 – An ARP announcement III.

Table 112 — CTC_IPv4_AUTOCONF_ANNOUNCING_03 – An ARP announcement III

Item	Content
CTC # – Title	CTC_IPv4_AUTOCONF_ANNOUNCING_03 – An ARP announcement III
Purpose	This CTC verifies that ANNOUNCE_WAIT seconds after the IUT has sent its last ARP probe, the IUT sends an ARP announcement with sender hardware address set to the IUT interface MAC address.
Reference	RFC 3927:2005,[10] 2.4
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 6. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.4.5.

Table 112 *(continued)*

Item	Content
Step	1. The UT shall configure the IUT DHCP client on IUT-Iface-0. 2. The UT shall cause the IUT to bring up IUT-Iface-0. 3. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0. 4. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr. 5. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr. 6. The LT shall wait till $t_{Announce\_Wait}$ - 0,05 ms for IUT to send ARP announcement message. 7. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr.
Iteration	Not applicable
Expected response	After step 3: The IUT sends a DHCPDISCOVER message. After step 4: The IUT sends three ARP request messages. After step 7: The IUT sends an ARP request message. After step 7: The UT verifies that received ARP request message contains the sender hardware address which is set to IUT-Iface-0-MAC-Addr.
Remark	—

Table 113 specifies the CTC_IPv4_AUTOCONF_ANNOUNCING_04 – An ARP announcement IV.

Table 113 — CTC_IPv4_AUTOCONF_ANNOUNCING_04 – An ARP announcement IV

Item	Content
CTC # – Title	CTC_IPv4_AUTOCONF_ANNOUNCING_04 – An ARP announcement IV
Purpose	This CTC verifies that ANNOUNCE_WAIT seconds after the IUT has sent its last ARP probe, the IUT sends an ARP announcement with target hardware address set to all zeroes.
Reference	RFC 3927:2005,[10] 2.4
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 6. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.4.5.

Table 113 *(continued)*

Item	Content
Step	1. The UT shall configure the IUT DHCP client on IUT-Iface-0. 2. The UT shall cause the IUT to bring up IUT-Iface-0. 3. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0. 4. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr. 5. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr. 6. The LT shall wait till $t_{Announce\_Wait}$ - 0,05 ms for IUT to send ARP announcement message. 7. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr.
Iteration	Not applicable
Expected response	After step 3: The IUT sends a DHCPDISCOVER message. After step 4: The IUT sends three ARP request messages. After step 7: The IUT sends an ARP request message. After step 7: The UT verifies that received ARP request message contains the target hardware address which is set to Null-MAC-Addr.
Remark	—

Table 114 specifies the CTC_IPv4_AUTOCONF_ANNOUNCING_05 – Announcing claimed address.

Table 114 — CTC_IPv4_AUTOCONF_ANNOUNCING_05 – Announcing claimed address

Item	Content
CTC # – Title	CTC_IPv4_AUTOCONF_ANNOUNCING_05 – Announcing claimed address
Purpose	This CTC verifies that when the IUT has successfully claimed an IP address it then announces its claimed address by broadcasting ANNOUNCE_NUM ARP announcements.
Reference	RFC 3927:2005,[10] 2.4
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 6. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.4.5.

Table 114 *(continued)*

Item	Content
Step	1. The UT shall configure the IUT DHCP client on IUT-Iface-0. 2. The UT shall cause the IUT to bring up IUT-Iface-0. 3. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0. 4. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr. 5. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr. 6. The LT shall wait till $t_{Announce\_Wait}$ - 0,05 ms for IUT to send ARP announcement message. 7. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr.
Iteration	Not applicable
Expected response	After step 3: The IUT sends a DHCPDISCOVER message. After step 4: The IUT sends three ARP request messages. After step 7: The IUT sends two ARP announcement messages.
Remark	—

Table 115 specifies the CTC_IPv4_AUTOCONF_ANNOUNCING_06 – Announcing claimed address (interval and packet count).

Table 115 — CTC_IPv4_AUTOCONF_ANNOUNCING_06 – Announcing claimed address (interval and packet count)

Item	Content
CTC # – Title	CTC_IPv4_AUTOCONF_ANNOUNCING_06 – Announcing claimed address (interval and packet count)
Purpose	This CTC verifies that when the IUT has successfully claimed an IP address it then announces its claimed address by broadcasting ANNOUNCE_NUM ARP announcements with $t_{Announce\_Interval}$ as interval time.
Reference	RFC 3927:2005,[10] 2.4
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 6. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.4.5.

Table 115 *(continued)*

Item	Content
Step	1. The UT shall configure the IUT DHCP client on IUT-Iface-0. 2. The UT shall cause the IUT to bring up IUT-Iface-0. 3. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0. 4. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr. 5. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr. 6. The LT shall wait till $t_{Announce\_Wait}$ - 0,05 ms for IUT to send ARP announcement message. 7. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr.
Iteration	Not applicable
Expected response	After step 3. The IUT sends a DHCPDISCOVER message. After step 4: The IUT sends three ARP request messages. After step 7: The IUT sends two ARP announcement messages. After step 7: The UT verifies that the time interval between reception of last two ARP requests is greater than $t_{Announce\_Interval}$ – 50 ms. After step 7: The UT verifies that the time interval between reception of last two ARP requests is less than $t_{Announce\_Interval}$ + 50 ms.
Remark	—

7.4.6.4 CTC_IPv4_AUTOCONF_CONFLICTC – Conflict detection and defense

Table 116 specifies the CTC_IPv4_AUTOCONF_CONFLICTC_06 – Link local address (usage cease condition I) test case.

Table 116 — CTC_IPv4_AUTOCONF_CONFLICTC_06 – Link local address (usage cease condition I)

Item	Content
CTC # – Title	CTC_IPv4_AUTOCONF_CONFLICTC_06 – Link local address (usage cease condition I)
Purpose	This CTC verifies that if the LT sends two conflicting ARP requests within $t_{Defend\_Interval}$ seconds, then the IUT probes with a new link local address.
Reference	RFC 3927:2005,[10] 2.5
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 6. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.4.5.

Table 116 *(continued)*

Item	Content
Step	1. The UT shall configure the IUT DHCP client on IUT-Iface-0. 2. The UT shall cause the IUT to bring up IUT-Iface-0. 3. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0. 4. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr. 5. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr. 6. The LT shall wait till $t_{Announce\_Wait}$ + $t_{Announce\_Interval}$ for IUT to assign the link-local address to IUT-Iface-0. 7. The LT Server-1 shall send ARP request message to IUT through IUT-Iface-0 containing: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr. 8. The LT shall wait until 0,5 × $t_{Defend\_Interval}$ before sending the next conflicting packet to IUT-Iface-0. 9. The LT Server-1 shall send ARP request message to IUT through LT-Iface-0 containing: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr. 10. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr; — target IP address that is not set to IUT-Iface-0-IP-Link-Local-Addr.
Iteration	Not applicable
Expected response	After step 3: The IUT sends a DHCPDISCOVER message. After step 4: The IUT sends three ARP request messages. After step 10: The IUT sends an ARP request message. After step 10: The UT verifies that a received ARP request message contains the target IP address that is not set to IUT-Iface-0-IP-Link-Local-Addr.
Remark	—

Table 117 specifies the CTC_IPv4_AUTOCONF_CONFLICTC_07 – Link local address (usage cease condition II).

Table 117 — CTC_IPv4_AUTOCONF_CONFLICTC_07 – Link local address (usage cease condition II)

Item	Content
CTC # – Title	CTC_IPv4_AUTOCONF_CONFLICTC_07 – Link local address (usage cease condition II)
Purpose	This CTC verifies that if the LT sends two conflicting ARP responses within $t_{Defend\_Interval}$ seconds, then the IUT probes with a new link local address.
Reference	RFC 3927:2005,[10] 2.5
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.

Table 117 *(continued)*

Item	Content
Set-up	The test system set-up shall be in accordance with Figure 6. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.4.5.
Step	1. The UT shall configure the IUT DHCP client on IUT-Iface-0. 2. The UT shall cause the IUT to bring up IUT-Iface-0. 3. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0. 4. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr. 5. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr. 6. The LT shall wait till $t_{Announce\_Wait}$ + $t_{Announce\_Interval}$ for IUT to assign the link-local address to IUT-Iface-0. 7. The LT Server-1 shall send ARP response message to IUT through LT-Iface-0 containing: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr. 8. The LT shall wait till 0,5 × $t_{Defend\_Interval}$ before sending the next conflicting packet to LT-Iface-0. 9. The LT Server-1 shall send ARP response message to IUT through IUT-Iface-0 containing: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr. 10. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr.
Iteration	Not applicable
Expected response	After step 3: The IUT sends a DHCPDISCOVER message. After step 4: The IUT sends three ARP request messages. After step 10: The IUT sends an ARP request message. After step 10: The UT verifies that a received ARP request message contains the target IP address that is not set to IUT-Iface-0-IP-Link-Local-Addr.
Remark	—

Table 118 specifies the CTC_IPv4_AUTOCONF_CONFLICTC_08 – Link local address (usage cease condition III).

Table 118 — CTC_IPv4_AUTOCONF_CONFLICTC_08 – Link local address (usage cease condition III)

Item	Content
CTC # – Title	CTC_IPv4_AUTOCONF_CONFLICTC_08 – Link local address (usage cease condition III)
Purpose	This CTC verifies that if the LT sends one conflicting ARP request and one conflicting ARP response within $t_{Defend\_Interval}$ seconds, then the IUT probes with a new link local address.
Reference	RFC 3927:2005,[10] 2.5

Table 118 *(continued)*

Item	Content
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 6. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.4.5.
Step	1. The UT shall configure the IUT DHCP client on IUT-Iface-0. 2. The UT shall cause the IUT to bring up IUT-Iface-0. 3. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0. 4. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr. 5. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr. 6. The LT shall wait till $t_{Announce\_Wait}$ + $t_{Announce\_Interval}$ for IUT to assign the link-local address to IUT-Iface-0. 7. The LT Server-1 shall send ARP request message to IUT through IUT-Iface-0 containing: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr. 8. The LT shall wait until o,5 × $t_{Defend\_Interval}$ before sending the next conflicting packet to IUT-Iface-0. 9. The LT Server-1 shall send ARP response message to IUT through IUT-Iface-0 containing: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr. 10. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr.
Iteration	Not applicable
Expected response	After step 3: The IUT sends a DHCPDISCOVER message. After step 4: The IUT sends three ARP request messages. After step 10: The IUT sends an ARP request message. After step 10: The UT verifies that a received ARP request message contains the target IP address that is not set to IUT-Iface-0-IP-Link-Local-Addr.
Remark	—

Table 119 specifies the CTC_IPv4_AUTOCONF_CONFLICTC_09 – Link local address (usage cease condition IV).

Table 119 — CTC_IPv4_AUTOCONF_CONFLICTC_09 – Link local address (usage cease condition IV)

Item	Content
CTC # – Title	CTC_IPv4_AUTOCONF_CONFLICTC_09 – Link local address (usage cease condition IV)

Table 119 *(continued)*

Item	Content
Purpose	This CTC verifies that if the LT sends one conflicting ARP response and one conflicting ARP request within $t_{Defend\_Interval}$ seconds, then the IUT probes with a new link local address.
Reference	RFC 3927:2005,[10] 2.5
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 6. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.4.5.
Step	1. The UT shall configure the IUT DHCP client on IUT-Iface-0. 2. The UT shall cause the IUT to bring up IUT-Iface-0. 3. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0. 4. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr. 5. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr. 6. The LT shall wait till $t_{Announce\_Wait}$ + $t_{Announce\_Interval}$ for IUT to assign the link-local address to IUT-Iface-0. 7. The LT Server-1 shall send ARP response message to IUT through IUT-Iface-0 containing: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr. 8. The LT shall wait until 0,5 × $t_{Defend\_Interval}$ before sending the next conflicting packet to IUT-Iface-0. 9. The LT Server-1 shall send ARP request message to IUT through IUT-Iface-0 containing: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr. 10. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr.
Iteration	Not applicable
Expected response	After step 3: The IUT sends a DHCPDISCOVER message. After step 4: The IUT sends three ARP request messages. After step 10: The IUT sends an ARP request message. After step 10: The UT verifies that received ARP request message contains the target IP address that is not set to IUT-Iface-0-IP-Link-Local-Addr.
Remark	—

Table 120 specifies the CTC_IPv4_AUTOCONF_CONFLICTC_10 – Receiving a conflicting ARP packet.

Table 120 — CTC_IPv4_AUTOCONF_CONFLICTC_10 – Receiving a conflicting ARP packet

Item	Content
CTC # – Title	CTC_IPv4_AUTOCONF_CONFLICTC_10 – Receiving a conflicting ARP packet

Table 120 *(continued)*

Item	Content
Purpose	This CTC verifies that if the LT sends a conflicting ARP response, then the IUT sends a probe with a different link local address.
Reference	RFC 3927:2005,[10] 2.5
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 6. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.4.5.
Step	1. The UT shall configure the IUT DHCP client on IUT-Iface-0. 2. The UT shall cause the IUT to bring up IUT-Iface-0. 3. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0. 4. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr. 5. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr. 6. The LT shall wait till $t_{Announce\_Wait}$ + $t_{Announce\_Interval}$ for IUT to assign the link-local address to IUT-Iface-0. 7. The LT Server-1 shall send ARP response message to IUT through IUT-Iface-0 containing: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr. 8. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr.
Iteration	Not applicable
Expected response	After step 3: The IUT sends a DHCPDISCOVER message. After step 4: The IUT sends three ARP request messages. After step 8: The IUT sends an ARP request message. After step 8: The UT verifies that received ARP request message contains the target IP address that is not set to IUT-Iface-0-IP-Link-Local-Addr.
Remark	—

Table 121 specifies the CTC_IPv4_AUTOCONF_CONFLICTC_11 – ARP segments containing (Link- Local sender IP address) rule – I.

Table 121 — CTC_IPv4_AUTOCONF_CONFLICTC_11 – ARP segments containing (Link- Local sender IP address) rule – I

Item	Content
CTC # – Title	CTC_IPv4_AUTOCONF_CONFLICTC_11 – ARP segments containing (Link- Local sender IP address) rule – I
Purpose	This CTC verifies that if the LT sends a conflicting ARP response, then the IUT sends a probe with the Ethernet destination address set to the broadcast address.
Reference	RFC 3927:2005,[10] 2.5

Table 121 *(continued)*

Item	Content
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 6. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.4.5.
Step	1. The UT shall configure the IUT DHCP client on IUT-Iface-0. 2. The UT shall cause the IUT to bring up IUT-Iface-0. 3. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0. 4. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr. 5. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr. 6. The LT shall wait till $t_{Announce\_Wait}$ + $t_{Announce\_Interval}$ for IUT to assign the link-local address to IUT-Iface-0. 7. The LT Server-1 shall send ARP request message to IUT through IUT-Iface-0 containing: — sender IP address set to All-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr. 8. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 3: The IUT sends a DHCPDISCOVER message. After step 4: The IUT sends three ARP probe request messages. After step 8: The IUT sends an ARP response message. After step 8: The UT verifies that received ARP response message contains: — target IP address is set to All-Iface-0-IP-Link-Local-Addr; — sender IP address is set to IUT-Iface-0-IP-Link-Local-Addr; — Ethernet destination hardware address is set to Eth-Broadcast-Addr.
Remark	—

7.4.6.5 CTC_IPv4_AUTOCONF_LINKLOCAL_PACKETS – Link-local segments are not forwarded

Table 122 specifies the CTC_IPv4_AUTOCONF_LINKLOCAL_PACKETS_04 – Link-local segments are not forwarded test case.

Table 122 — CTC_IPv4_AUTOCONF_LINKLOCAL_PACKETS_04 – Link-local segments are not forwarded

Item	Content
CTC # – Title	CTC_IPv4_AUTOCONF_LINKLOCAL_PACKETS_04 – Link-local segments are not forwarded
Purpose	This CTC verifies that the IUT does not answer to an ARP request with an arbitrary link-local address which it is not using.
Reference	RFC 3927:2005,[10] 2.7

Table 122 *(continued)*

Item	Content
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 6. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.4.5.
Step	1. The UT shall configure the IUT DHCP client on IUT-Iface-0. 2. The UT shall cause the IUT to bring up IUT-Iface-0. 3. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0. 4. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr. 5. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and stores it in IUT-Iface-0-IP-Link-Local-Addr. 6. The LT shall wait till (PROBE_MAX × 2) + ANNOUNCE_WAIT + ANNOUNCE_INTERVAL for IUT to assign the link-local address to IUT-Iface-0. 7. The LT Server-1 shall send ARP request message to IUT through IUT-Iface-0 containing: — sender IP address set to All-Iface-0-IP-Link-Local-Addr; — target IP address set to Arbitrary-IP-Link-Local-Addr; — target hardware address set to Null-MAC-Addr; — sender hardware address set to MAC-Addr-1. 8. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — sender IP address set to Arbitrary-IP-Link-Local-Addr; — target IP address set to All-Iface-0-IP-Link-Local-Addr.
Iteration	Not applicable
Expected response	After step 3: The IUT sends a DHCPDISCOVER message. After step 4: The IUT sends an ARP request message. After step 8: The IUT does not send ARP response message.
Remark	—

7.4.6.6 CTC_IPv4_AUTOCONF_NETWORK_PARTITIONS – Healing of network partitions

Table 123 specifies the CTC_IPv4_AUTOCONF_NETWORK_PARTITIONS_01 – Healing of network partitions hosts test case.

Table 123 — CTC_IPv4_AUTOCONF_NETWORK_PARTITIONS_01 – Healing of network partitions hosts

Item	Content
CTC # – Title	CTC_IPv4_AUTOCONF_NETWORK_PARTITIONS_01 – Healing of network partitions hosts
Purpose	This CTC verifies that the IUT does not send periodic gratuitous ARP request packets.
Reference	RFC 3927:2005,[10] section 4

Table 123 *(continued)*

Item	Content
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 6. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.4.5.
Step	1. The UT shall configure the IUT DHCP client on IUT-Iface-0. 2. The UT shall cause the IUT to bring up IUT-Iface-0. 3. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0. 4. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — expected network address of target IP address set to Link-Local-Net-Addr. 5. The LT Server-1 shall retrieve the value of destination protocol address field of ARP request message received from IUT-Iface-0 and store it in IUT-Iface-0-IP-Link-Local-Addr. 6. The LT shall wait till $t_{Announce\_Wait}$ + $t_{Announce\_Interval}$ for IUT to assign the link-local address to IUT-Iface-0. 7. The LT Server-1 shall send ARP request message to IUT through IUT-Iface-0 containing: — sender IP address set to All-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr. 8. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to All-Iface-0-IP-Link-Local-Addr. 9. The LT Server-1 shall listen up to Param-Listen-Time on LT-Iface-0 with: — sender IP address set to IUT-Iface-0-IP-Link-Local-Addr; — target IP address set to IUT-Iface-0-IP-Link-Local-Addr.
Iteration	Not applicable
Expected response	After step 3: The IUT sends a DHCPDISCOVER message. After step 4: The IUT sends three ARP request messages. After step 8: The IUT sends an ARP response message. After step 9: The IUT does not send ARP request message.
Remark	—

7.5 TL – User datagram protocol (UDP)

7.5.1 General

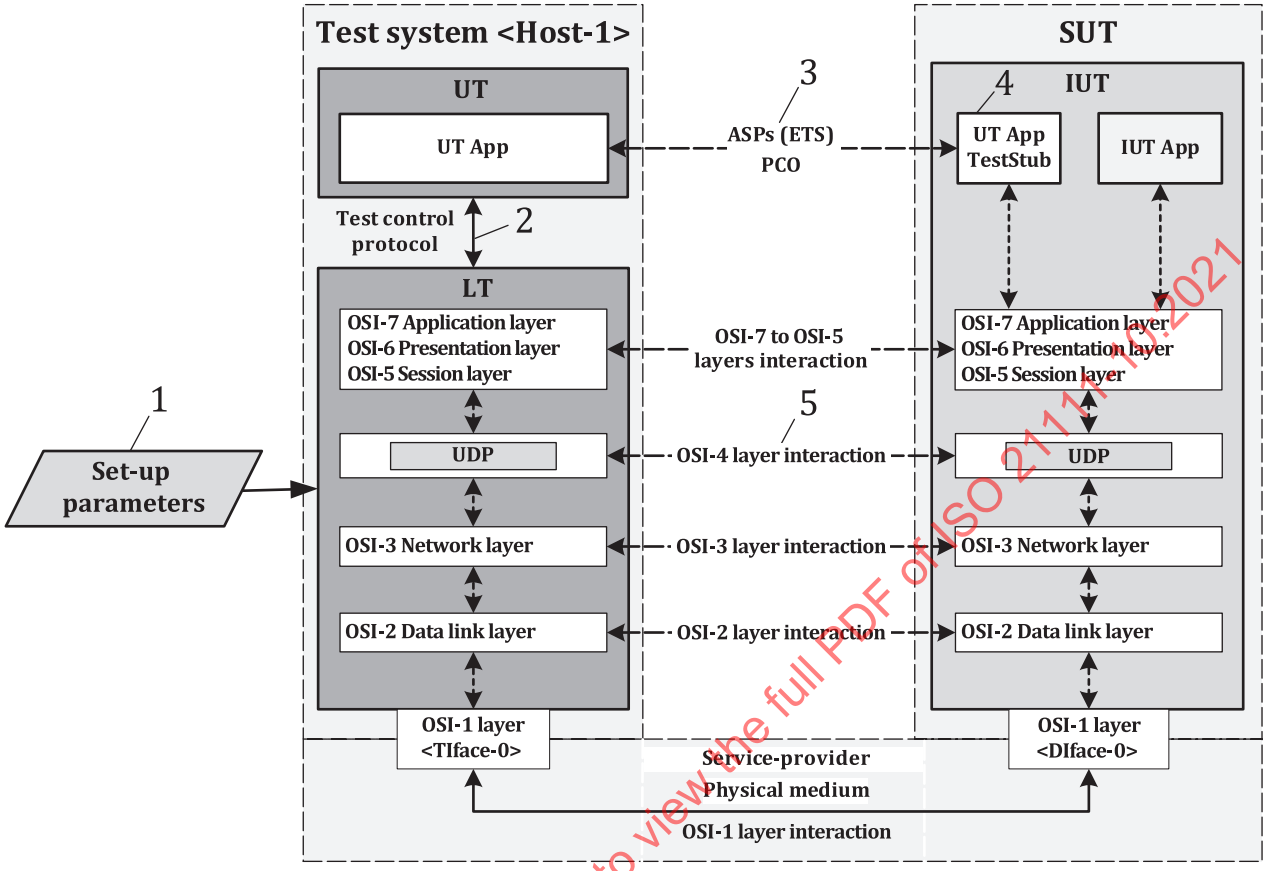
The objective of this subclause is to specify CTCs for the User datagram protocol (UDP).

7.5.2 Referenced specification

The RFC 768:1980[4] specifies a user datagram protocol. All CTCs in 7.5 are in accordance with this RFC.

7.5.3 Test system topology – TL – UDP

Figure 7 shows the test system topology – TL – UDP.



Key

1 IUT-specific set-up parameters (electronic data sheet)
2 test control protocol
3 PCO and ASPs based on ETS
4 Upper tester TestStub application
5 OSI layer 4 UDP interaction

Figure 7 — Test system topology – TL – UDP

7.5.4 Test system topology and related CTC configuration

This test suite:

— expects to be running against an UDP stack;

— runs over Ethernet; and

— runs all tests with one interface, except two CTCs.

7.5.5 UDP parameters used in CTCs

Table 124 specifies the parameter used in UDP CTCs.

Table 124 — Parameter used in UDP CTCs

Parameter used in CTCs	Content
LT-UDP-Port	Port number used for UDP in LT
Unused-UDP-Src-Port	Unused UDP-source port number used in LT [value: 20 000]
Unused-UDP-Dest-Port-1	Unused UDP-destination port number used in LT [value: 20 001]
UDP-User-Data-Size	UDP-data size used by the LT [value: 101]
Calculated-UDP-Checksum	UDP checksum of a UDP packet
Incorrect-UDP-Checksum	Incorrect UDP checksum [value: $FFFF_{16}$]
UDP-Default-Data	Default data used in UDP datagram by LT and UT
UDP-Default-Data-Len	Length of UDP default data
UDP-Data	UDP data used by LT [value: TESTERTESTERTESTERTESTER\0]
UDP-Data-Len	UDP data length [value: 17]
All-System-Multicast-Addr	Multicast address for all systems
All-Iface-0-Broadcast-IP	Broadcast address of the LT's 0th interface's network
Host-1-IP	Unused IP address from network
Host-2-IP	Unused IP address from network
IUT-Supports-Dynamic-Interface	Automotive ECUs may not support dynamic user interface for new port creation, either for performance or security reasons. TRUE indicates IUT supports dynamic user interface. FALSE indicates IUT does not support dynamic user interface. Default: FALSE

7.5.6 UDP CTCs

7.5.6.1 CTC_UDP_MessageFormat – UDP datagram format

Table 125 specifies the CTC_UDP_MessageFormat_02 – IUT accepts a UDP datagram containing a well-formed UDP header test case.

Table 125 — CTC_UDP_MessageFormat_02 – IUT accepts a UDP datagram containing a well-formed UDP header

Item	Content
CTC # – Title	CTC_UDP_MessageFormat_02 – IUT accepts a UDP datagram containing a well-formed UDP header
Purpose	This CTC verifies that when the IUT receives a UDP datagram containing a well-formed header that contains a source port field containing a destination port that indicates a value equal to the IUT's UDP port that contains a length field indicating a valid value equal to the size of the sent datagram that contains a checksum field indicating a value equal to the Calculated-UDP-Checksum by the IUT then the IUT accepts the UDP datagram.
Reference	RFC 768:1980,[4] Format
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 7. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.5.5.

Table 125 *(continued)*

Item	Content
Step	1. The LT shall send a UDP datagram containing a well-formed UDP header. 2. The UT shall verify that the IUT accepts the UDP datagram by using the service primitive RECEIVE_AND_FORWARD.
Iteration	Not applicable
Expected response	After step 2: The UT sends an indication that the IUT has received the UDP datagram containing the same content by using the service primitive RECEIVE_AND_FORWARD.
Remark	—

7.5.6.2 CTC_UDP_DatagramLength – UDP datagram length

Table 126 specifies the CTC_UDP_DatagramLength_01 – IUT discards a truncated UDP datagram test case.

Table 126 — CTC_UDP_DatagramLength_01 – IUT discards a truncated UDP datagram

Item	Content
CTC # – Title	CTC_UDP_DatagramLength_01 – IUT discards a truncated UDP datagram
Purpose	This CTC verifies that when the IUT receives a truncated UDP datagram (a datagram with the length field smaller than the actual size of the data coming from the Ethernet frame) then the IUT discards the UDP datagram.
Reference	RFC 768:1980,[4] Format; automotive-specific requirements on frame integrity.
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 7. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.5.5.
Step	1. The LT shall send a truncated UDP datagram. 2. The UT shall verify that the IUT accepts the UDP datagram by using the service primitive RECEIVE_AND_FORWARD.
Iteration	Not applicable
Expected response	After step 2: The UT sends an indication that the IUT discards the UDP datagram by using the service primitive RECEIVE_AND_FORWARD.
Remark	—

7.5.6.3 CTC_UDP_Padding – UDP padding

Table 127 specifies the CTC_UDP_Padding_02 – IUT generates UDP datagram with even size of payload and no padding at the end test case.

Table 127 — CTC_UDP_Padding_02 – IUT generates UDP datagram with even size of payload and no padding at the end

Item	Content
CTC # – Title	CTC_UDP_Padding_02 – IUT generates UDP datagram with even size of payload and no padding at the end
Purpose	This CTC verifies that when the IUT is requested to generate a UDP datagram with an even payload size, then the IUT generates a UDP datagram that contains data indicating a value of the received even UDP-User-Data-Size with no padding bytes.

Table 127 *(continued)*

Item	Content
Reference	RFC 768:1980, Fields
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 7. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.5.5.
Step	1. The LT shall send a sendUdpPacketEvenSize to the IUT to request a UDP datagram with an even UDP-User-Data-Size. 2. The IUT shall generate a UDP datagram without padding.
Iteration	Not applicable
Expected response	After step 2: The IUT generates a UDP segment containing data indicating the value of the received an even UDP-User-Data-Size with no padding bytes.
Remark	—

7.5.6.4 CTC_UDP_FIELDS – UDP fields

Table 128 specifies the CTC_UDP_FIELDS_01 – Fields – Specify source port test case.

Table 128 — CTC_UDP_FIELDS_01 – Fields – Specify source port

Item	Content
CTC # – Title	CTC_UDP_FIELDS_01 – Fields – Specify source port
Purpose	This CTC verifies that the application can specify a source port. A source port is an optional field, when meaningful, it indicates the port of the sending process, and may be assumed to be the port to which a reply should be addressed in the absence of any other information. A user interface should allow the creation of new receive ports.
Reference	RFC 768:1980,[4] Fields
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 7. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.5.5.
Step	1. The UT shall cause the IUT to send a UDP datagram with source port set to Unused-UDP-Dest-Port-1 through IUT-Iface-0. 2. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 2: The IUT sends a message. After step 2: The UT verifies that the received UDP datagram contains the source UDP port field that is set to unusedUDPDstPort1.
Remark	—

Table 129 specifies the CTC_UDP_FIELDS_02 – Fields – Specify destination port.

Table 129 — CTC_UDP_FIELDS_02 – Fields – Specify destination port

Item	Content
CTC # – Title	CTC_UDP_FIELDS_02 – Fields – Specify destination port

Table 129 *(continued)*

Item	Content
Purpose	This CTC verifies that the UDP datagrams include a destination port. A source port is an optional field, when meaningful, it indicates the port of the sending process, and may be assumed to be the port to which a reply should be addressed in the absence of any other information.
Reference	RFC 768:1980,[4] Fields
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 7. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.5.5.
Step	1. IUT CONFIGURE: Externally cause the IUT to listen on port Unused-UDP-Dest-Port-1 on IUT-Iface-0. 2. The LT shall send a message to IUT through IUT-Iface-0 containing: — source UDP port field set to Unused-UDP-Src-Port; — destination UDP port field set to Unused-UDP-Dest-Port-1. 3. The UT shall cause the IUT to send a UDP datagram with UDP-Default-Data as data through IUT-Iface-0. 4. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 1: The IUT listens on port Unused-UDP-Dest-Port-1 on IUT-Iface-0. After step 4: The IUT sends a message. After step 4: The UT verifies that the received UDP datagram contains the destination UDP port field that is set to Unused-UDP-Src-Port.
Remark	—

Table 130 specifies the CTC_UDP_FIELDS_03 – Fields – Accept source port set to zero.

Table 130 — CTC_UDP_FIELDS_03 – Fields – Accept source port set to zero

Item	Content
CTC # – Title	CTC_UDP_FIELDS_03 – Fields – Accept source port set to zero
Purpose	This CTC verifies that using the value 0 for UDP source port is valid and IUT accepts such a message. Source port is an optional field, when meaningful, it indicates the port of the sending process, and may be assumed to be the port to which a reply should be addressed in the absence of any other information. If not used, a value of zero is inserted.
Reference	RFC 768:1980,[4] Fields
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 7. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.5.5.

Table 130 *(continued)*

Item	Content
Step	1. IUT CONFIGURE: Externally cause the IUT to listen on port Unused-UDP-Dest-Port-1 on IUT-Iface-0. 2. The LT shall send a message to IUT through IUT-Iface-0 containing: — source UDP port field set to 0; — destination UDP port field set to Unused-UDP-Dest-Port-1.
Iteration	Not applicable
Expected response	After step 1: The IUT listens on port Unused-UDP-Dest-Port-1 on IUT-Iface-0. After step 2: The UT verifies that the IUT received a UDP datagram containing the UDP source port field set to 0.
Remark	—

Table 131 specifies the CTC_UDP_FIELDS_04 – Fields – Same destination port with different IP address (send).

Table 131 — CTC_UDP_FIELDS_04 – Fields – Same destination port with different IP address (send)

Item	Content
CTC # – Title	CTC_UDP_FIELDS_04 – Fields – Same destination port with different IP address (send)
Purpose	This CTC verifies that IUT can send a UDP datagram at same destination port to more than one different IP addresses. Destination port has a meaning within the context of a particular internet destination address.
Reference	RFC 768:1980,[4] Fields
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 7. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.5.5.
Step	1. IUT CONFIGURE: Externally cause the IUT to send a UDP datagram at LT-UDP-Port as the destination port and to Host-1-IP IP address through IUT-Iface-0. 2. The LT shall listen up to Param-Listen-Time on LT-Iface-0. 3. IUT CONFIGURE: Externally cause the IUT to send a UDP datagram at LT-UDP-Port as the destination port and to Host-2-IP IP address through IUT-Iface-0. 4. The LT HOST-2 listens up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 2: The IUT sends a message. After step 2: The UT verifies that the IUT application layer receives a UDP datagram that contains: — destination IP address field is set to Host-1-IP; — destination UDP port field is set to LT-UDP-Port. After step 4: The IUT sends a message. After step 4: The UT verifies that the IUT application layer receives a UDP datagram that contains: — destination IP address field is set to Host-2-IP; — destination UDP port field is set to LT-UDP-Port.

Table 131 *(continued)*

Item	Content
Remark	—

Table 132 specifies the CTC_UDP_FIELDS_05 – Fields – Same port with different IP address (receive and send).

Table 132 — CTC_UDP_FIELDS_05 – Fields – Same port with different IP address (receive and send)

Item	Content
CTC # – Title	CTC_UDP_FIELDS_05 – Fields – Same port with different IP address (receive and send)
Purpose	This CTC verifies that IUT can receive send a UDP datagram at same destination port to more than one different IP addresses. Destination port has a meaning within the context of a particular internet destination address.
Reference	RFC 768:1980,[4] Fields
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 7. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.5.5.
Step	1. IUT CONFIGURE: Externally cause the IUT to listen on port Unused-UDP-Dest-Port-1 on IUT-Iface-0. 2. The LT shall send a message to IUT through IUT-Iface-0 containing: — source IP address field set to Host-1-IP; — destination IP address field set to IUT-Iface-0-IP; — destination UDP port field set to Unused-UDP-Dest-Port-1; — UDP data field set to UDP-Data. 3. IUT CONFIGURE: Externally cause the IUT to listen on port Unused-UDP-Dest-Port-1 on IUT-Iface-0. 4. The LT HOST-2 sends message to IUT through IUT-Iface-0 containing: — source IP address field set to Host-2-IP; — destination IP address field set to IUT-Iface-0-IP; — destination UDP port field set to Unused-UDP-Dest-Port-1; — UDP data field set to UDP-Default-Data.
Iteration	Not applicable
Expected response	After step 1: The IUT listens on port Unused-UDP-Dest-Port-1 on IUT-Iface-0. After step 2: The UT verifies that the application layer has received a UDP datagram containing UDP data field equal to UDP-Data. After step 3: The IUT listens on port Unused-UDP-Dest-Port-1 on IUT-Iface-0. After step 4: The UT verifies that the application layer receives a UDP datagram containing the UDP data field equal to UDP-Default-Data.
Remark	—

Table 133 specifies the CTC_UDP_FIELDS_06 – Fields – Total length.

Table 133 — CTC_UDP_FIELDS_06 – Fields – Total length

Item	Content
CTC # – Title	CTC_UDP_FIELDS_06 – Fields – Total length
Purpose	This verifies that to configure IUT to send UDP-User-Data-Size size of data so that the length in header is [udpUserDataSize + 8 (UDP header Size)] bytes. Length is the length in octets of this user datagram including this header and the data.
Reference	RFC 768:1980,[4] Fields
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 7. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.5.5.
Step	1. The UT shall cause the IUT to send a UDP datagram with UDP-User-Data-Size of data through IUT-Iface-0. 2. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 1: The IUT sends message. After step 2: The UT verifies that the IUT receives a UDP datagram containing the UDP header length field that is set to (UDP-User-Data-Size + 8).
Remark	—

Table 134 specifies the CTC_UDP_FIELDS_07 – Fields – Total length (no data).

Table 134 — CTC_UDP_FIELDS_07 – Fields – Total length (no data)

Item	Content
CTC # – Title	CTC_UDP_FIELDS_07 – Fields – Total length (no data)
Purpose	This CTC verifies that to configure IUT to send 0 (zero) size of data so that the length in header is 8(UDP header size) bytes. Length is the length in octets of this user datagram including this header and the data.
Reference	RFC 768:1980,[4] Fields
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 7. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.5.5.
Step	1. The UT shall cause the IUT to send a UDP datagram without data in the data field through IUT-Iface-0. 2. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 2: The IUT sends a message. After step 2: The UT verifies that the IUT receives a UDP datagram containing the UDP header length field that is set to 8.
Remark	—

Table 135 specifies the CTC_UDP_FIELDS_08 – Fields – Total length (less than 8 bytes).

Table 135 — CTC_UDP_FIELDS_08 – Fields – Total length (less than 8 bytes)

Item	Content
CTC # – Title	CTC_UDP_FIELDS_08 – Fields – Total length (less than 8 bytes)
Purpose	This CTC verifies that the IUT discards the received datagram in case the total length of the datagram is less than 8 bytes. Length is the length in octets of this user datagram including this header and the data.
Reference	RFC 768:1980,[4] Fields
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 7. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.5.5.
Step	1. IUT CONFIGURE: Externally cause the IUT to listen on port Unused-UDP-Dest-Port-1 on IUT-Iface-0. 2. The LT shall send a message to the IUT through IUT-Iface-0 containing: — truncated message: length less than 8 bytes; — no UDP data field set.
Iteration	Not applicable
Expected response	After step 1: The IUT listens on port Unused-UDP-Dest-Port-1 on IUT-Iface-0. After step 2: The UT verifies that the IUT discards the UDP datagram.
	—

Table 136 specifies the CTC_UDP_FIELDS_09 – Fields – Total length (equal to zero).

Table 136 — CTC_UDP_FIELDS_09 – Fields – Total length (equal to zero)

Item	Content
CTC # – Title	CTC_UDP_FIELDS_09 – Fields – Total length (equal to zero)
Purpose	This CTC verifies that the IUT discards the received datagram in case the total length of the datagram is zero. Length is the length in octets of this user datagram including this header and the data.
Reference	RFC 768:1980,[4] Fields
Prerequisite	The IUT powered on and linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT running and the TCP/IP TestStub active.
Test setup	The test system set-up in accordance with Figure 7. The test system parameterized in accordance with the configuration set-up parameters as specified in 7.5.5.
Step	1. IUT CONFIGURE: Externally cause the IUT to listen on port Unused-UDP-Dest-Port-1 on IUT-Iface-0. 2. The LT shall send a message to the IUT through IUT-Iface-0 containing: — UDP data field set to UDP-Data; — length field set to 0.
Iteration	Not applicable
	After step 1: The IUT listens on port Unused-UDP-Dest-Port-1 on IUT-Iface-0. After step 2: The UT verifies that the IUT discards the UDP datagram.
Remark	—

Table 137 specifies the CTC_UDP_FIELDS_10 – Fields – Total length (greater than actual).

Table 137 — CTC_UDP_FIELDS_10 – Fields – Total length (greater than actual)

Item	Content
CTC # – Title	CTC_UDP_FIELDS_10 – Fields – Total length (greater than actual)
Purpose	This CTC verifies that the IUT discards the received datagram in case the length value in the header is greater than the actual length of the datagram. Length is the length in octets of this user datagram including this header and the data.
Reference	RFC 768:1980,[4] Fields
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 7. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.5.5.
Step	1. IUT CONFIGURE: Externally cause the IUT to listen on port Unused-UDP-Dest-Port-1 on IUT-Iface-0. 2. The LT shall send a message to the IUT through IUT-Iface-0 containing: — length field set to (length of UDP-Data + 8) + 1; — UDP data field set to UDP-Data.
Iteration	Not applicable
Expected response	After step 1: The IUT listens on port Unused-UDP-Dest-Port-1 on IUT-Iface-0. After step 2: The UT verifies that the IUT discards the UDP datagram.
Remark	—

Table 138 specifies the CTC_UDP_FIELDS_12 – Fields – Total length (maximum).

Table 138 — CTC_UDP_FIELDS_12 – Fields – Total length (maximum)

Item	Content
CTC # – Title	CTC_UDP_FIELDS_12 – Fields – Total length (maximum)
Purpose	This CTC verifies that the IUT accepts the received datagram in case the length value in the header is set to the maximum allowed value. Length is the length in octets of this user datagram including this header and the data: — IPv4: 65,507 bytes (65,535 – 8-byte UDP header – 20 byte IP header); — IPv6: 65,535 byte].
Reference	RFC 768:1980,[4] Fields
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 7. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.5.5.
Step	1. IUT CONFIGURE: Externally cause the IUT to listen on port Unused-UDP-Dest-Port-1 on IUT-Iface-0. 2. The LT shall send a message to the IUT through IUT-Iface-0 containing: — length field set to the maximum supported value; — data field set to the maximum supported octet size.
Iteration	Not applicable

Table 138 *(continued)*

Item	Content
Expected response	After step 1: The IUT listens on port Unused-UDP-Dest-Port-1 on IUT-Iface-0. After step 2: The UT verifies that the IUT application layer receives the UDP datagram.
Remark	—

Table 139 specifies the CTC_UDP_FIELDS_13 – Fields – Checksum (with padding).

Table 139 — CTC_UDP_FIELDS_13 – Fields – Checksum (with padding)

Item	Content
CTC # – Title	CTC_UDP_FIELDS_13 – Fields – Checksum (with padding)
Purpose	This CTC verifies if the IUT calculates the UDP checksum correctly. While calculating UDP checksum the padded byte is needed to be considered. Checksum is the 16 bit one's complement of the one's complement sum of a pseudo header of information from the IP header, the UDP header, and the data, padded with 0 octets at the end (if necessary) to make a multiple of 2 octets.
Reference	RFC 768:1980,[4] Fields
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 7. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.5.5.
Step	1. The UT shall cause the IUT to send a UDP datagram with UDP-User-Data-Size of data through IUT-Iface-0. 2. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 2: The IUT sends a message. After step 2: The LT application layer receives a UDP datagram that contains the UDP header checksum field set to Calculated-UDP-Checksum.
Remark	—

Table 140 specifies the CTC_UDP_FIELDS_14 – Fields – Checksum (no padding).

Table 140 — CTC_UDP_FIELDS_14 – Fields – Checksum (no padding)

Item	Content
CTC # – Title	CTC_UDP_FIELDS_14 – Fields – Checksum (no padding)
Purpose	This CTC verifies if the IUT calculates the UDP checksum correctly. While calculating UDP checksum the padded byte is not required. Checksum is the 16 bit one's complement of the one's complement sum of a pseudo header of information from the IP header, the UDP header, and the data, padded with 0 octets at the end (if necessary) to make a multiple of 2 octets.
Reference	RFC 768:1980,[4] Fields
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 7. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.5.5.
Step	1. The UT shall cause the IUT to send a UDP datagram with 100 of data through IUT-Iface-0. 2. The LT shall listen up to Param-Listen-Time on LT-Iface-0.

Table 140 *(continued)*

Item	Content
Iteration	Not applicable
Expected response	After step 2: The IUT sends a message. After step 2: The LT application layer receives a UDP datagram that contains the UDP header checksum field set to Calculated-UDP-Checksum.
Remark	—

Table 141 specifies the CTC_UDP_FIELDS_15 – Fields – Checksum (incorrect).

Table 141 — CTC_UDP_FIELDS_15 – Fields – Checksum (incorrect)

Item	Content
CTC # – Title	CTC_UDP_FIELDS_15 – Fields – Checksum (incorrect)
Purpose	This CTC verifies that the IUT does not accept a UDP datagram with incorrect checksum. If a UDP datagram is received with a checksum that is non-zero and invalid, UDP silently discards the datagram.
Reference	RFC 1122:1989,[9] 4.1.3.4
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 7. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.5.5.
Step	1. IUT CONFIGURE: Externally cause the IUT to listen on port Unused-UDP-Dest-Port-1 on IUT-Iface-0. 2. The LT shall send a message to the IUT through IUT-Iface-0 containing: — destination UDP port field set to Unused-UDP-Dest-Port-1; — UDP header checksum field set to Incorrect-UDP-Checksum; — UDP data field set to UDP-Default-Data.
Iteration	Not applicable
Expected response	After step 1: The IUT listens on port Unused-UDP-Dest-Port-1 on IUT-Iface-0. After step 2: The UT verifies that the IUT application layer does not receive a UDP datagram that contains UDP data field equal to UDP-Default-Data.
Remark	—

Table 142 specifies the CTC_UDP_FIELDS_16 – Fields – Checksum (zero checksum).

Table 142 — CTC_UDP_FIELDS_16 – Fields – Checksum (zero checksum)

Item	Content
CTC # – Title	CTC_UDP_FIELDS_16 – Fields – Checksum (zero checksum)
Purpose	This CTC verifies that the IUT accepts the UDP datagram with zero checksum. An all zero transmitted checksum value means that the transmitter generated no checksum (for debugging or for higher level protocols that do not care). An application may optionally be able to control whether a UDP checksum is generated, but it defaults to checksumming on.
Reference	RFC 768:1980,[4] Fields
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.

Table 142 *(continued)*

Item	Content
Set-up	The test system set-up shall be in accordance with Figure 7. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.5.5.
Step	1. IUT CONFIGURE: Externally cause the IUT to listen on port Unused-UDP-Dest-Port-1 on IUT-Iface-0. 2. The LT shall send a message to the IUT through IUT-Iface-0 containing: — destination UDP port field set to Unused-UDP-Dest-Port-1; — UDP header checksum field set to 0; — UDP data field set to UDP-Default-Data.
Iteration	Not applicable
Expected response	After step 1: The IUT listens on port Unused-UDP-Dest-Port-1 on IUT-Iface-0. After step 2: The UT verifies that the IUT application layer receives a UDP datagram that contains UDP data field equal to UDP-Default-Data.
Remark	—

7.5.6.5 CTC_UDP_USER_INTERFACE – User interface

Table 143 specifies the CTC_UDP_USER_INTERFACE_02 – User interface – Data octets test case.

Table 143 — CTC_UDP_USER_INTERFACE_02 – User interface – Data octets

Item	Content
CTC # – Title	CTC_UDP_USER_INTERFACE_02 – User interface – Data octets
Purpose	This CTC verifies that the receive operations on the receive ports return the data octets correctly. This CTC is only running when IUT-Supports-Dynamic-Interface is TRUE. A user interface should allow the creation of new receive ports, receive operations on the receive ports that return the data octets and an indication of source port and source address, and an operation that allows a datagram to be sent, specifying the data, source and destination ports and addresses to be sent.
Reference	RFC 768:1980,[4] User Interface
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 7. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.5.5.
Step	1. IUT CONFIGURE: Externally cause the IUT to listen on port Unused-UDP-Dest-Port-1 on IUT-Iface-0. 2. The LT shall send a message to the IUT through IUT-Iface-0 containing: — destination UDP port field set to Unused-UDP-Dest-Port-1; — UDP data field set to UDP-Default-Data.
Iteration	Not applicable
Expected response	After step 1: The IUT listens on port Unused-UDP-Dest-Port-1 on IUT-Iface-0. After step 2: The UT verifies that the IUT application layer receives a UDP datagram that contains UDP data field equal to UDP-Default-Data.
Remark	—

Table 144 specifies the CTC_UDP_USER_INTERFACE_03 – User interface – Return source port.

Table 144 — CTC_UDP_USER_INTERFACE_03 – User interface – Return source port

Item	Content
CTC # – Title	CTC_UDP_USER_INTERFACE_03 – User interface – Return source port
Purpose	This CTC verifies that the receive operations on the receive ports return the source port correctly. This CTC is only running when IUT-Supports-Dynamic-Interface is TRUE. A user interface should allow the creation of new receive ports, receive operations on the receive ports that return the data octets and an indication of source port and source address, and an operation that allows a datagram to be sent, specifying the data, source and destination ports and addresses to be sent.
Reference	RFC 768:1980,[4] User Interface
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 7. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.5.5.
Step	1. IUT CONFIGURE: Externally cause the IUT to listen on port Unused-UDP-Dest-Port-1 on IUT-Iface-0. 2. The LT shall send a message to IUT through IUT-Iface-0 containing: — source UDP port field set to Unused-UDP-Src-Port; — destination UDP port field set to Unused-UDP-Dest-Port-1.
Iteration	Not applicable
Expected response	After step 1: The IUT listens on port Unused-UDP-Dest-Port-1 on IUT-Iface-0. After step 2: The UT verifies that the IUT application layer receives a UDP datagram that contains the UDP source port field set to Unused-UDP-Src-Port.
Remark	—

Table 145 specifies the CTC_UDP_USER_INTERFACE_04 – User interface – Return source IP address.

Table 145 — CTC_UDP_USER_INTERFACE_04 – User interface – Return source IP address

Item	Content
CTC # – Title	CTC_UDP_USER_INTERFACE_04 – User interface – Return source IP address
Purpose	This CTC verifies that the receive operations on the receive ports return the source address correctly. This CTC is only running when IUT-Supports-Dynamic-Interface is TRUE. A user interface should allow the creation of new receive ports, receive operations on the receive ports that return the data octets and an indication of source port and source address, and an operation that allows a datagram to be sent, specifying the data, source and destination ports and addresses to be sent.
Reference	RFC 768:1980, User Interface
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 7. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.5.5.
Step	1. IUT CONFIGURE: Externally cause the IUT to listen on port Unused-UDP-Dest-Port-1 on IUT-Iface-0. 2. The LT shall send a message to the IUT through IUT-Iface-0 containing: — source IP address field set to All-Iface-0-IP; — destination UDP port field set to Unused-UDP-Dest-Port-1.

Table 145 *(continued)*

Item	Content
Iteration	Not applicable
Expected response	After step 1: The IUT listens on port Unused-UDP-Dest-Port-1 on IUT-Iface-0. After step 2: The UT verifies that the LT application layer received a UDP datagram that contains a UDP source address equal to All-Iface-0-IP.
Remark	—

Table 146 specifies the CTC_UDP_USER_INTERFACE_05 – User interface – Source port (to be sent).

Table 146 — CTC_UDP_USER_INTERFACE_05 – User interface – Source port (to be sent)

Item	Content
CTC # – Title	CTC_UDP_USER_INTERFACE_05 – User interface – Source port (to be sent)
Purpose	This CTC verifies that an operation that allows a datagram to be sent, specifies the source port to be sent. This CTC is only ran when IUT-Supports-Dynamic-Interface is TRUE. A user interface should allow the creation of new receive ports, receive operations on the receive ports that return the data octets and an indication of source port and source address, and an operation that allows a datagram to be sent, specifying the data, source and destination ports and addresses to be sent.
Reference	RFC 768:1980,[4] User Interface
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 7. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.5.5.
Step	1. The UT shall cause the IUT to send a UDP datagram with source port set to Unused-UDP-Src-Port through IUT-Iface-0. 2. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 2: The IUT sends a message. After step 2: The UT verifies that the LT application layer receives a UDP datagram that contains the source UDP port field set to Unused-UDP-Src-Port.
Remark	—

Table 147 specifies the CTC_UDP_USER_INTERFACE_06 – User interface – Destination port (to be sent).

Table 147 — CTC_UDP_USER_INTERFACE_06 – User interface – Destination port (to be sent)

Item	Content
CTC # – Title	CTC_UDP_USER_INTERFACE_06 – User interface – Destination port (to be sent)
Purpose	This CTC verifies that an operation that allows a datagram to be sent, specifies the destination port to be sent. This CTC is only ran when IUT-Supports-Dynamic-Interface is TRUE. A user interface should allow the creation of new receive ports, receive operations on the receive ports that return the data octets and an indication of source port and source address, and an operation that allows a datagram to be sent, specifying the data, source and destination ports and addresses to be sent.
Reference	RFC 768:1980,[4] User Interface
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 7. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.5.5.

Table 147 *(continued)*

Item	Content
Step	1. The UT shall cause the IUT to send a UDP datagram with destination port set to LT-UDP-Port through IUT-Iface-0. 2. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 2: The IUT sends a message. After step 2: The UT verifies that the LT application layer receives a UDP datagram that contains the destination UDP port field set to testerUDPPort.
Remark	—

Table 148 specifies the CTC_UDP_USER_INTERFACE_07 – User interface – Source IP address (to be sent).

Table 148 — CTC_UDP_USER_INTERFACE_07 – User interface – Source IP address (to be sent)

Item	Content
CTC # – Title	CTC_UDP_USER_INTERFACE_07 – User interface – Source IP address (to be sent)
Purpose	This CTC verifies that an operation that allows a datagram to be sent, specifies the source address to be sent. This CTC is only ran when IUT-Supports-Dynamic-Interface is TRUE. A user interface should allow the creation of new receive ports, receive operations on the receive ports that return the data octets and an indication of source port and source address, and an operation that allows a datagram to be sent, specifying the data, source and destination ports and addresses to be sent.
Reference	RFC 768:1980,[4] User Interface
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 7. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.5.5.
Step	1. The UT shall cause the IUT to send a UDP datagram with source address shall be set to IUT-Iface-0-IP through IUT-Iface-0. 2. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 2: The IUT sends a message. After step 2: The UT verifies that the LT application layer receives a UDP datagram that contains the source IP address field set to IUT-Iface-0-IP.
Remark	—

Table 149 specifies the CTC_UDP_USER_INTERFACE_08 – User interface – Destination address (to be sent).

Table 149 — CTC_UDP_USER_INTERFACE_08 – User interface – Destination address (to be sent)

Item	Content
CTC # – Title	CTC_UDP_USER_INTERFACE_08 – User interface – Destination address (to be sent)
Purpose	This CTC verifies that an operation that allows a datagram to be sent, specifies the destination address to be sent. This CTC is only ran when IUT-Supports-Dynamic-Interface is TRUE. A user interface should allow the creation of new receive ports, receive operations on the receive ports that return the data octets and an indication of source port and source address, and an operation that allows a datagram to be sent, specifying the data, source and destination ports and addresses to be sent.
Reference	RFC 768:1980,[4] User Interface

Table 149 *(continued)*

Item	Content
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 7. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.5.5.
Step	1. The UT shall cause the IUT to send a UDP datagram with destination address set to All-Iface-0-IP through IUT-Iface-0. 2. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 2: The IUT sends a message. After step 2: The UT verifies that the LT application layer receives an IP datagram containing a UDP datagram that contains a destination IP address field set to All-Iface-0-IP.
Remark	—

7.5.6.6 CTC_UDP_INTRODUCTION – UDP introduction

Table 150 specifies the CTC_UDP_INTRODUCTION_01 – Introduction – Broadcast destination address test case.

Table 150 — CTC_UDP_INTRODUCTION_01 – Introduction – Broadcast destination address

Item	Content
CTC # – Title	CTC_UDP_INTRODUCTION_01 – Introduction – Broadcast destination address
Purpose	This CTC verifies that the IUT accepts the UDP datagram with broadcast destination address. UDP is used by applications that do not require the level of service of TCP or that wish to use communications services (e.g., multicast or broadcast delivery) not available from TCP.
Reference	RFC 1122:1989,[9] 4.1.1
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 7. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.5.5.
Step	1. IUT-CONFIGURE: Externally cause the IUT to listen on port Unused-UDP-Dest-Port-1 on IUT-Iface-0. 2. The LT shall send a message to the IUT through IUT-Iface-0 containing: — destination IP address field set to All-Iface-0-Broadcast-IP; — destination UDP port field set to Unused-UDP-Dest-Port-1.
Iteration	Not applicable
Expected response	After step 1: The IUT listens on port Unused-UDP-Dest-Port-1 on DIFACE-0. After step 2: The UT verifies that the IUT application layer received a UDP datagram that contains a destination address equal to AllIface-0-BcastIP.
Remark	—

Table 151 specifies the CTC_UDP_INTRODUCTION_00 – Introduction – Multicast destination address.

Table 151 — CTC_UDP_INTRODUCTION_01 – Introduction – Broadcast destination address

Item	Content
CTC # – Title	CTC_UDP_INTRODUCTION_01 – Introduction – Broadcast destination address
Purpose	This CTC verifies that the IUT denies a UDP datagram with broadcast destination address. This CTC inverts the RFC requirement due to security negotiations. UDP is used by applications that do not require the level of service of TCP or that wish to use communications services (e.g. multicast or broadcast delivery) not available from TCP.
Reference	RFC 1122:1989,[9] 4.1.1
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 7. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.5.5.
Step	1. IUT CONFIGURE: Externally cause the IUT to listen on port Unused-UDP-Dest-Port-1 on IUT-Iface-0. 2. The LT shall send a message to IUT through IUT-Iface-0 containing: — destination IP address field set to All-Iface-0-Broadcast-IP; — destination UDP port field set to Unused-UDP-Dest-Port-1.
Iteration	Not applicable
Expected response	After step 1: The IUT listens on port Unused-UDP-Dest-Port-1 on IUT-Iface-0. After step 2: The UT verifies that the IUT application layer did not receive a UDP datagram that contains a destination address equal to All-Iface-0-Broadcast-IP.
Remark	—

Table 152 specifies the CTC_UDP_INTRODUCTION_02 – Introduction – Multicast destination address.

Table 152 — CTC_UDP_INTRODUCTION_02 – Introduction – Multicast destination address

Item	Content
CTC # – Title	CTC_UDP_INTRODUCTION_02 – Introduction – Multicast destination address
Purpose	This CTC verifies that the IUT inverts the RFC requirement due to security negotiations. UDP is used by applications that do not require the level of service of TCP or that wish to use communications services (e.g., multicast or broadcast delivery) not available from TCP.
Reference	RFC 1122:1989,[9] 4.1.1
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 7. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.5.5.
Step	1. IUT CONFIGURE: Externally cause the IUT to listen on port Unused-UDP-Dest-Port-1 on IUT-Iface-0. 2. The LT shall send a message to the IUT through IUT-Iface-0 containing: — destination IP address field set to All-System-Multicast-Addr; — destination UDP port field set to Unused-UDP-Dest-Port-1.
Iteration	Not applicable

Table 152 *(continued)*

Item	Content
Expected response	After step 1: The IUT listens on port Unused-UDP-Dest-Port-1 on IUT-Iface-0. After step 2: The UT verifies that the IUT application layer does not receive a UDP datagram that contains a destination address equal to All-System-Multicast-Addr.
Remark	—

Table 153 specifies the CTC_UDP_INTRODUCTION_03 – Introduction – Pending listen call.

Table 153 — CTC_UDP_INTRODUCTION_03 – Introduction – Pending listen call

Item	Content
CTC # – Title	CTC_UDP_INTRODUCTION_03 – Introduction – Pending listen call
Purpose	This CTC verifies that a datagram arrives, that is addressed to a UDP port for which there is no pending LISTEN call, UDP SHOULD send an ICMP port unreachable message.
Reference	RFC 1122:1989,[9] 4.1.3.1
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 7. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.5.5.
Step	1. The LT shall send a message to the IUT through IUT-Iface-0 containing: — destination IP address field set to IUT-Iface-0-IP; — destination UDP port field set to Unused-UDP-Dest-Port-1. 2. The LT shall listen up to Param-Listen-Time on LT-Iface-0.
Iteration	Not applicable
Expected response	After step 2: The IUT sends the ICMP-Dest-Unrchbl message.
Remark	—

7.5.6.7 CTC_UDP_INVALID_ADDRESSES – Invalid addresses

Table 154 specifies the CTC_UDP_INVALID_ADDRESSES_01 – Invalid addresses – Multicast source address test case.

Table 154 — CTC_UDP_INVALID_ADDRESSES_01 – Invalid addresses – Multicast source address

Item	Content
CTC # – Title	CTC_UDP_INVALID_ADDRESSES_01 – Invalid addresses – Multicast source address
Purpose	This CTC verifies a UDP datagram with multicast address as source address. A UDP datagram received with an invalid IP source address (e.g. a broadcast or multicast address) is discarded by UDP or by the IP layer (see RFC 1122:1989,[9] 3.2.1.3).
Reference	RFC 1122:1989,[9] 4.1.3.6
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 7. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.5.5.

Table 154 *(continued)*

Item	Content
Step	1. IUT CONFIGURE: Externally cause the IUT to listen on port Unused-UDP-Dest-Port-1 on IUT-Iface-0. 2. The LT shall send a message to the IUT through IUT-Iface-0 containing: — source IP address field set to All-System-Multicast-Addr; — destination UDP port field set to Unused-UDP-Dest-Port-1; — UDP data field set to UDP-Default-Data.
Iteration	Not applicable
Expected response	After step 1: The IUT listens on port Unused-UDP-Dest-Port-1 on IUT-Iface-0. After step 2: The UT verifies that the LT application layer does not receive a UDP datagram containing UDP data field equal to UDP-Default-Data.
Remark	—

Table 155 specifies the CTC_UDP_INVALID_ADDRESSES_02 – Invalid addresses – Broadcast source address.

Table 155 — CTC_UDP_INVALID_ADDRESSES_02 – Invalid addresses – Broadcast source address

Item	Content
CTC # – Title	CTC_UDP_INVALID_ADDRESSES_02 – Invalid addresses – Broadcast source address
Purpose	This CTC verifies a UDP datagram with broadcast address as source address. A UDP datagram received with an invalid IP source address (e.g. a broadcast or multicast address) is discarded by UDP or by the IP layer (see RFC 1122:1989,[9] 3.2.1.3).
Reference	RFC 1122:1989,[9] 4.1.3.6
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 7. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.5.5.
Step	1. IUT CONFIGURE: Externally cause the IUT to listen on port Unused-UDP-Dest-Port-1 on IUT-Iface-0. 2. The LT shall send a message to the IUT through IUT-Iface-0 containing: — source IP address field set to All-Iface-0-Broadcast-IP; — destination UDP port field set to Unused-UDP-Dest-Port-1; — UDP data field set to UDP-Default-Data.
Iteration	Not applicable
Expected response	After step 1: The IUT listens on port Unused-UDP-Dest-Port-1 on IUT-Iface-0. After step 2: The UT verifies using the UT that the application layer does not get a UDP datagram containing UDP data field equal to UDP-Default-Data.
Remark	—

7.6 TL – Transmisison control protocol (TCP)

7.6.1 General

The objective of this subclause is to specify CTCs for the transmisison control protocol (TCP).

7.6.2 Referenced specification

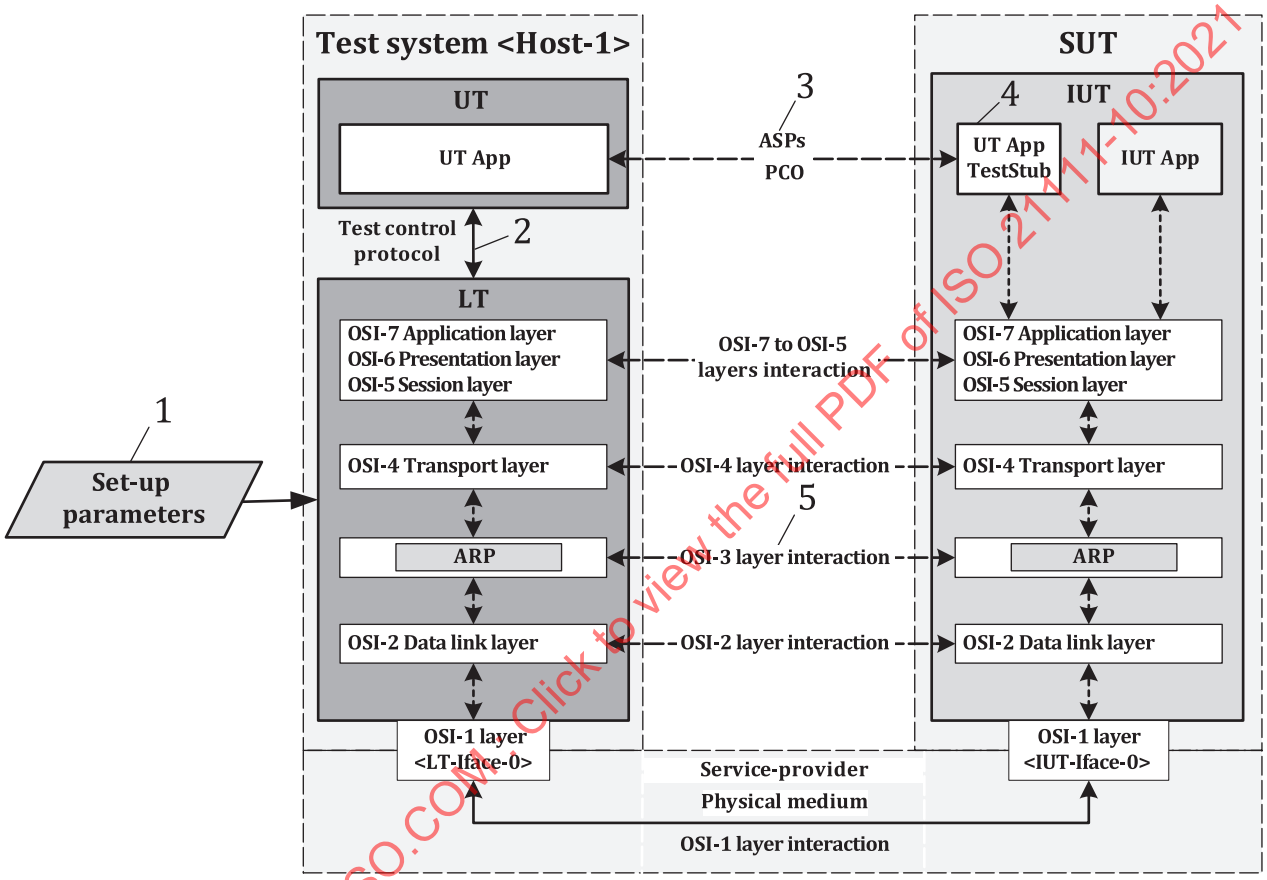
All CTCs in 7.6 are in accordance with these RFCs:

— RFC 793:1981,[7];

— RFC 1122:1989,[9].

7.6.3 Test system topology – TL – TCP

Figure 8 shows the test system topology – TL – TCP.



Key

1 IUT-specific set-up parameters (electronic data sheet)
2 test control protocol
3 PCO and ASPs based on ETS
4 UT TestStub application
5 OSI layer 4 TCP interaction

Figure 8 — Test system topology – TL – TCP

7.6.4 Test system topology and related CTC configuration

This test suite expects to be running against a TCP stack over Ethernet.

7.6.5 TCP parameters used in CTCs

Table 156 specifies the parameters used in TCP CTCs.

Table 156 — Parameters used in TCP CTCs

Parameter used in CTCs	Content
Number-Of-Data-Segments-Sent	The number of data segments sent consecutively from tester side to IUT
Data-Segment-Size	A data segment size that is much smaller than the effective send MSS should be less than the effective send MSS of IUT.
MTT	The maximum time within which the IUT shall send a segment from its transmit buffer irrespective of its size or whether it contains PSH flag bit set.
Well-Known-Port	A well-known port on the IUT where an application e.g. TELNET server is assumed to wait in LISTEN state.
Unimplemented-Option	An unimplemented TCP option on the IUT
MSL	The maximum segment lifetime used by the IUT.
Full-Window-Operation	The IUT's TCP has reached a state when it is allowed to send data segments of size of test system's entire receive window without getting any acknowledgement from the LT.
Full-Sized-Segment	Segment with size equal to the effective send MSS
Outside-The-Window	Outside the window of the receiver
Port-1	The port number the UT UDP communication is carried out through.
Seq-No-1	Sequence number 1 used to compare the sequence or acknowledgement numbers in the received or sent segments
Seq-No-2	Sequence number 2 used to compare the sequence or acknowledgement numbers in the received or sent segments
TCP-Segment-Type	Variable used to specify type of a TCP segment
Seq-Max-Val	Maximum value of sequence number

7.6.6 TCP CTCs

7.6.6.1 CTC_TCP_BASICS – Connection establishment and basic exercising of the state machine

Table 157 specifies the CTC_TCP_BASICS_01 – [listen] SYN - SYN/ACK [syn_recv] test case.

Table 157 — CTC_TCP_BASICS_01 – [listen] SYN - SYN/ACK [syn_recv]

Item	Content
CTC # – Title	CTC_TCP_BASICS_01 – [listen] SYN - SYN/ACK [syn_recv]
Purpose	This CTC verifies that the IUT sends a TCP segment with SYN and ACK flags set for a SYN received in LISTEN state.
Reference	RFC 793:1981,[7] 3.2
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The LT shall send a TCP segment with the SYN flag set.
Iteration	Not applicable
Expected response	After step 1: The IUT sends a TCP segment with the SYN and ACK flags set.
Remark	—

Table 158 specifies the CTC_TCP_BASICS_02 – [syn_recv] ACK - [ESTABLISHED].

Table 158 — CTC_TCP_BASICS_02 – [syn_recv] ACK - [ESTABLISHED]

Item	Content
CTC # – Title	CTC_TCP_BASICS_02 – [syn_recv] ACK - [ESTABLISHED]
Purpose	This CTC verifies that the IUT in SYN-RCVD state transits to ESTABLISHED state after receiving a TCP segment with an ACK flag set.
Reference	RFC 793:1981,[7] 3.2
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The LT shall send a TCP segment with an ACK flag set for the TCP segment with SYN and ACK flags set just received from the IUT.
Iteration	Not applicable
Expected response	After step 1: The LT verifies that the IUT transits to ESTABLISHED state.
Remark	—

Table 159 specifies the CTC_TCP_BASICS_03 – [ESTABLISHED] FIN - ACK [CLOSE_WAIT].

Table 159 — CTC_TCP_BASICS_03 – [ESTABLISHED] FIN - ACK [CLOSE_WAIT]

Item	Content
CTC # – Title	CTC_TCP_BASICS_03 – [ESTABLISHED] FIN - ACK [CLOSE_WAIT]
Purpose	This CTC verifies that the TCP sends a TCP segment with an ACK flag set for a FIN received in ESTABLISHED state.
Reference	RFC 793:1981,[7] 3.2
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The LT shall send a TCP segment with a FIN and ACK flag set.
Iteration	Not applicable
Expected response	After step 1: The IUT sends a TCP segment with an ACK flag set for the FIN.
Remark	—

Table 160 specifies the CTC_TCP_BASICS_04 – [CLOSED] data(no ack, no rst) - RST(seq 0) [CLOSED].

Table 160 — CTC_TCP_BASICS_04 – [CLOSED] data(no ack, no rst) - RST(seq 0) [CLOSED]

Item	Content
CTC # – Title	CTC_TCP_BASICS_04 – [CLOSED] data(no ack, no rst) - RST(seq 0) [CLOSED]
Purpose	This CTC verifies that the TCP, in CLOSED state, sends an RST with zero sequence number in response to an incoming TCP segment not containing RST or ACK flags.
Reference	RFC 793:1981,[7] 3.9
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.

Table 160 *(continued)*

Item	Content
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The LT shall send a TCP segment of type TCP-Segment.
Iteration	a) case: TCP-Segment = TCP segment with a SYN flag set. b) case: TCP-Segment = TCP segment with a FIN flag set. c) case: TCP-Segment = data segment.
Expected response	After step 1 case a) to c): The IUT sends a TCP segment with an RST flag with zero sequence number.
Remark	—

Table 161 specifies the CTC_TCP_BASICS_05 – [CLOSED] data(ack, no rst) - RST(seq - ack) [CLOSED].

Table 161 — CTC_TCP_BASICS_05 – [CLOSED] data(ack, no rst) - RST(seq - ack) [CLOSED]

Item	Content
CTC # – Title	CTC_TCP_BASICS_05 – [CLOSED] data(ack, no rst) - RST(seq - ack) [CLOSED]
Purpose	This CTC verifies that the TCP, in CLOSED state, sends an RST with sequence number taken from SEG.ACK in response to an incoming segment containing ACK and not containing RST.
Reference	RFC 793:1981,[7] 3.2
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The LT shall send a TCP segment of type TCP-Segment.
Iteration	a) case: TCP-Segment = TCP segment with SYN and ACK flags set. b) case: TCP-Segment = TCP segment with an ACK flag set.
Expected response	After step 1 case a) to b): The IUT sends a TCP segment with an RST flag set with sequence number same as the acknowledge number of the received TCP segment.
Remark	—

Table 162 specifies the CTC_TCP_BASICS_06 – [CLOSED] OPEN call - SYN.

Table 162 — CTC_TCP_BASICS_06 – [CLOSED] OPEN call - SYN

Item	Content
CTC # – Title	CTC_TCP_BASICS_06 – [CLOSED] OPEN call - SYN
Purpose	This CTC verifies that the TCP, in CLOSED state, sends a SYN flag on an active OPEN call.
Reference	RFC 793:1981,[7] 3.2
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.

Table 162 *(continued)*

Item	Content
Step	1. The UT shall cause the IUT application to issue an active OPEN call by using the service primitive CONNECT.
Iteration	Not applicable
Expected response	After step 1: The IUT sends a TCP segment with a SYN flag set.
Remark	—

Table 163 specifies the CTC_TCP_BASICS_07 – [syn_sent] SYN/ACK - ACK [ESTABLISHED].

Table 163 — CTC_TCP_BASICS_07 – [syn_sent] SYN/ACK - ACK [ESTABLISHED]

Item	Content
CTC # – Title	CTC_TCP_BASICS_07 – [syn_sent] SYN/ACK - ACK [ESTABLISHED]
Purpose	This CTC verifies that the TCP, in SYN-SENT state, moves to ESTABLISHED state after receiving SYN and ACK flags.
Reference	RFC 793:1981,[7] 3.2
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The LT shall send a TCP segment with SYN and ACK flags set for the SYN flag just received from the IUT.
Iteration	Not applicable
Expected response	After step 1: The IUT sends a TCP segment with an ACK flag set. After step 1: The LT verifies that the IUT transits to ESTABLISHED state.
Remark	—

Table 164 specifies the CTC_TCP_BASICS_08 – [established | CLOSE_WAIT] close - FIN [...].

Table 164 — CTC_TCP_BASICS_08 – [ESTABLISHED | CLOSE-WAIT] close - FIN [...]

Item	Content
CTC # – Title	CTC_TCP_BASICS_08 – [established | CLOSE_WAIT] close - FIN [...]
Purpose	This CTC verifies that the TCP sends a TCP segment with a FIN flag set on a CLOSE call in ESTABLISHED or CLOSE-WAIT state.
Reference	RFC 793:1981,[7] 3.2
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The UP shall cause the IUT to transit to TCP-State. 2. The UT shall cause the IUT application to issue a CLOSE call by using the service primitive CLOSE_SOCKET.
Iteration	a) case: TCP-State = ESTABLISHED; b) case: TCP-State = CLOSE-WAIT.

Table 164 *(continued)*

Item	Content
Expected response	After step 2 case a) to b):The IUT sends a TCP segment with a FIN flag set.
Remark	—

Table 165 specifies the CTC_TCP_BASICS_09 – [LAST-ACK] ACK of FIN - [CLOSED].

Table 165 — CTC_TCP_BASICS_09 – [LAST-ACK] ACK of FIN - [CLOSED]

Item	Content
CTC # – Title	CTC_TCP_BASICS_09 – [LAST-ACK] ACK of FIN - [CLOSED]
Purpose	This CTC verifies that the TCP, in LAST-ACK state, transists to CLOSED state after receiving a TCP segment with an ACK flag set for the previously transmitted FIN flag.
Reference	RFC 793:1981,[7] 3.2
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The UP shall cause the IUT to transit to LAST-ACK state. 2. The LT shall send an ACK flag for the FIN just received from the IUT. 3. The LT shall send a TCP segment without an RST flag set.
Iteration	Not applicable
Expected response	After step 3: The IUT sends a TCP segment with an RST flag set (this indicates that the IUT is in CLOSED state).
Remark	—

Table 166 specifies the CTC_TCP_BASICS_10 – [FIN-WAIT-1| FIN-WAIT-2] FIN - ACK.

Table 166 — CTC_TCP_BASICS_10 – [FIN-WAIT-1| FIN-WAIT-2] FIN - ACK

Item	Content
CTC # – Title	CTC_TCP_BASICS_10 – [FIN-WAIT-1| FIN-WAIT-2] FIN - ACK
Purpose	This CTC verifies that the TCP sends a TCP segment with an ACK flag for a FIN received in FIN-WAIT-1 or FIN-WAIT-2 state.
Reference	RFC 793:1981,[7] 3.2
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The UP shall cause the IUT to transit to TCP-State. 2. The LT shall send a TCP segment with a FIN flag set.
Iteration	a) case: TCP-State = FIN-WAIT-1; b) case: TCP-State = FIN-WAIT-2.
Expected response	After step 2 case a) to b):The IUT sends a TCP segment with an ACK flag set.

Table 166 *(continued)*

Item	Content
Remark	—

Table 167 specifies the CTC_TCP_BASICS_11 – [FIN-WAIT-2 - TIME-WAIT] delay(2 × MSL) - [CLOSED].

Table 167 — CTC_TCP_BASICS_11 – [FIN-WAIT-2 - TIME-WAIT] delay(2 × MSL) - [CLOSED]

Item	Content
CTC # – Title	CTC_TCP_BASICS_11 – [FIN-WAIT-2 - TIME-WAIT] delay(2 × MSL) - [CLOSED]
Purpose	This CTC verifies that the TCP, in TIME-WAIT state, moves on to CLOSED state after a timeout of 2 × MSL, where TIME-WAIT state is reached through FIN-WAIT-2 state.
Reference	RFC 793:1981,[7] 3.2
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The UP shall cause the IUT to transit to TIME-WAIT state, where TIME-WAIT state is reached through FIN-WAIT-2 state. 2. The LT shall send a TCP segment with a FIN flag set. 3. The LT shall send a TCP segment with a FIN flag set after 2 × MSL + 20 %.
Iteration	Not applicable
Expected response	After step 2: The IUT sends a TCP segment with an ACK flag set. After step 3: The IUT sends a TCP segment with an RST flag (this indicates that the IUT is in CLOSED state).
Remark	—

Table 168 specifies the CTC_TCP_BASICS_12 – [CLOSING - TIME-WAIT] delay(2 × MSL) - [CLOSED].

Table 168 — CTC_TCP_BASICS_12 – [CLOSING - TIME-WAIT] delay(2 × MSL) - [CLOSED]

Item	Content
CTC # – Title	CTC_TCP_BASICS_12 – [CLOSING - TIME-WAIT] delay(2 × MSL) - [CLOSED]
Purpose	This CTC verifies that the TCP, in TIME-WAIT state, transits to CLOSED state after a timeout of 2 × MSL, where TIME-WAIT is reached through CLOSING state.
Reference	RFC 793:1981,[7] 3.2
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The UP shall cause the IUT to transit to TIME-WAIT state, where TIME-WAIT state is reached through CLOSING state. 2. The LT shall send a TCP segment with an ACK flag set for the FIN flag just received from the IUT. 3. The LT shall send a TCP segment with a FIN flag set after 2 × MSL + 20 %.
Iteration	Not applicable

Table 168 *(continued)*

Item	Content
Expected response	After step 3: The IUT sends a TCP segment with an RST flag set (this indicates that the IUT is in CLOSED state).
Remark	—

Table 169 specifies the CTC_TCP_BASICS_13 – [FIN-WAIT-2- TIME-WAIT] delay(2 × MSL) - no change yet.

Table 169 — CTC_TCP_BASICS_13 – [FIN-WAIT-2- TIME-WAIT] delay(2 × MSL) - no change yet

Item	Content
CTC # – Title	CTC_TCP_BASICS_13 – [FIN-WAIT-2- TIME-WAIT] delay(2 × MSL) - no change yet
Purpose	This CTC verifies that the TCP, in TIME-WAIT state, does not move to CLOSED state before expiration of 2 × MSL time, where TIME-WAIT is reached through FIN-WAIT-2 state.
Reference	RFC 793:1981,[7] 3.2
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5. The IUT shall be in FIN-WAIT-2 state.
Step	1. The UP shall cause the IUT to transit to TIME-WAIT state, where TIME-WAIT state is reached through FIN-WAIT-2 state. 2. The LT shall send a TCP segment with a FIN flag set. 3. The LT shall send a TCP segment with a FIN flag set within 2 × MSL.
Iteration	Not applicable
Expected response	After step 2: The IUT sends a TCP segment with an ACK flag set. After step 3: The IUT sends a TCP segment with an ACK flag set.
Remark	—

Table 170 specifies the CTC_TCP_BASICS_14 – [CLOSING - TIME-WAIT] delay(2 × MSL) - no change yet.

Table 170 — CTC_TCP_BASICS_14 – [CLOSING - TIME-WAIT] delay(2 × MSL) - no change yet

Item	Content
CTC # – Title	CTC_TCP_BASICS_14 – [CLOSING - TIME-WAIT] delay(2 × MSL) - no change yet
Purpose	This CTC verifies that the TCP, in TIME-WAIT state, does not transit to CLOSED state before expiration of 2 × MSL time, where TIME-WAIT is reached through CLOSING state.
Reference	RFC 793:1981,[7] 3.2
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.

Table 170 *(continued)*

Item	Content
Step	1. The UT shall cause the IUT to transit to TIME-WAIT state, where TIME-WAIT state is reached through CLOSING state. 2. The LT shall send a TCP segment with an ACK flag set for the FIN flag just received from the IUT. 3. The LT shall send a TCP segment with a FIN flag set within 2 × MSL.
Iteration	Not applicable
Expected response	After step 3: The IUT sends sends a TCP segment with an ACK flag set.
Remark	—

Table 171 specifies the CTC_TCP_BASICS_17 – Simultaneous open call.

Table 171 — CTC_TCP_BASICS_17 – Simultaneous open call

Item	Content
CTC # – Title	CTC_TCP_BASICS_17 – Simultaneous open call
Purpose	This CTC verifies that the TCP supports simultaneous OPEN attempts.
Reference	RFC 1122:1989,[9] 4.2.2.10
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The UT shall cause the IUT application to issue an active open call by using the service primitive CONNECT. 2. The LT shall send a TCP segment with a SYN flag set simultaneously. 3. The LT shall send a TCP segment with SYN and ACK flags set for the SYN flag received from the IUT.
Iteration	Not applicable
Expected response	After step 1: The IUT sends a TCP segment with a SYN flag set. After step 2: The IUT sends a TCP segment with SYN and ACK flags for the SYN flag just received. After step 3: The IUT sends a TCP segment with an ACK flag for the SYN and ACK flags just received. After step 3: The LT verifies that the IUT transits to ESTABLISHED state.
Remark	—

7.6.6.2 CTC_TCP_CHECKSUM – Processing and generating TCP checksums

Table 172 specifies the CTC_TCP_CHECKSUM_01 – Receiver check – checksum ok test case.

Table 172 — CTC_TCP_CHECKSUM_01 – Receiver check – checksum ok

Item	Content
CTC # – Title	CTC_TCP_CHECKSUM_01 – Receiver check – checksum ok
Purpose	This CTC verifies that the receiver TCP checks the checksum in any incoming segment and acknowledges in case of no error.

Table 172 *(continued)*

Item	Content
Reference	RFC 1122:1989,[9] 4.2.2.7; RFC 793:1981,[7] 3.1.
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The UP shall cause the IUT to transit to ESTABLISHED state. 2. The LT shall send a TCP data segment with correct checksum.
Iteration	Not applicable
Expected response	After step 2: The IUT sends a TCP segment with an ACK flag set for the TCP data segment just received.
Remark	—

Table 173 specifies the CTC_TCP_CHECKSUM_02 – Receiver check – Checksum not ok.

Table 173 — CTC_TCP_CHECKSUM_02 – Receiver check – Checksum not ok

Item	Content
CTC # – Title	CTC_TCP_CHECKSUM_02 – Receiver check – Checksum not ok
Purpose	This CTC verifies that the receiver TCP checks the checksum in any incoming segment and does not acknowledge in case of an error.
Reference	RFC 1122:1989,[9] 4.2.2.7; RFC 793:1981,[7] 3.1.
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The UP shall cause the IUT to transit to ESTABLISHED state. 2. The LT shall send a TCP data segment with incorrect checksum.
Iteration	Not applicable
Expected response	After step 2: The IUT does not send a TCP segment with an ACK flag set.
Remark	—

Table 174 specifies the CTC_TCP_CHECKSUM_03 – Sender computes checksum.

Table 174 — CTC_TCP_CHECKSUM_03 – Sender computes checksum

Item	Content
CTC # – Title	CTC_TCP_CHECKSUM_03 – Sender computes checksum
Purpose	This CTC verifies that the IUT generates a correct checksum.
Reference	RFC 1122:1989,[9] 4.2.2.7; RFC 793:1981,[7] 3.1.

Table 174 *(continued)*

Item	Content
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The UP shall cause the IUT to transit to ESTABLISHED state. 2. The UT shall cause the IUT application to issue a send request by using the service primitive SEND_DATA.
Iteration	Not applicable
Expected response	After step 2: The IUT sends the TCP data segment. After step 2: The LT verifies that the TCP segment contains the correct checksum.
Remark	—

Table 175 specifies the CTC_TCP_CHECKSUM_04 – Use clock-driven ISN selection.

Table 175 — CTC_TCP_CHECKSUM_04 – Use clock-driven ISN selection

Item	Content
CTC # – Title	CTC_TCP_CHECKSUM_04 – Use clock-driven ISN selection
Purpose	This CTC verifies that a TCP uses the specified clock-driven selection of initial sequence numbers. This CTC checks that ISN changes with each new connection.
Reference	RFC 1122:1989,[9] 4.2.2.9; RFC 793:1981,[7] 3.3.
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The UT shall cause the IUT application to issue an active open call by using the service primitive CONNECT. 2. The LT shall send a TCP segment with RST and ACK flags set to transit the IUT to CLOSED state. 3. The UT shall cause the IUT application to issue another active open call by using the service primitive CONNECT.
Iteration	Not applicable
Expected response	After step 1: The IUT sends a TCP segment with the SYN flag set. After step 3: The IUT sends a TCP segment with the SYN flag set. After step 3: The LT verifies that the sequence number of the recent TCP segment with the SYN flag set is different from the sequence number of the previous TCP segment with the SYN flag set.
Remark	—

7.6.6.3 CTC_TCP_UNACCEPTABLE – Processing unacceptable acknowledgments and out-of-window sequence numbers

Table 176 specifies the CTC_TCP_UNACCEPTABLE_01 – [syn-recv] RST - [listen] (passive open) test case.

Table 176 — CTC_TCP_UNACCEPTABLE_01 – [syn-recv] RST - [listen] (passive open)

Item	Content
CTC # – Title	CTC_TCP_UNACCEPTABLE_01 – [syn-recv] RST - [listen] (passive open)
Purpose	This CTC verifies that the TCP returns to LISTEN state on receiving an acceptable RST in SYN-RCVD state, where SYN-RCVD is reached through LISTEN state.
Reference	RFC 793:1981,[7] 3.4
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The UT shall cause the IUT to transit to SYN-RCVD state reached through LISTEN state. 2. The LT shall send a TCP segment with the RST flag set (as if the TCP segment with the SYN and ACK flags set just received from the IUT was unexpected).
Iteration	Not applicable
Expected response	After step 2: The IUT does not send a TCP segment in response. After step 2: The LT verifies that the IUT transits to LISTEN state.
Remark	—

Table 177 specifies the CTC_TCP_UNACCEPTABLE_02 – [syn-recv] RST out-of-window - [syn-recv].

Table 177 — CTC_TCP_UNACCEPTABLE_02 – [syn-recv] RST out-of-window - [syn-recv]

Item	Content
CTC # – Title	CTC_TCP_UNACCEPTABLE_02 – [syn-recv] RST out-of-window - [syn-recv]
Purpose	This CTC verifies that the TCP does not change state on receiving an unacceptable RST in SYN-RCVD state.
Reference	RFC 793:1981,[7] 3.4
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The UT shall cause the IUT to transit to SYN-RCVD state. 2. The LT shall send a TCP segment with an RST flag set with a sequence number outside the receive window of the IUT.
Iteration	Not applicable
Expected response	After step 2: The IUT does not send a TCP segment in response. After step 2: The UT verifies that the IUT remains in SYN-RCVD state.
Remark	—

Table 178 specifies the CTC_TCP_UNACCEPTABLE_03 – [syn-recv] unacceptable ACK - RST [syn-recv].

Table 178 — CTC_TCP_UNACCEPTABLE_03 – [syn-recv] unacceptable ACK - RST [syn-recv]

Item	Content
CTC # – Title	CTC_TCP_UNACCEPTABLE_03 – [syn-recv] unacceptable ACK - RST [syn-recv]
Purpose	This CTC verifies that the TCP sends an RST after receiving an unacceptable ACK in SYN-RCVD state.

Table 178 *(continued)*

Item	Content
Reference	RFC 793:1981,[Z] 3.4
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The UT shall cause the IUT to transit to SYN-RCVD state. 2. The LT shall send a TCP segment with an ACK flag set with an unacceptable acknowledge number.
Iteration	Not applicable
Expected response	After step 2: The IUT sends a TCP segment with an RST flag set.
Remark	—

Table 179 specifies the CTC_TCP_UNACCEPTABLE_04 – [ESTABLISHED] out-of-window SEQ/unacceptable ACK - empty message with sequence [ESTABLISHED].

Table 179 — CTC_TCP_UNACCEPTABLE_04 – [ESTABLISHED] out-of-window SEQ/unacceptable ACK - empty message with sequence [ESTABLISHED]

Item	Content
CTC # – Title	CTC_TCP_UNACCEPTABLE_04 – [ESTABLISHED] out-of-window SEQ/unacceptable ACK - empty message with sequence [ESTABLISHED]
Purpose	This CTC verifies that the TCP, in ESTABLISHED state, sends a TCP segment with an ACK flag set and proper sequence and acknowledge number in response to a TCP data segment with out-of-window sequence number or unacceptable acknowledge number and the connection remains in the same state.
Reference	RFC 793:1981,[Z] 3.4
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The UT shall cause the IUT to transit to ESTABLISHED state. 2. The LT shall send a TCP segment of type TCP-Segment.
Iteration	a) case: TCP-Segment = TCP data segment with Out-Of-Window sequence number. b) case: TCP-Segment = TCP data segment with an unacceptable acknowledge number.
Expected response	After step 2 case a) to b):The IUT sends a TCP segment with an ACK flag set and with current sequence number and the acknowledge number indicating the next sequence number expected. After step 2 case a) to b):The IUT remains in the ESTABLISHED state.
Remark	—

Table 180 specifies the CTC_TCP_UNACCEPTABLE_05 – [listen] unacceptable ACK - RST [listen].

Table 180 — CTC_TCP_UNACCEPTABLE_05 – [listen] unacceptable ACK - RST [listen]

Item	Content
CTC # – Title	CTC_TCP_UNACCEPTABLE_05 – [listen] unacceptable ACK - RST [listen]
Purpose	This CTC verifies that the TCP, in LISTEN state, sends an RST flag set after receiving a TCP segment that is carrying an unacceptable ACK flag and the connection remains in the same state.
Reference	RFC 793:1981,[7] 3.4
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The UT shall cause the IUT to transit to LISTEN state. 2. The LT shall send a TCP segment of type TCP-Segment.
Iteration	a) case: TCP-Segment = TCP segment with SYN and ACK flags set and with unacceptable acknowledge number; b) case: TCP-Segment = TCP segment with an ACK flag set and with unacceptable acknowledge number.
Expected response	After step 2 case a) to b):The IUT sends a TCP segment with an RST flag set. After step 2 case a) to b):The IUT remains in LISTEN state.
Remark	—

Table 181 specifies the CTC_TCP_UNACCEPTABLE_06 – [ESTABLISHED] out-of-window SYN - ACK (seq) [ESTABLISHED].

Table 181 — CTC_TCP_UNACCEPTABLE_06 – [ESTABLISHED] out-of-window SYN - ACK (seq) [ESTABLISHED]

Item	Content
CTC # – Title	CTC_TCP_UNACCEPTABLE_06 – [ESTABLISHED] out-of-window SYN - ACK (seq) [ESTABLISHED]
Purpose	This CTC verifies that the TCP, in ESTABLISHED state, sends a TCP segment with an ACK flag set, indicating the correct sequence number it expects, after receiving a SYN with an out-of-window sequence number.
Reference	RFC 793:1981,[7] 3.4
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The UT shall cause the IUT to transit to ESTABLISHED state. 2. The LT shall send a TCP segment with a SYN flag set with an Out-Of-Window sequence number.
Iteration	Not applicable
Expected response	After step 2: The IUT sends a TCP segment with an ACK flag set and an acknowledge number indicating the next expected sequence number.
Remark	—

Table 182 specifies the CTC_TCP_UNACCEPTABLE_07 – [listen] old SYN/ACK - RST [listen].

Table 182 — CTC_TCP_UNACCEPTABLE_07 – [listen] old SYN/ACK - RST [listen]

Item	Content
CTC # – Title	CTC_TCP_UNACCEPTABLE_07 – [listen] old SYN/ACK - RST [listen]
Purpose	This CTC verifies that the TCP, in LISTEN state, sends an RST after receiving a spurious SYN, ACK that potentially corresponds to an old SYN.
Reference	RFC 793:1981,[7] 3.4
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The UT shall cause the IUT to transit to LISTEN state. 2. The LT shall send a TCP segment with a SYN and ACK flag set.
Iteration	Not applicable
Expected response	After step 2: The IUT sends a TCP segment with an RST flag set.
Remark	—

Table 183 specifies the CTC_TCP_UNACCEPTABLE_08 – [syn-sent] unacceptable ACK - RST (seq).

Table 183 — CTC_TCP_UNACCEPTABLE_08 – [syn-sent] unacceptable ACK - RST (seq)

Item	Content
CTC # – Title	CTC_TCP_UNACCEPTABLE_08 – [syn-sent] unacceptable ACK - RST (seq)
Purpose	This CTC verifies that the TCP, in SYN-SENT state, sends an RST in response to a segment that acknowledges something not yet sent (the segment carries an unacceptable ACK).
Reference	RFC 793:1981,[7] 3.4
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The UT shall cause the IUT to transit to SYN-SENT state. 2. The LT shall send a TCP segment of type TCP-Segment.
Iteration	a) case: TCP-Segment = TCP segment with SYN and ACK flags set and with unacceptable acknowledge number. b) case: TCP-Segment = TCP segment with an ACK flag set and with unacceptable acknowledge number.
Expected response	After step 2 case a) to b): The IUT sends a TCP segment with an RST flag set with sequence number same as the acknowledge number of the incoming segment.
Remark	—

Table 184 specifies the CTC_TCP_UNACCEPTABLE_09 – [FIN-WAIT-1] out-of-window sequence | unacceptable ACK - ACK (seq, ack) [FIN-WAIT-1].

Table 184 — CTC_TCP_UNACCEPTABLE_09 – [FIN-WAIT-1] out-of-window sequence | unacceptable ACK - ACK (seq, ack) [FIN-WAIT-1]

Item	Content
CTC # – Title	CTC_TCP_UNACCEPTABLE_09 – [FIN-WAIT-1] out-of-window sequence | unacceptable ACK - ACK (seq, ack) [FIN-WAIT-1]
Purpose	This CTC verifies that the TCP, in FIN-WAIT-1 state, sends a TCP segment with an ACK flag set and proper sequence and acknowledge number in response to a TCP data segment with out-of-window sequence number or unacceptable acknowledge number and the connection remains in the same state.
Reference	RFC 793:1981,[7] 3.4
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The UT shall cause the IUT to transit to FIN-WAIT-1 state. 2. The LT shall send a TCP segment of type TCP-Segment.
Iteration	a) case: TCP-Segment = data segment with Out-Of-Window sequence number. b) case: TCP-Segment = data segment with an unacceptable acknowledge number.
Expected response	After step 2 case a) to b):The IUT sends a TCP segment with an ACK flag set and with current sequence number and acknowledge number indicating next sequence number expected. After step 2 case a) to b):The IUT remains in FIN-WAIT-1 state.
Remark	—

Table 185 specifies the CTC_TCP_UNACCEPTABLE_10 – [FIN-WAIT-2] out-of-window sequence | unacceptable ACK - ACK (seq, ack) [FIN-WAIT-2].

Table 185 — CTC_TCP_UNACCEPTABLE_10 – [FIN-WAIT-2] out-of-window sequence | unacceptable ACK - ACK (seq, ack) [FIN-WAIT-2]

Item	Content
CTC # – Title	CTC_TCP_UNACCEPTABLE_10 – [FIN-WAIT-2] out-of-window sequence | unacceptable ACK - ACK (seq, ack) [FIN-WAIT-2]
Purpose	This CTC verifies that the TCP, in FIN-WAIT-2 state, sends a TCP segment with an ACK flag set and proper sequence and acknowledge number in response to a TCP data segment with out-of-window sequence number or unacceptable acknowledge number and the connection remains in the same state.
Reference	RFC 793:1981,[7] 3.4
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The UT shall cause the IUT to transit to FIN-WAIT-2 state. 2. The LT shall send a TCP segment of type TCP-Segment.
Iteration	a) case: TCP-Segment = data segment with Out-Of-Window sequence number. b) case: TCP-Segment = data segment with an unacceptable acknowledge number.

Table 185 *(continued)*

Item	Content
Expected response	After step 2 case a) to b):The IUT sends a TCP segment with an ACK flag set and with current sequence number and acknowledge number indicating next sequence number expected. After step 2 case a) to b):The IUT remains in FIN-WAIT-2 state.
Remark	—

Table 186 specifies the CTC_TCP_UNACCEPTABLE_11 – [CLOSING] out-of-window sequence | unacceptable ACK - ACK (seq, ack) [CLOSING].

Table 186 — CTC_TCP_UNACCEPTABLE_11 – [CLOSING] out-of-window sequence | unacceptable ACK - ACK (seq, ack) [CLOSING]

Item	Content
CTC # – Title	CTC_TCP_UNACCEPTABLE_11 – [CLOSING] out-of-window sequence | unacceptable ACK - ACK (seq, ack) [CLOSING]
Purpose	This CTC verifies that the TCP, in CLOSING state, sends a TCP segment with an ACK flag set and proper sequence and acknowledge number in response to a TCP data segment with out-of-window sequence number or unacceptable acknowledge number and the connection remains in the same state.
Reference	RFC 793:1981,[7] 3.4
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The UT shall cause the IUT to transit to CLOSING state. 2. The LT shall send a TCP segment of type TCP-Segment.
Iteration	a) case: TCP-Segment = data segment with Out-Of-Window sequence number. b) case: TCP-Segment = data segment with an unacceptable acknowledge number.
Expected response	After step 2 case a) to b):The IUT sends a TCP segment with an ACK flag set and with current sequence number and acknowledge number indicating next sequence number expected. After step 2 case a) to b):The IUT remains in CLOSING state.
Remark	—

Table 187 specifies the CTC_TCP_UNACCEPTABLE_12 – [LAST-ACK] out-of-window sequence | unacceptable ACK - ACK (seq, ack) [LAST-ACK].

Table 187 — CTC_TCP_UNACCEPTABLE_12 – [LAST-ACK] out-of-window sequence | unacceptable ACK - ACK (seq, ack) [LAST-ACK]

Item	Content
CTC # – Title	CTC_TCP_UNACCEPTABLE_12 – [LAST-ACK] out-of-window sequence | unacceptable ACK - ACK (seq, ack) [LAST-ACK]
Purpose	This CTC verifies that the TCP, in LAST-ACK state, sends a TCP segment with an ACK flag set and proper sequence and acknowledge number in response to a TCP data segment with out-of-window sequence number or unacceptable acknowledge number and the connection remains in the same state.
Reference	RFC 793:1981,[7] 3.4

Table 187 *(continued)*

Item	Content
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The UT shall cause the IUT to transit to LAST-ACK state. 2. The LT shall send a TCP segment of type TCP-Segment.
Iteration	a) case: TCP-Segment = data segment with Out-Of-Window sequence number. b) case: TCP-Segment = data segment with an unacceptable acknowledge number.
Expected response	After step 2 case a) to b):The IUT sends a TCP segment with an ACK flag set and with current sequence number and acknowledge number indicating next sequence number expected. After step 2 case a) to b):The IUT remains in LAST-ACK state.
Remark	—

Table 188 specifies the CTC_TCP_UNACCEPTABLE_13 – [TIME-WAIT] out-of-window sequence | unacceptable ACK - ACK (seq, ack) [TIME-WAIT].

Table 188 — CTC_TCP_UNACCEPTABLE_13 – [TIME-WAIT] out-of-window sequence | unacceptable ACK - ACK (seq, ack) [TIME-WAIT]

Item	Content
CTC # – Title	CTC_TCP_UNACCEPTABLE_13 – [TIME-WAIT] out-of-window sequence | unacceptable ACK - ACK (seq, ack) [TIME-WAIT]
Purpose	This CTC verifies that the TCP, in TIME-WAIT state, sends a TCP segment with an ACK flag set and proper sequence and acknowledge number in response to a TCP data segment with out-of-window sequence number or unacceptable acknowledge number and the connection remains in the same state.
Reference	RFC 793:1981 [7] 3.4
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The UT shall cause the IUT to transit to TIME-WAIT state. 2. The LT shall send a TCP segment of type TCP-Segment.
Iteration	a) case: TCP-Segment = data segment with Out-Of-Window sequence number. b) case: TCP-Segment = data segment with an unacceptable acknowledge number.
Expected response	After step 2 case a) to b):The IUT sends a TCP segment with an ACK flag set and with current sequence number and acknowledge number indicating next sequence number expected. After step 2 case a) to b):The IUT remains in TIME-WAIT state.
Remark	—

Table 189 specifies the CTC_TCP_UNACCEPTABLE_14 – [CLOSE-WAIT] out-of-window sequence | unacceptable ACK - ACK (seq, ack) [CLOSE-WAIT].

Table 189 — CTC_TCP_UNACCEPTABLE_14 – [CLOSE-WAIT] out-of-window sequence | unacceptable ACK - ACK (seq, ack) [CLOSE-WAIT]

Item	Content
CTC # – Title	CTC_TCP_UNACCEPTABLE_14 – [CLOSE-WAIT] out-of-window sequence | unacceptable ACK - ACK (seq, ack) [CLOSE-WAIT]
Purpose	This CTC verifies that the TCP, in CLOSE-WAIT state, sends a TCP segment with an ACK flag set and proper sequence and acknowledge number in response to a TCP data segment with out-of-window sequence number or unacceptable acknowledge number and the connection remains in the same state.
Reference	RFC 793:1981,[7] 3.4
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The UT shall cause the IUT to transit to CLOSE-WAIT state. 2. The LT shall send a TCP segment of type TCP-Segment.
Iteration	a) case: TCP-Segment = data segment with Out-Of-Window sequence number. b) case: TCP-Segment = data segment with an unacceptable acknowledge number.
Expected response	After step 2 case a) to b):The IUT sends a TCP segment with an ACK flag set and with current sequence number and acknowledge number indicating next sequence number expected. After step 2 case a) to b):The IUT remains in CLOSE-WAIT state.
Remark	—

7.6.6.4 CTC_TCP_CALL_RECEIVE – Processing TCP RECEIVE calls received from the application layer

Table 190 specifies the CTC_TCP_CALL_RECEIVE_04 – Receive: Reassemble queues incoming segments [established | FIN-WAIT-1| FIN-WAIT-2] test case.

Table 190 — CTC_TCP_CALL_RECEIVE_04 – Receive: Reassemble queues incoming segments [established | FIN-WAIT-1| FIN-WAIT-2]

Item	Content
CTC # – Title	CTC_TCP_CALL_RECEIVE_04 – Receive: Reassemble queues incoming segments [established | FIN-WAIT-1| FIN-WAIT-2]
Purpose	This CTC verifies that the TCP reassembles queued incoming segments and returns the data to the application, if a RECEIVE call arrives in ESTABLISHED, FINWAIT-1 or FINWAIT-2 state.
Reference	RFC 793:1981,[7] 3.9
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.

Table 190 *(continued)*

Item	Content
Step	1. The UT shall cause the IUT to transit to TCP-State. 2. The LT shall send Number-Of-Data-Segments-Sent number of small sized Data-Segment-Size data segments. 3. The UT shall cause the IUT application to issue a RECEIVE call by using the service primitive RECEIVE_AND_FORWARD requesting data of length Number-Of-Data-Segments-Sent × Data-Segment-Size.
Iteration	a) case: TCP-State = ESTABLISHED state. b) case: TCP-State = FINWAIT-1 state. c) case: TCP-State = FINWAIT-2 state.
Expected response	After step 3 case a) to c): The IUT responds with the reassembled data of length Number-Of-Data-Segments-Sent × Data-Segment-Size.
Remark	—

Table 191 specifies the CTC_TCP_CALL_RECEIVE_05 – Receive – Queued data [CLOSE-WAIT].

Table 191 — CTC_TCP_CALL_RECEIVE_05 – Receive – Queued data [CLOSE-WAIT]

Item	Content
CTC # – Title	CTC_TCP_CALL_RECEIVE_05 – Receive – Queued data [CLOSE-WAIT]
Purpose	This CTC verifies that the TCP returns the data to the application, if a RECEIVE call arrives in CLOSE-WAIT state and there is data awaiting delivery.
Reference	RFC 793:1981,[7] 3.9
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The UT shall cause the IUT to transit to ESTABLISHED state. 2. The LT shall send a data segment with a FIN flag set. 3. The UT shall cause the IUT application to issue a RECEIVE call by using the service primitive RECEIVE_AND_FORWARD. 4. The IUT shall issue a RECEIVE call.
Iteration	Not applicable
Expected response	After step 4: The UT verifies that the IUT responds with the received data.
Remark	—

7.6.6.5 CTC_TCP_CALL_ABORT – Processing TCP ABORT Calls Received from the Application layer

Table 192 specifies the CTC_TCP_CALL_ABORT_02 – Abort – Closing connection [ESTABLISHED] - [CLOSED] test case.

Table 192 — CTC_TCP_CALL_ABORT_02 – Abort – Closing connection [ESTABLISHED] - [CLOSED]

Item	Content
CTC # – Title	CTC_TCP_CALL_ABORT_02 – Abort – Closing connection [ESTABLISHED] - [CLOSED]
Purpose	This CTC verifies that the TCP enters CLOSED state if an ABORT call arrives in ESTABLISHED state.
Reference	RFC 793:1981,[Z] 3.9
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The UT shall cause the IUT to transit to ESTABLISHED state. 2. The UT shall cause the IUT application to issue an ABORT call by using the service primitive CLOSE_SOCKET.
Iteration	Not applicable
Expected response	After step 2: The IUT sends a TCP segment with an RST flag set. After step 3: The LT verifies that the IUT transits to CLOSED state.
Remark	—

Table 193 specifies the CTC_TCP_CALL_ABORT_03 – Abort – Closing connection [CLOSING | LAST-ACK | TIME-WAIT] - [CLOSED].

Table 193 — CTC_TCP_CALL_ABORT_03 – Abort – Closing connection [CLOSING | LAST-ACK | TIME-WAIT] - [CLOSED]

Item	Content
CTC # – Title	CTC_TCP_CALL_ABORT_03 – Abort – Closing connection [CLOSING | LAST-ACK | TIME-WAIT] - [CLOSED]
Purpose	This CTC verifies that the TCP enters CLOSED state if an ABORT call arrives in CLOSING, LAST-ACK or TIME-WAIT state.
Reference	RFC 793:1981,[Z] 3.9
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The UT shall cause the IUT to transit to TCP-State state. 2. The UT shall cause the IUT application to issue an ABORT call by using the service primitive CLOSE_SOCKET.
Iteration	a) case: TCP-State = CLOSING state. b) case: TCP-State = LAST-ACK state. c) case: TCP-State = TIME-WAIT state.
Expected response	After step 2 case a) to c): The IUT issues an ABORT call. After step 2 case a) to c): The IUT transits to CLOSED state.
Remark	

7.6.6.6 CTC_TCP_FLAGS_INVALID – TCP segment flag generation in response to receiving invalid segments

Table 194 specifies the CTC_TCP_FLAGS_INVALID_01 – [listen] RST - ignore test case.

Table 194 — CTC_TCP_FLAGS_INVALID_01 – [listen] RST - ignore

Item	Content
CTC # – Title	CTC_TCP_FLAGS_INVALID_01 – [listen] RST - ignore
Purpose	This CTC verifies that the TCP ignores an incoming segment withan RST flag set in LISTEN state.
Reference	RFC 793:1981,[7] 3.9
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The UT shall cause the IUT to transit to LISTEN state at a Well-Known-Port. 2. The LT shall send a TCP segment with SYN and RST flags set.
Iteration	Not applicable
Expected response	After step 2: The IUT sends any response. After step 2: The LT verifies that the IUT remains in the LISTEN state.
Remark	—

Table 195 specifies the CTC_TCP_FLAGS_INVALID_02 – [listen] ACK- RST(seq - ack) [listen].

Table 195 — CTC_TCP_FLAGS_INVALID_02 – [listen] ACK- RST(seq - ack) [listen]

Item	Content
CTC # – Title	CTC_TCP_FLAGS_INVALID_02 – [listen] ACK- RST(seq - ack) [listen]
Purpose	This CTC verifies that the TCP in LISTEN state sends RST in response to an incoming segment with an ACK flag set and remains in the same state. The sequence number of RST is taken from SEG.ACK.
Reference	RFC 793:1981,[7] 3.9
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The UT shall cause the IUT to transit to LISTEN state at a Well-Known-Port. 2. The LT shall send a TCP segment with SYN and ACK flags set.
Iteration	Not applicable
Expected response	After step 2: The IUT sends an RST control message with sequence number same as the acknowledge number of the incoming segment. After step 2: The LT verifies that the IUT remains in the LISTEN state.
Remark	—

Table 196 specifies the CTC_TCP_FLAGS_INVALID_03 – [syn-sent] ACK/RST- ignore.

Table 196 — CTC_TCP_FLAGS_INVALID_03 – [syn-sent] ACK/RST- ignore

Item	Content
CTC # – Title	CTC_TCP_FLAGS_INVALID_03 – [syn-sent] ACK/RST- ignore
Purpose	This CTC verifies that the TCP in SYN-SENT state ignores a segment carrying an unacceptable ACK and RST.
Reference	RFC 793:1981,[7] 3.9
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5. The IUT shall be in SYN-SENT state.
Step	1. The UT shall cause the IUT to transit to SYN-SENT state. 2. The LT shall send a TCP segment with ACK and RST flags set with an unacceptable acknowledge number.
Iteration	Not applicable
Expected response	After step 2: The IUT sends any response. After step 2: The LT verifies that the IUT remains in SYN-SENT state.
Remark	—

Table 197 specifies the CTC_TCP_FLAGS_INVALID_04 – [syn-sent] RST- ignore.

Table 197 — CTC_TCP_FLAGS_INVALID_04 – [syn-sent] RST- ignore

Item	Content
CTC # – Title	CTC_TCP_FLAGS_INVALID_04 – [syn-sent] RST- ignore
Purpose	This CTC verifies that the TCP, in SYN-SENT state ignores an RST control message.
Reference	RFC 793:1981,[7] 3.9
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The UT shall cause the IUT to transit to SYN-SENT state. 2. The LT shall send an RST control message.
Iteration	Not applicable
Expected response	After step 2: The IUT sends any response. After step 2: The LT verifies that the IUT remains in SYN-SENT state.
Remark	—

Table 198 specifies the CTC_TCP_FLAGS_INVALID_05 – [syn-sent] ACK/RST- [CLOSED].

Table 198 — CTC_TCP_FLAGS_INVALID_05 – [syn-sent] ACK/RST- [CLOSED]

Item	Content
CTC # – Title	CTC_TCP_FLAGS_INVALID_05 – [syn-sent] ACK/RST- [CLOSED]
Purpose	This CTC verifies that the TCP, in SYN-SENT state moves on to CLOSED state after receiving a segment with ACK and RST flags set and acceptable acknowledge number.

Table 198 *(continued)*

Item	Content
Reference	RFC 793:1981,[7] 3.9
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The UT shall cause the IUT to transit to SYN-SENT state. 2. The LT shall send a TCP segment of type TCP-Segment with an RST flag set and with an acceptable acknowledge number.
Iteration	a) case: TCP-Segment = TCP segment with SYN and ACK flags set. b) case: TCP-Segment = TCP segment with an ACK flag set.
Expected response	After step 2 case a) to b):The IUT transits to CLOSED state.
Remark	—

Table 199 specifies the CTC_TCP_FLAGS_INVALID_06 – [syn-sent] no syn/no rst- do nothing.

Table 199 — CTC_TCP_FLAGS_INVALID_06 – [syn-sent] no syn/no rst- do nothing

Item	Content
CTC # – Title	CTC_TCP_FLAGS_INVALID_06 – [syn-sent] no syn/no rst- do nothing
Purpose	This CTC verifies that the TCP, in SYN-SENT state drops the segment and remains in the same state after receiving a segment with neither SYN nor RST flag set.
Reference	RFC 793:1981,[7] 3.9
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The UT shall cause the IUT to transit to SYN-SENT state. 2. The LT shall send a TCP segment of type TCP-Segment with an ACK flag set and with an acceptable acknowledge number.
Iteration	a) case: TCP-Segment = TCP segment without data. b) case: TCP-Segment = TCP segment with data.
Expected response	After step 2 case a) to b):The IUT does not change its state. After step 2 case a) to b):The LT verifies that the IUT does not send a TCP segment with SYN and ACK flags set and remains in SYN-SENT state.
Remark	—

Table 200 specifies the CTC_TCP_FLAGS_INVALID_07 – [syn-rcvd] !RST(otw SEQ)- ACK(SEQ).

Table 200 — CTC_TCP_FLAGS_INVALID_07 – [syn-rcvd] !RST(otw SEQ)- ACK(SEQ)

Item	Content
CTC # – Title	CTC_TCP_FLAGS_INVALID_07 – [syn-rcvd] !RST(otw SEQ)- ACK(SEQ)

Table 200 *(continued)*

Item	Content
Purpose	This CTC verifies that the TCP, in SYN-RCVD state, sends ACK with the next expected sequence number on receiving any segment (without RST) with an Outside-The-Window sequence number and remains in the same state.
Reference	RFC 793:1981,[7] 3.9
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The UT shall cause the IUT to transit to SYN-RCVD state. 2. The LT shall send a TCP segment of type TCP-Segment with an RST flag not set and with an unacceptable sequence number.
Iteration	a) case: TCP-Segment = TCP segment with a SYN flag set. b) case: TCP-Segment = TCP segment with SYN and ACK flags set. c) case: TCP-Segment = TCP segment with an ACK flag set. d) case: TCP-Segment = TCP segment with a FIN flag set. e) case: TCP-Segment = TCP data segment.
Expected response	After step 2 case a) to e): The IUT sends a TCP segment with an ACK flag set with acknowledge number indicating the correct expected next sequence number. After step 2 case a) to e): The LT verifies that the IUT remains in SYN-RCVD state.
Remark	

Table 201 specifies the CTC_TCP_FLAGS_INVALID_08 – [ESTABLISHED] (otw SEQ)- ACK(seq) [ESTABLISHED].

Table 201 — CTC_TCP_FLAGS_INVALID_08 – [ESTABLISHED] (otw SEQ)- ACK(seq) [ESTABLISHED]

Item	Content
CTC # – Title	CTC_TCP_FLAGS_INVALID_08 – [ESTABLISHED] (otw SEQ)- ACK(seq) [ESTABLISHED]
Purpose	This CTC verifies that the TCP, in ESTABLISHED state, sends a TCP segment with an ACK flag with the next expected sequence number after receiving any segment with an Outside-The-Window sequence number and remains in the same state.
Reference	RFC 793:1981,[7] 3.9
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The UT shall cause the IUT to transit to ESTABLISHED state. 2. The LT shall send a TCP segment of type TCP-Segment with an RST flag not set and with an unacceptable sequence number.

Table 201 *(continued)*

Item	Content

Iteration	a) case: TCP-Segment = TCP segment with a SYN flag set;
	b) case: TCP-Segment = TCP segment with SYN and ACK flags set;
	c) case: TCP-Segment = TCP segment with an ACK flag set;
	d) case: TCP-Segment = TCP segment with a FIN flag set;
	e) case: TCP-Segment = TCP data segment.

Expected response	After step 2 case a) to e): The IUT sends a TCP segment with an ACK flag set with acknowledge number indicating the correct expected next sequence number. After step 2: The LT verifies that the IUT remains in ESTABLISHED state.
Remark	—

Table 202 specifies the CTC_TCP_FLAGS_INVALID_09 – [FIN-WAIT-1] (otw SEQ)- ACK(seq) [FIN-WAIT-1].

Table 202 — CTC_TCP_FLAGS_INVALID_09 – [FIN-WAIT-1] (otw SEQ)- ACK(seq) [FIN-WAIT-1]

Item	Content
CTC # – Title	CTC_TCP_FLAGS_INVALID_09 – [FIN-WAIT-1] (otw SEQ)- ACK(seq) [FIN-WAIT-1]
Purpose	This CTC verifies that the TCP, in FINWAIT-1 state, sends a TCP segment with an ACK flag with the next expected sequence number after receiving any segment with an Outside-The-Window sequence number and remains in the same state.
Reference	RFC 793:1981,[7] 3.9
Prerequisite	The IUT shall be powered on and shall be linked-up with the test system. The IUT shall implement the TCP/IP TestStub in accordance with 6.5. The IUT shall be running and the TCP/IP TestStub shall be active.
Set-up	The test system set-up shall be in accordance with Figure 8. The test system shall be parameterized in accordance with the configuration set-up parameters as specified in 7.6.5.
Step	1. The UT shall cause the IUT to transit to FINWAIT-1 state. 2. The LT shall send a TCP segment of type TCP-Segment with an RST flag not set and with an unacceptable sequence number.
Iteration	a) case: TCP-Segment = TCP segment with a SYN flag set. b) case: TCP-Segment = TCP segment with SYN and ACK flags set. c) case: TCP-Segment = TCP segment with an ACK flag set. d) case: TCP-Segment = TCP segment with a FIN flag set. e) case: TCP-Segment = data segment.
Expected response	After step 2 case a) to e): The IUT sends a TCP segment with an ACK flag set and with acknowledge number indicating the correct expected next sequence number. After step 2 case a) to e): The IUT remains in FINWAIT-1 state.
Remark	—

Table 203 specifies the CTC_TCP_FLAGS_INVALID_10 – [FIN-WAIT-2] (otw SEQ)- ACK(seq) [FIN-WAIT-2].

Table 203 — CTC_TCP_FLAGS_INVALID_10 – [FIN-WAIT-2] (otw SEQ)- ACK(seq) [FIN-WAIT-2]

Item	Content
CTC # – Title	CTC_TCP_FLAGS_INVALID_10 – [FIN-WAIT-2] (otw SEQ)- ACK(seq) [FIN-WAIT-2]