
**Information technology —
Telecommunications and information
exchange between systems — Transport
conformance testing for connection-mode
transport protocol operating over
connection-mode network service —**

Part 3:

**Transport test management protocol
specification**

*Technologies de l'information — Télécommunications et échange
d'information entre systèmes — Essais de conformité de la couche
transport pour le protocole de transport en mode connexion opérant sur
le service réseau en mode connexion —*

Partie 3: Spécifications du protocole de gestion de test de transport



Reference number
ISO/IEC 10025-3:1993(E)

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

International Standard ISO/IEC 10025-3 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Sub-Committee SC 6, *Telecommunications and information exchange between systems*.

ISO/IEC 10025 consists of the following parts, under the general title *Information technology — Telecommunications and information exchange between systems — Transport conformance testing for connection-mode transport protocol operating over connection-mode network service*:

- *Part 1: General principles*
- *Part 2: Test suite structure and test purposes*
- *Part 3: Transport test management protocol specification*
- *Part 4: Abstract test suites and PIXIT*

Annexes A and B form an integral part of this part of ISO/IEC 10025. Annexes C and D are for information only.

Introduction

This part of ISO/IEC 10025 provides a specification of the protocol used to communicate between a lower tester (LT) and an upper tester (UT) for use in Coordinated Single (CS) or Coordinated Single Embedded (CSE) testing of the ISO transport layer, following the guidelines given in ISO 9646-2.

It is intended that the Test Management Protocol (TMP) should be general enough to cater for the total range of conformance testing without restricting future extensions.

The primary aim of the specification is to provide a set of rules for communication expressed in terms of the procedures to be carried out by test management entities at the time of communication.

As it is expected that the initial users of this part of ISO/IEC 10025 will be designers and implementors of equipment, this part of ISO/IEC 10025 contains, in notes or in annexes, guidance on the implementation of the procedures defined herein.

The transport TMP is positioned at the upper boundary of the transport layer. It uses and makes reference to the Transport Service standard (ISO 8072) whose provisions it assumes in order to accomplish the TMP's aims.

The interrelationship is illustrated in figure 1.

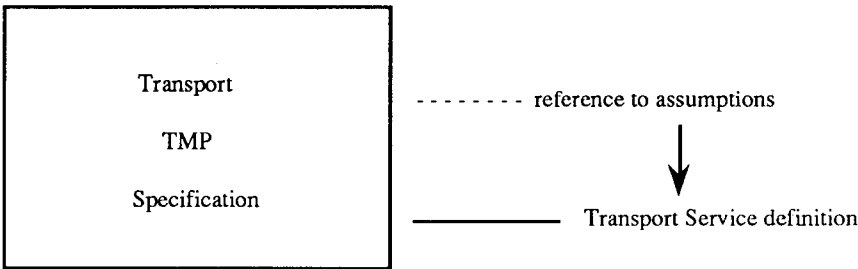


Figure 1 — Relationship between the TMP and adjacent service

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Part 3: Transport test management protocol specification

1 Scope

This part of ISO/IEC 10025 defines

- a) procedures for a single protocol for the transfer of data and control information from a lower tester to an upper tester;
- b) the structure and encoding of the test management protocol data units used for the transfer of data and control information;

The procedures are defined in terms of

- a) the interactions between test management entities through the exchange of test management protocol data units;
- b) the interactions between a test management entity and the Transport Service provider through the exchange of Transport Service primitives.

2 Conformance

A system claiming to conform to the procedures in this part of ISO/IEC 10025 shall implement all mandatory features.

The supplier of a protocol implementation which is claimed to conform to this part of ISO/IEC 10025 shall complete a copy of the PICS Proforma provided in annex B and shall provide the information necessary to identify both the supplier and the implementation.

3 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC 10025. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO/IEC 10025 are encouraged to investigate the possibility of applying the most recent editions of the standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 7498: 1984, *Information processing systems - Open Systems Interconnection - Basic Reference Model*.

ISO 8072: 1986, *Information processing systems - Open Systems Interconnection - Transport Service Definition*.

ISO/IEC 9646-1: 1991, *Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 1: General concepts*.

ISO/IEC 9646-2: 1991, *Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 2: Abstract test suite specification*.

4 Definitions

4.1 Conformance methodology definitions

This part of ISO/IEC 10025 makes use of the following terms defined in ISO/IEC 9646-1:

- a) implementation under test;
- b) system under test;
- c) lower tester;
- d) upper tester;
- e) test management protocol.

4.2 Transport test management protocol specification definitions

For the purposes of this part of ISO/IEC 10025, the following definitions apply:

- 4.2.1 **TMP-entity** : Either an UT-TMP-entity or LT-TMP-entity.
- 4.2.2 **UT-TMP-entity** : An instance of the Upper Tester (UT), which acts as a predictable user of the service provided by the Implementation Under Test (IUT).
- 4.2.3 **LT-TMP-entity** : That part of the Lower Tester (LT) which instructs the UT as to what requests it is to make to the IUT and controls and monitors the UT.
- 4.2.4 **TMPDU code (CODE)** : Header information that identifies the Test Management Protocol Data Unit (TMPDU) concerned.
- 4.2.5 **parameter Count (PC)** : An indicator that represents the number of parameters in the TMPDU concerned.
- 4.2.6 **parameter length** : An indicator that represents the length of an associated parameter field.
- 4.2.7 **parameter part** : A group of one or more octets used to represent a particular set of information. A parameter is **MANDATORY** if it is listed in this specification.
- 4.2.8 **primitive out of context (POC)** : A primitive is out of context if it results in a non-allowable sequence of Transport Service (TS) primitive as defined in the TS definition.
- 4.2.9 **internal count limit event (CLE)** : An event generated by a UT-TMP-entity when a particular count reaches a limit.
- 4.2.10 **superfluous primitive** : A T-DATA indication or a T-EXPEDITED DATA indication is a superfluous primitive if it is received out of context after the UT-TMP-entity has sent a T-DISCONNECT request.
- 4.2.11 **mode parameter** : Objects used within the UT-TMP-entity to define responses to a defined event, or to define parameters for the internal CLE or for data generation.
- 4.2.12 **count parameter** : Objects used within the UT-TMP-entity for the logging of activity, in each direction, across the TS interface and in the relaying of this information to the LT.
- 4.2.13 **stored item** : Objects, in addition to the mode and count parameters used within the UT-TMP-entity to store variables.
- 4.2.14 **primitive action** : A defined action by the UT-TMP-entity, used in constructing a response to an incoming primitive event.
- 4.2.15 **TMPDU command** : A command to set or retrieve values of internal variables, control data generation or generate parallel UT-TMP entities.
- 4.2.16 **TMPDU reply** : A TMPDU which provides information, explicitly or implicitly (e.g. stop data generation), as requested by a corresponding TMPDU command.

- 4.2.17** **invalid TMPDU** : A TMPDU that does not comply with the requirements of this part of ISO/IEC 10025 for structure and encoding.
- 4.2.18** **primitive event** : An event which stimulates a response from the UT-TMP-entity.
- 4.2.19** **give type TMPDU command** : A command to retrieve values of internal variables from an UT-TMP-entity.
- 4.2.20** **set type TMPDU command** : A command to set values of internal variables.
- 4.2.21** **internal start event** : A primitive used to start or restart an UT-TMP-entity.
- 4.2.22** **change mode event** : A primitive event which causes an UT-TMP-entity to set its internal mode parameters to the values of the parameters carried in the TMPDU and make a response to the new mode if required.
- 4.2.23** **data sources** : Provide a means of generating data on the T-DATA or T-EXPEDITED DATA flows.
- 4.2.24** **automatic source** : A data source which is started or stopped by specific TMP commands. When active it works asynchronously within the UT-TMP-entity.
- 4.2.25** **single shot source** : A data source which generates data synchronously in response to a specific TMP command.
- 4.2.26** **ECHOED-TSDU** : An ECHOED-TSDU is formulated by using data received in a T-DATA indication or T-EXPEDITED DATA indication and is sent in a T-DATA request.
- 4.2.27** **ECHOED-ETSDU** : An ECHOED-ETSDU is formulated by using data received in a T-DATA indication or T-EXPEDITED DATA indication and is sent in a T-EXPEDITED DATA request.

5 Symbols and abbreviations

5.1 Data units

<i>TMPDU</i>	Test Management Protocol Data Unit
<i>TSDU</i>	Transport Service Data Unit
<i>ETSDU</i>	Expedited Transport Service Data Unit

5.2 TMPDU fields

<i>CODE</i>	TMPDU Identifier (see 4.2.4)
<i>PC</i>	Parameter Count (see 4.2.5)

5.3 Miscellaneous

<i>TS</i>	Transport Service
<i>IUT</i>	Implementation Under Test
<i>SUT</i>	System Under Test
<i>CLE</i>	Count Limit Event
<i>POC</i>	Primitive Out of Context
<i>LT</i>	Lower Tester
<i>UT</i>	Upper Tester
<i>TMP</i>	Test Management Protocol

5.4 Local Variables

<i>Sn</i>	Stored item n where n is in the range 1 to 33
<i>Cn</i>	Count n where n is in the range 1 to 38
<i>Mn</i>	Mode parameters where n is in the range 1 to 27

6 Overview of the test management protocol

Test management protocol entities comprise two types: UT-TMP-entity and LT-TMP-entity. An Upper Tester (UT) consists of one or more UT-TMP entities. An UT resides within a System Under Test (SUT) and can be thought of as a predictable user of the service provided by the IUT (see figure 2). The LT-TMP-entity forms part of the LT and has the job of instructing the UT as to what requests it is to make of the IUT (see figure 3).

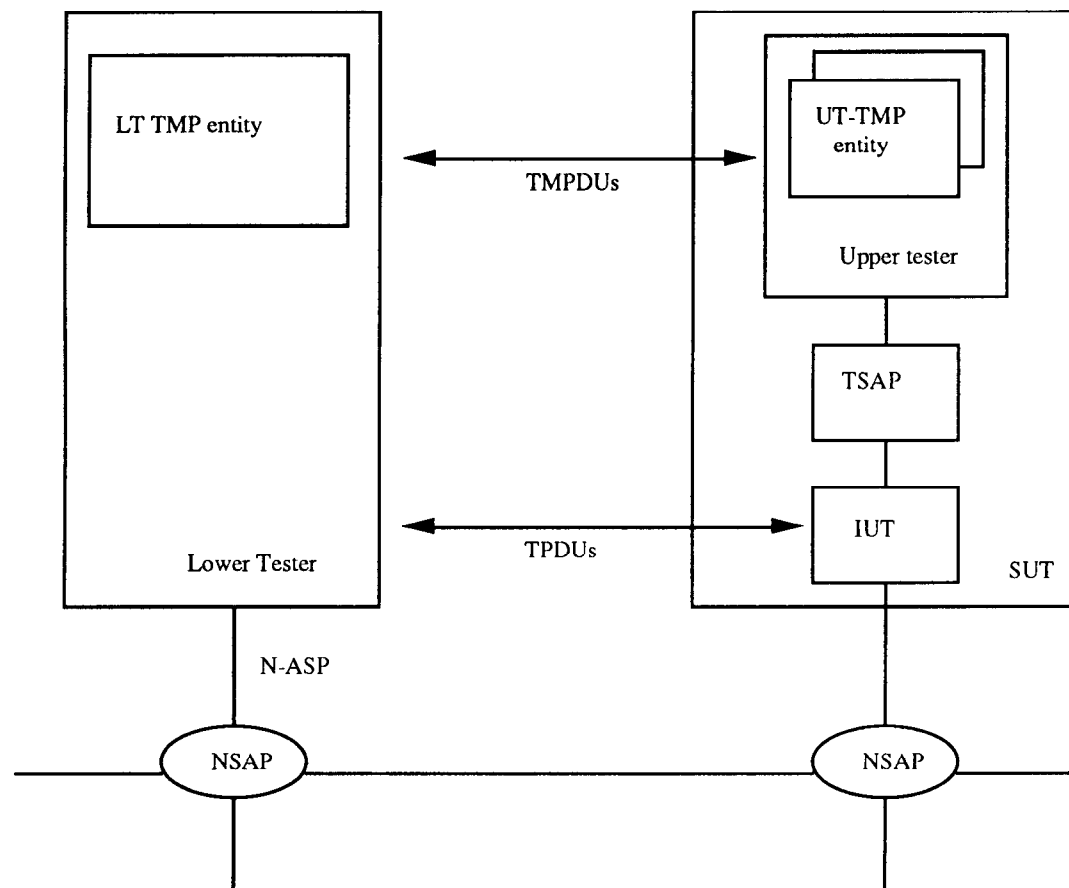


Figure 2 - Relationship to reference model

NOTE 1 The components shown as parts of the LT and SUT in the above diagram are those relevant to TMP. Other constituent parts of the LT and SUT are not shown as these components are a local matter.

The TMP is dissymmetrical. The LT-TMP-entity has a master role:

- it is allowed to send any sequence of TMPDUs, normal TSDUs or expedited TSDUs to the UT-TMP-entity; and
- it is never required to respond to the UT-TMP-entity in any standardized manner.

NOTE 2 In case a TMPDU sent by the LT-TMP-entity is invalid the behaviour of the UT-TMP-entity is controlled by a mode.

The UT-TMP-entity has a slave role:

- it shall behave in accordance to this specification on receipt of TMPDUs, normal TSDUs, or expedited TSDUs;
- it shall, in particular, respond to LT commands contained in TMPDUs or modes.

An UT-TMP-entity handles a single transport connection at a given time. Further, UT-TMP-entities are required for multiplexing tests or tests of simultaneous connections.

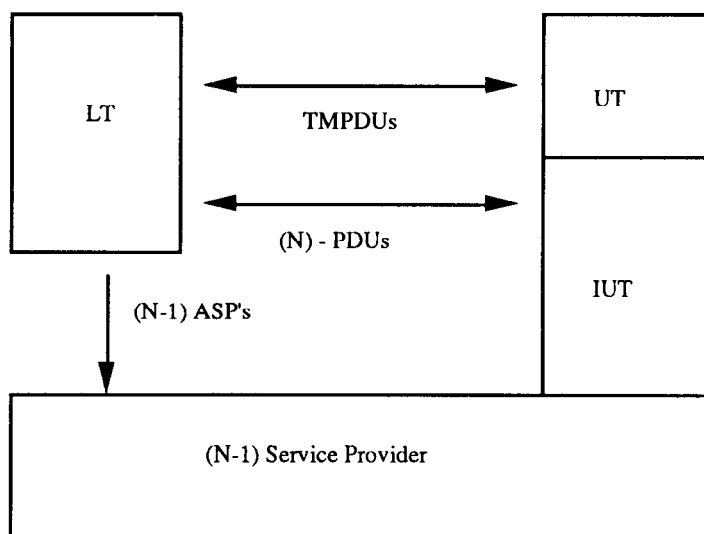


Figure 3 - Relationship to Testing Architecture (The CS Test method)

This specification makes use of internal variables. These internal variables are divisible into 3 types: counts, modes and stored items.

a) Counts

The counts maintained by the UT-TMP-entity monitor the traffic of TS primitives across the interface between itself and the transport layer. Counts are assigned to each category of service primitive in each direction across the interface, with normal and out of context primitives being counted separately.

In addition to the TS primitives, counts also exist for various totals. DATA and EXPEDITED-DATA octets received by the UT-TMP-entity are also counted with normal, POC, and superfluous primitives being counted separately (see 7.1.1).

b) Modes

The behaviour of the UT-TMP-entity is controlled by a set of mode parameters. Mode parameters are used to define the series of actions which make up the response to a defined event, or to define the parameters for the CLE or for data generation (see 7.1.2).

The defined events mentioned above are simply some form of stimulus to which the UT-TMP-entity makes a response. The defined events are listed in 6.2.2.

In response to these events the appropriate mode parameters specify a sequence of primitive actions encoded as specified in clause 8. The entire response will be processed prior to examination of the next event.

c) Stored Items

The stored items consist of additional variables which include the last received parameters from incoming TS primitives and the values supplied as parameters to outgoing primitives (see 7.1.3).

The UT-TMP-entity's internal variables may be both controlled and monitored by the LT through the TMP. This protocol has two elements, a 'command' issued by the LT instructing the UT-TMP-entity to take some action, and a 'reply' returned by the UT-TMP-entity which returns some information to the tester. The commands and replies are carried in T-DATA service primitives. Commands comprise three main categories:

- 1) those which set internal variables: e.g. set mode parameters or reset the values of the service primitive counts;

- 2) those which request relay of internal information; e.g. to check the values of the mode parameters or the service primitive counts;
- 3) those which cause the UT-TMP-entity to take some other specific action; e.g. start data generation.

Replies, in contrast, have only one purpose: the supply of information to the active tester.

6.1 Use of Transport service primitives

The protocol specified in this part of ISO/IEC 10025 assumes the use of the TS defined in ISO 8072.

Information is transferred to and from the TS provider in the TS primitives listed in table 1.

Table 1 - Transport service primitives

Primitives		Parameters
T-CONNECT	request	Called Address Calling Address Expedited Data Option Quality of Service TS User Data
	indication	
T-CONNECT	response	Responding address Quality of Service Expedited Data Option TS User Data
	confirm	
T-DATA	request	TS User Data
	indication	
T-EXPEDITED DATA	request	TS User Data
	indication	
T-DISCONNECT	request	TS User Data
T-DISCONNECT	indication	Disconnect reason TS User Data

6.2 Functions of the TMP

6.2.1 The UT-TMP-entity shall be capable of making a series of primitive actions on the service provided by the IUT:

- a) Do nothing;
- b) issue a T-CONNECT request;
- c) issue a T-CONNECT response;
- d) issue a T-DISCONNECT request;

- e) append the last received octet into an ECHOED-TSDU;
- f) send ECHOED-TSDU;
- g) append the last received octet into an ECHOED-ETSDU;
- h) send ECHOED-ETSDU;
- i) start automatic source;
- j) stop automatic source;
- k) send one TSDU from the single shot source;
- l) generate a new UT-TMP-entity;
- m) terminate and restart UT-TMP-entity;
- n) terminate UT-TMP-entity.

6.2.2 The UT-TMP-entity shall be capable of recognising a series of primitive events:

- a) receipt of T-CONNECT indication;
- b) receipt of T-CONNECT confirm;
- c) receipt of T-DISCONNECT indication;
- d) receipt of T-DATA indication;
- e) receipt of T-EXPEDITED data indication;
- f) internal CLE;
- g) POC received;
- h) internal start event.

6.2.3 The UT-TMP-entity shall be capable of receiving the following TMPDU commands, which are contained in T-DATA indications:

- a) change mode;
- b) reset counts to zero;
- c) set T-DISCONNECT request parameter;
- d) set T-CONNECT response parameters;
- e) set T-CONNECT request parameters;
- f) start data generation;
- g) generate a new UT-TMP-entity;
- h) give the values of the mode parameters;
- i) give the values of the counts;
- j) give the last received T-DISCONNECT indication parameters;

- k) give the last received T-CONNECT indication parameters;
- l) give the last received T-CONNECT confirm parameters;
- m) give the value of the last received non-TMP data or expedited data octet;
- n) stop data generation.

6.2.4 The UT-TMP-entity shall be capable of sending the following TMPDU response, which are contained in T-DATA requests:

- a) return the value of the mode parameters;
- b) return the value of the counts;
- c) return the value of the last T-DISCONNECT indication parameter;
- d) return the value of the last T-CONNECT indication parameter;
- e) return the value of the last T-CONNECT confirm;
- f) return the value of the last received non-TMP data or expedited data octet;
- g) return the value of the last octet sent during data generation.

6.2.5 The UT-TMP-entity shall be capable of detecting invalid TMPDUs and taking the appropriate action.

7 Elements of procedures

7.1 Objects used within the UT-TMP-entity

7.1.1 Counts

Table 2 - List of counts

Name	Counted Quantity
C1	Normal T-CONNECT indications
C2	Normal T-CONNECT confirms
C3	Normal T-DISCONNECT indications
C4	Normal T-DATA indications (incremented per octet)
C5	Normal T-DATA indications (incremented per TSDU)
C6	Normal T-EXPEDITED-DATA indications (incremented per octet)
C7	Normal T-EXPEDITED-DATA indications (incremented per ETSDU)
C8	Out of context T-CONNECT indications
C9	Out of context T-CONNECT confirms
C10	Out of context T-DISCONNECT indications
C11	Out of context T-DATA indications (per octet)
C12	Out of context T-DATA indications (per TSDU)
C13	Out of context T-EXPEDITED-DATA indications (incremented per octet)
C14	Out of context T-EXPEDITED-DATA indications (incremented per ETSDU)
C15	Superfluous T-DATA indications (incremented per octet)
C16	Superfluous T-DATA indications (incremented per TSDU)
C17	Superfluous T-EXPEDITED-DATA indications (incremented per octet)
C18	Superfluous T-EXPEDITED-DATA indications (incremented per ETSDU)
C19	Total C1 + C2 + C3 + C4 + C5 + C6 + C7 (normal input)
C20	Total C8 + C9 + C10 + C11 + C12 + C13 + C14 (out of context input)
C21	Total C15 + C16 + C17 + C18 (superfluous input)
C22	Undefined
C23	Normal T-CONNECT requests
C24	Normal T-CONNECT responses
C25	Normal T-DISCONNECT requests
C26	Normal T-DATA requests (incremented per octet)
C27	Normal T-DATA requests (incremented per TSDU)
C28	Normal T-EXPEDITED-DATA requests (incremented per octet)
C29	Normal T-EXPEDITED-DATA requests (incremented per ETSDU)
C30	Out of context T-CONNECT requests
C31	Out of context T-CONNECT responses
C32	Out of context T-DISCONNECT requests
C33	Out of context T-DATA requests (incremented per octet)
C34	Out of context T-DATA requests (incremented per TSDU)
C35	Out of context T-EXPEDITED-DATA requests (incremented per octet)
C36	Out of context T-EXPEDITED-DATA requests (incremented per ETSDU)
C37	Total C23 + C24 + C25 + C26 + C27 + C28 + C29 (normal output)
C38	Total C30 + C31 + C32 + C33 + C34 + C35 + C36 (out of context output)

7.1.2 Modes

Table 3 - List of modes

Name	Mode Parameter
M1	Response to normal T-CONNECT indication
M2	Response to normal T-CONNECT confirm
M3	Response to normal T-DISCONNECT indication
M4	Response to normal T-DATA indication (octet)
M5	Response to normal T-DATA indication (end of TSDU)
M6	Response to normal T-EXPEDITED DATA indication (octet)
M7	Response to normal T-EXPEDITED DATA indication (end of ETSDU)
M8	Undefined
M9	Response to start event or changed mode event
M10	Response to internal CLE
M11	Response to invalid TMPDU Command
M12	Response to POC Event
M13	Count Identifier for internal CLE
M14	Limit for the internal CLE
M15	Source stream allocation
M16	Automatic source: first octet
M17	Automatic source: maximum octet value
M18	Automatic source: octet increment
M19	Automatic source: size of first TSDU
M20	Automatic source: maximum size of TSDU
M21	Automatic source: TSDU size increment
M22	Single shot source: first octet value
M23	Single shot source: maximum octet value
M24	Single shot source: octet increment
M25	Single shot source: size of TSDU
M26	Data stream source burst flag
M27	Expedited data stream source burst flag

7.1.3 Stored items

Table 4 - List of stored items

Name	Stored Item
S1	Undefined
S2	Undefined
For use with DISCONNECT requests	
S3	TS User Data (for normal use)
S4	TS User Data (for use after an invalid TMPDU)
S5	TS User Data (for use after a POC event)
S6	TS User Data (for use with a DISCONNECT request sent in place of POC request)
S7	Undefined
For use with CONNECT responses	
S8	Quality of Service
S9	Responding Address
S10	Expedited Data Option
S11	TS User Data
For use with CONNECT requests	
S12	Called Address
S13	Calling Address
S14	Expedited Data Option
S15	Quality of Service
S16	TS User Data
From last received DISCONNECT indication	
S17	Reason
S18	TS User Data
From last received CONNECT indication	
S19	Called Address
S20	Calling Address
S21	Expedited Data Option
S22	Quality of Service
S23	TS User Data
From last received CONNECT confirm	
S24	Quality of Service
S25	Responding Address
S26	Expedited Data Option
S27	TS User Data
From Data sources	
S28	Undefined
S29	Undefined
S30	Last received non-TMP DATA or EXPEDITED DATA octet
S31	Last octet from automatic source
S32	ECHOED-TSDU
S33	ECHOED-ETSDU