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Integrated Services Digital Network (ISDN); Signalling System No.7; Operations, Maintenance and Administration Part (OMAP); Part 1: Protocol specification

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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Signalling Protocols and Switching (SPS).

The present document details exceptions and clarifications to ITU-T Recommendations Q.750 [1], Q.751.1 [10], Q.752 to Q.754 [2] to [4], defining the management of international ITU-T Signalling System No.7 networks, for example those used to provide the pan-European cellular digital radio system and the Integrated Services Digital Network (ISDN).

The present document also lists considerations for the interconnection of ITU-T Signalling System No.7 (SS7) networks, using ITU-T Recommendation M.4110 [17] as an aid, as well as ITU-T Recommendations Q.750 [1], Q.752 to Q.755 [2] to [18] and Q.780 [15].

The present document is part 1 of a multi-part EN covering Integrated Services Digital Network (ISDN) Signalling System No.7 Operations, Maintenance and Administration Part (OMAP), as identified below:

- Part 1: "Protocol specification";** [SIST EN 301 007-1:2000](https://standards.iteh.ai/catalog/standards/sist/eb87ca03-737e-4b06-a58e-301007-1-2000)
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Part 2: "Protocol Implementation Conformance Statement (PICS) profile specification".

National transposition dates	
Date of adoption of this EN	17 April 1998
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1 Scope

This first part of EN 301 007 defines the requirements for monitoring and measuring in Signalling System No.7 networks (including measurements for message traffic accounting), the requirements for the Message Transfer Part (MTP) and the Signalling Connection Control Part (SCCP) managed objects, and the requirements for the MTP Routing Verification Test (MRVT) of Signalling System No.7 management. It also lists the considerations applicable when inter-connecting Signalling System No.7 networks.

The requirements in the present document are based upon ITU-T Recommendations Q.750 [1], Q.751.1 [10], Q.752 to Q.754 [2] to [4], and ETS 300 356-1 [11].

The present document draws upon ITU-T Recommendations Q.750 [1], Q.752 to Q.754 [2] to [4], Q.755 [18] and M.4110 [17] as informative references, for considerations applicable to the inter-connection of Signalling System No.7 networks.

NOTE: The requirements of M.4110 [17] are used to derive the considerations in the present document, but the present document does not make any statement as to the applicability or otherwise of M.4110 [17].

2 References

References may be made to:

- a) specific versions of publications (identified by date of publication, edition number, version number, etc.), in which case, subsequent revisions to the referenced document do not apply; or
- b) all versions up to and including the identified version (identified by "up to and including" before the version identity); or
- c) all versions subsequent to and including the identified version (identified by "onwards" following the version identity); or
- d) publications without mention of a specific version, in which case the latest version applies.

A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

2.1 Normative references

- [1] ITU-T Recommendation Q.750 (1993): "Overview of Signalling System No. 7 management".
- [2] ITU-T Recommendation Q.752 (1993): "Monitoring and measurements for Signalling System No. 7 networks".
- [3] ITU-T Recommendation Q.753 (1993): "Signalling System No. 7 management functions MRVT, SRVT and CVT and definition of the OMASE-user".
- [4] ITU-T Recommendation Q.754 (1993): "Signalling System No. 7 management application service element (ASE) definitions".
- [5] ITU-T Recommendation Q.704 : "Signalling network functions and messages".
- [6] ETS 300 008-1 (1997): "Integrated Services Digital Network (ISDN); Signalling System No.7; Message Transfer Part (MTP) to support international interconnection; Part 1: Protocol specification [ITU-T Recommendations Q.701 (1993), Q.702 (1988), Q.703 to Q.706 (1993), Q.707 (1988) and Q.708 (1993), modified]".
- [7] ETS 300 009-1 (1996), Third Edition: "Integrated Services Digital Network (ISDN); Signalling System No.7; Signalling Connection Control Part (SCCP) (connectionless and connection-oriented class 2) to support international interconnection; Part 1: Protocol specification [ITU-T Recommendations Q.711 to Q.714 and Q.716 (1993), modified]".

- [8] ETS 300 287-1 edition 2 (1996): "Integrated Services Digital Network (ISDN); Signalling System No.7; Transaction Capabilities (TC) version 2; Part 1: Protocol specification [ITU-T Recommendations Q.771 to Q.775 (1993), modified]".
- [9] CCITT Recommendation X.209 (1988): "Specification of basic encoding rules for Abstract Syntax Notation One (ASN.1)".
- [10] ITU-T Recommendation Q.751.1: "Network element management information model for the Message Transfer Part".
- [11] ETS 300 356-1 (1995): "Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP) version 2 for the international interface; Part 1: Basic services [ITU-T Recommendations Q.761 to Q.764 (1993), modified]".
- [12] ITU-T Recommendation Q.751.3 (1997): "Network Information Model for MTP Accounting and Accounting Verification".
- [13] ITU-T Recommendation X.690 (1994) | ISO/IEC 8825-1: "Information technology - ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)".
- [14] CCITT Recommendation X.208 (1988): "Specification of Abstract Syntax Notation One (ASN.1)".
- [15] ITU-T Recommendation Q.780 (1995): "Signalling System No.7 test specification general description".
- [16] ITU-T Recommendation M.3100 (1995): "Generic network information model".

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2.2 Informative references

- [17] ITU-T Recommendation M.4110: "Inter-Administration agreements on Common Channel Signalling System No. 7".
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- [18] ITU-T Recommendation Q.755 (1993): "Signalling System No. 7 protocol tests".
- [19] ITU-T Recommendation Q.822 (1994): "Stage 1, stage 2 and stage 3 description for the Q3 interface – Performance management".
- [20] ITU-T Recommendation Q.2210 (1996): "Message transfer part level 3 functions and messages using the services of ITU-T Recommendation Q.2140".
- [21] ITU-T Recommendation Q.756 (1997): "Guidebook to Operations, Maintenance and Administration Part (OMAP)".
- [22] ITU-T Recommendation Q.705 (1993): "Signalling Network Structure".

3 Abbreviations

ASN.1	Abstract Syntax Notation 1
BEC	Basic Error Correction
BER	Basic Encoding Rules
CDPA	CalleD Party Address
CGPA	CallinG Party Address
CIC	Circuit Identification Code
GT	Global Title
GTAI	GT Address Information
GTI	GT Indicator
ILS	Incoming LinkSet
ISDN	Integrated Services Digital Network
ISUP	ISDN User Part

MRVT	MTP Routing Verification Test
MTP	Message Transfer Part
NAI	Nature of Address Indicator
NP	Numbering Plan
OLS	Outgoing LinkSet
OMAP	Operations, Maintenance and Administration Part
PC	Point Code
PCR	Preventive Cyclic Retransmission
PICS	Protocol Implementation Conformance Statement
SAP	Service Access Point
SEP	Signalling End Point
SCCP	Signalling Connection Control Part
SI	Service Indicator
SLC	Signalling Link Code
SP	Signalling Point (general)
SSN	Sub System Number
STP	Signalling Transfer Point
TMN	Telecommunications Management Network
TT	Translation type
UDT	UniDatTa message
XUDT	Extended UniDatTa message
XUDTS	Extended UniDatTa Service message

4 General exceptions and clarifications to ITU-T Recommendations Q.750 to Q.751

4.1 Q.750

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ITU-T Recommendation Q.750 [1] is an overview document which is generally applicable.

4.2 Q.751.1

ITU-T Recommendation Q.751.1 [10] defines the network information model (in the form of managed objects) for the MTP of Signalling System No.7. If the network operator uses a Telecommunications Management Network (TMN) Operations System to control the Signalling System No.7 network, the management of the MTP shall be via the Managed Objects defined in ITU-T Recommendation Q.751.1 [10] with the clarifications and exceptions listed here.

The requirements specified in the present document referring to subclause 6 of ITU-T Recommendation Q.751.1 [10] shall also constrain the conditional packages and optional parameters in subclause 7 of ITU-T Recommendation Q.751.1 [10].

4.2.1 Subclause 1 to 6.1 inclusive of Q.751.1

Subclause 1 to 6.1 inclusive shall apply.

4.2.2 Subclause 6.2 of Q.751.1

The Signalling Link Set Timer Profile (subclause 6.2.1) may be used, Managed Switching Element (subclause 6.2.2) may apply, MTP Access Point (instance) (subclause 6.2.3) shall apply.

The MTP Level 2 Protocol Profile (subclause 6.2.4) may be used, but the `bufferMechanismPackage`, `multipleTransmissionCongestionLevelsPackage` and `multipleTransmissionCongestionStatesPackage` shall not apply.

The MTP Signalling Point (subclause 6.2.6) shall apply. The conditional package `spTimersPackage` may be used, but attributes 14, 17, 21, 22 and 30 (ITU-T Recommendation Q.704 [5] timers T7, T11, T15, T16 and T24 respectively)

shall not apply; (note that if this package is used then the Signalling Point Timers Profile shall not be used at the same signalling point - this is required in the conditional packages statement of the formal description of subclause 7 of ITU-T Recommendation Q.751.1 [10]).

The Signalling Data Link Termination Point (subclause 6.2.7) shall apply.

The Signalling Link Set Termination Point (subclause 6.2.8) shall apply. If the conditional package spTimersPackage is used in the superior MTP Signalling Point instance, the lsTimersProfilePointerPackage shall not be used. If the spTimersProfilePointerPackage is used in the superior MTP Signalling Point instance, the lsTimersProfilePointerPackage shall not be used.

The Signalling Link Termination Point (subclause 6.2.9) shall apply, but attribute 11 (linkCongestionLevel) shall not apply. Attributes 13 and 15 (signDataLinkTpList and signTermList) may be used, but only to support the basic signalling link management procedures of ITU-T Recommendation Q.704 [5] subclause 12.2 (see ETS 300 008-1 [6]). In addition, create and set rejection reasons vii) and viii) referring to ITU-T Recommendation Q.704 [5] timer T17 shall not apply. If the conditional package spTimersPackage is used in the superior MTP Signalling Point instance, the slTimersProfilePointerPackage shall not be used. If the spTimersProfilePointerPackage is used in the superior MTP Signalling Point instance, the slTimersProfilePointerPackage shall not be used.

The Signalling Link Timer Profile (subclause 6.2.10) may be used, but attribute 5 (ITU-T Recommendation Q.704 [5] timer T24) shall not apply.

The Signalling Point Timers Profile (subclause 6.2.11) shall apply if the spTimersPackage of the MTP Signalling Point is not used, but ITU-T Recommendation Q.704 [5] timers T7, T11, T15 and T16 shall not apply.

The Signalling Route Network Element Part shall apply (subclause 6.2.12).

The Signalling Route Set Network Element Part (subclause 6.2.13) shall apply, with the congestedStatePackage. The congestionLevelPackage shall not apply.

The Signalling Terminal may be used, but only to support the basic signalling link management procedures of ITU-T Recommendation Q.704 [5] subclause 12.2 (see ETS 300 008-1 [6]).

The Signalling Transfer Point (STP) Screening Table may be used.

For all object classes additionally applies:

"Creation of new object class instances may be rejected due to lack of system resources, e.g. the system specific maximal number of instances of this object class per superior object instance have been exceeded."

Object class mtpAccessPoint:

Additionally applies:

The MTP status is mapped to the operationalState and availabilityStatus attributes as follows:

MTP Status	operationalState	availabilityStatus
allowed	enabled	{ }
congested	enabled	{degraded}
prohibited	disabled	{off line}

Object class signDataLinkTp:

Additionally applies:

"If an attempt is made to delete a signDataLinkTp instance which is still referenced by a signLinkTp, the delete request is rejected".

Object class signLinkTp:

Attribute "mtpL2ProtocolProfilePointer" (and all references to it) is renamed to "protocolProfilePointer".

Object class signLinkSetTp:

For the congestionControlMethod only the values "unknown" or "ccmQ704International" apply.

4.2.3 Subclause 7 of Q.751.1

Subclause 7 of ITU-T Recommendation Q.751.1 [10] is the formalization of the informal specification of subclause 6.2. Subclause 7 shall apply, but shall be constrained by the exceptions and clarifications to subclause 6.2 given previously, and by the corrections and additions listed below.

4.2.4 Subclause 7.1 of Q.751.1

4.2.4.1 Subclause 7.1.8 of Q.751.1

Object class signLinkSetTp:

For attribute inLsLoadShareAlgorithm also the operation SET BY CREATE applies.

4.2.4.2 Subclause 7.1.9 of Q.751.1

Object class signLinkTp:

For attribute maxCapacitySl also the operation SET BY CREATE applies. For attributes signDataLinkTpList and signTermList also the operations SET BY CREATE and ADD-REMOVE apply.

4.2.5 Subclause 7.4 of Q.751.1

Attribute template signLinkTpPointer does not apply.

4.2.6 Subclause 7.5 of Q.751.1

Action replaceSignTerm does not apply.

4.2.8 Subclause 7.8 of Q.751.1

The ASN.1 type Point Code is extended to: (unrestricted) INTEGER.

For the CHOICE components of StpScreeningTableLineId the typing is replaced by "designatedLinkSet" and "designatedOpc".

The ASN.1 type TimerValue is extended to: INTEGER (0..360000).

4.2.9 Annex A of Q.751.1

This annex is informative.

4.2.10 Annex B of Q.751.1

This annex is informative.

It is an informal definition of the Signalling System No.7 MTP resources and their management, as seen from the MTP. It is written from a network management perspective, and does not apply directly, although it may be useful for an explanation of the MTP and its management.

4.2.11 Annex E and annex F of Q.751.1

Annex E is the formal description of MTP measurements. The MTP measurements used for message traffic accounting are for further study in ITU-T Recommendation Q.751.1 [10], the requirements of the present document are defined in subclause 3.2.12.

Only those portions of annex E apply which correspond to required measurements defined in ITU-T Recommendation Q.752 [2] (see clause 4 of the present document).

Annex F is the definition of the MRVT managed object class, and shall apply.

4.2.12 Object model for MTP accounting and verification

ITU-T Recommendation Q.751.3 [12] shall apply, with the exception that MTP accounting verification is not required.

5 Exceptions and clarifications to ITU-T Recommendation Q.752

If a Protocol Implementation Conformance Statement (PICS) associated with an ETSI deliverable contains a reference to an optional Signalling System No.7 function, and that function has an associated measurement which is obligatory if the function is used, then the measurement shall be supplied if the function is supplied.

The references to Recommendation Q.751 in ITU-T Recommendation Q.752 [2] should be replaced throughout by "the series of Recommendations Q.751".

5.1 Subclause 1 of Q.752

Subclause 1 shall apply with the following exceptions:

Subclause 1.1.1: add to the hyphenated list at the end:

"ITU-T Recommendation Q.752 [2] does not describe any filtering techniques to be applied after measurements are taken (apart from the "first and interval" method to reduce the number of output reports). The Q.820 series of Recommendations define filtering techniques useful for control of the Signalling System No.7 network. In particular, ITU-T Recommendation Q.822 [19] defines packages of counters, grouped into one data object. So, for instance, if the operator wishes to monitor error performance, all counters in a group could be activated at the same time. The distinction made in the ITU-T Recommendation Q.752 [2] Recommendation between "permanent" and "activated" measurements also disappears, - all measurements are inherently "activated", permanency can be achieved by keeping a measurement activated all the time."

Subclause 1.1.2 should refer to the operations, maintenance and administration part and not the operations and maintenance application part.

Subclause 1.4.2: delete the words "according to the managed object being measured" in the first sentence.

Subclause 1.6: refer to ITU-T Recommendation X.701 and not paragraph 2.2 in ITU-T Recommendation Q.750 [1].

Subclause 1.6.4: delete the last sentence "However, certain measurements ... for STP accounting purposes".

Subclause 1.7.1.2: delete the clause apart from its first sentence.

Subclause 1.7.1.7: add a paragraph at the end "The "1st & interval" measurements "Units" column contains two items if the units for the first event report are different from those applied in the interval, and in that case the ones applied in the interval are the second in the column."

Add a subclause 1.8:

"1.8 Techniques for filtering measurements

1.8.1 Single faults giving rise to multiple error reports

Where a single fault could cause recurring event reports (e.g. a single MTP routing data corruption could result in many MSUs being discarded), the first and interval measurement technique can be used. The initial report should contain enough information to establish the location of the fault, the interval count will then indicate its severity. The interval should be short enough to allow real time control. This technique presents information essential to the maintenance staff, and filters out that which is redundant."

5.2 Subclause 2 through 5 of Q.752

The provisions of these clauses shall apply where the measurements referred-to apply (see the references to the tables of ITU-T Recommendation Q.752 [2] in the present document).

Subclause 2.1: add a paragraph at the beginning: "The measurements for MTPs according to Q.2210 [20] have yet to be defined in detail, however the ones included here for level 3 are likely to be appropriate also in the broad band environment."

Subclause 2.3.1: change to "Item 2.1 could be derived from measurements 1.2, 1.12, 2.5 and 2.6."

Subclause 3.2.1: replace the subclause with:

"Subclause **3.2.1** Routing failure measurements (items 7.1 through 7.7 and 7.9) refer to all possible failures (both local and remote) detected by SCCP Routing Control, and count all SCCP messages which encounter transport problems, regardless of whether or not a (X)Unitdata Service message or N-NOTICE primitive is returned to the originator. Receipt of a (X)Unitdata Service message is not included in this count. The measurements refer to both primary and secondary entities, or just the primary if no secondary entity is prescribed.

All of these measurements are marked as "1st & interval". They enable SCCP routing failures to be identified.

The reassembly error measurements (items 7.10 through 7.12) are prescribed for the SCCP connectionless reassembly service. item 7.12 (no reassembly space) indicates a resource limitation when the first segment of a sequence is received.

Item 7.13 (Hop counter violation) indicates a routing failure, possibly an SCCP circular route. All hop counter violations are reported with this item, including those from Connection Request messages.

The report associated with the first event of items 7.10 and 7.11 should contain at least the calling party address and the segmentation local reference as diagnostic information.

The report associated with the first event of item 7.13 should contain as diagnostic information at least the called party address, and the OPC of the MTP routing label. If present, the calling party address should also be included.

The report associated with the first event of item 7.14 should contain as diagnostic information the subsystem number and called party address.

The reports associated with the first event of items 7.15, 7.16 and 7.18 should contain as diagnostic information at least the MTP Service Access Point (SAP) identity (implementation dependent), the connection references (local and remote) and the DPC.

Item 7.18 should also contain the cause."

Subclause 3.4.4 and 3.4.5 should be replaced by:

"Subclause **3.4.4** Measurements 9.6 and 9.7 are taken per protocol class (as present in the protocol class parameter of (X)UDT messages) and per SSN. 9.6 is counted at the origin per source SSN and refers to messages delivered to an MTP Service Access Point, 9.7 is counted at the destination per sink SSN and refers to messages received from an MTP Service Access Point.

"Subclause **3.4.5** Measurement 9.8 refers only to those messages which would normally have been routed to a local subsystem but because of a change in the translation process (e.g. due to a routing failure towards that subsystem), are directed to a backup subsystem. The measurement is only applicable at replicated nodes with translation capabilities."

Subclause 3.4: delete the last sentence.

5.3 Subclause 6 of Q.752

This subclause is informative.

5.4 Subclause 7 of Q.752

Add a clause 7 to ITU-T Recommendation Q.752 [2], and note that the network operator shall be able to determine to what date and time the start of each accounting interval belongs. It should be noted that implementations might respond with different delays in starting accounting when requested, and the network operator should take this into consideration when determining when to start the first accounting interval. In addition, depending upon implementation, it might or might not be sufficient to associate a date and time only with the first accounting interval, and then to determine the date and time of the start of each successive interval from its position and the length of preceding intervals.

The text of the new clause 7 is:

"Subclause 7 Accounting of MTP and SCCP message traffic

Subclause 7.1 General

Subclause 7.1.1

This section covers all registration items appropriate to support cascade remuneration. This accounting method is based on the principle that the originator pays the operator (if different) of the next node in the message's path for delivering the message; the next node's operator pays the operator of its next node, and so on. The measurements here, because they differentiate on the basis of the destination of the messages, would allow all the network operators involved to be remunerated.

Subclause 7.1.2

Two functions are defined for Signalling System No.7 message accounting:

- 1) verification of the number of messages sent for which the receiving operator should be paid (this function is optional);
- 2) registration by the receiving operator of the number of messages for which payment is to be received.

Subclause 7.1.3

Two types of traffic registration are distinguished. The registration of the MTP signalling traffic refers to the usage of the "transfer" resources. The registration of the SCCP signalling traffic refers to the usage of the "relay" resources. Traffic registration will not only be needed for remuneration but also for remuneration verification. Correlation between both kinds of traffic registration within one node is not required. The role of Signalling End Points (SEPs) and SCCP endpoints in accounting and accounting verification is for further study.

NOTE: The use of Service Indicator (SI), SSN and SCCP class as registration items for accounting purposes should be considered in the light of the need for data protection, information security and fair competition (see Q.756 [21]).

Subclause 7.2 MTP traffic registration

MTP traffic registration is applicable within one Operator's MTP network or a group of Operators of one MTP network (e.g. different countries owning parts of the overall international signalling network). If required, these networks can also be subdivided into different parts (in order to apply different tariffs).

Subclause 7.2.1 Basic registration principles

Subclause 7.2.1.1 For remuneration purposes, the incoming MTP signalling traffic should be registered against the following items:

- The identity of the adjacent network operator sending the MTP message. If discrimination between several operators is not required the identity of a group of these operators should be used.
- Destination information, as far as relevant for the accounting agreements. This information may identify one or more networks. If also required, network parts could be identified.
- Optionally, the identity of the requested service or group of services.

For each relevant combination the number of messages transferred as well as the number of octets should be registered per specific time interval (e.g. every 30 minutes).