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PNO-ISC/SPEC/005

C7 Interconnect Message Transfer Part (MTP)

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PNO-ISC SPECIFICATION NUMBER 005

C7 INTERCONNECT MESSAGE TRANSFER PART (MTP)

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0.2 Normative Information

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0.4 History

Revision	Date of Issue	Updated By	Description
Issue 3	August 2000	Brian Skinner, BT	Approved by PNO-IG

0.5 Issue Control

PAGE	ISSUE	DATE
All	Issue 3	August 2000

0.6 References

- /1/ PNO-ISC/SPEC/006 C7 Interconnect User Part (BSI document no. PD 6645)
- /2/ PNO-ISC/SPEC/007 C7 Interconnect ISUP (BSI document no. PD 6623)
- /3/ PNO-ISC/SPEC/003 C7 Interconnect SCCP (BSI document no. PD 6638)
- /4/ CCITT Blue Book Recommendations Q.702, Q.707,
- /5/ PNO-ISC/SPEC/001 Point Codes for Network Interconnect in the UK (BSI document no. PD 6646)
- /6/ ITU-T Recommendation Q.752 (1997)
- /7/ ITU-T Recommendations Q.700, Q.701, Q.705, Q.706 (1993)
- /8/ ITU-T Recommendations Q.703, Q.704 (1996)
- /9/ PNO-ISC/INFO/007 UK Interconnect use of MTP& SCCP (BSI document no. PD 6627)
- /10/ ITU-T Implementor's Guide (12/99) for Q.704 (1996)
- /11/ ITU-T Implementor's Guide (12/99) for Q.706 (1993)
- /12/ ITU-T Implementor's Guide (9/97) for Q.705 (1993)
- /13/ ITU-T Implementor's Guide (3/99) for Q.703 (1996)

0.7 Abbreviations

CBA	Changeback Acknowledgement
CBD	Changeback Declaration
CCITT	International Telegraph and Telephone Consultative Committee (now called ITU)
CIC	Circuit Identification Code
COA	Changeover Acknowledgement
COO	Changeover Order
DPC	Destination Point Code
ECA	Emergency Changeover Acknowledgement
ECO	Emergency Changeover Order
EDA	Excessive Delay of Acknowledgement
FISU	Fill-In Signal Unit
H0	Heading Code (message group)
H1	Heading Code (signal code)
ISDN	Integrated Services Digital Network
ITU	International Telecommunication Union (replaced CCITT)
LI	Length Indicator
LII	Level of implementation indicator
LPO	Local Processor Outage
LSSU	Link Status Signal Unit
MSU	Message Signal Unit
MTP	Message Transfer Part
OPC	Originating Point Code
OSS	Operator Services System
PCM	Pulse Code Modulation
RPO	Remote Processor Outage
RST	Route Set Test (message)
SF	Status Field
SI	Service Indicator

SIB	Status indication busy
SIC	Service Indicator Code
SIE	Status indication emergency alignment
SIF	Signalling Information Field
SIN	Status indication normal alignment
SIO	Status Indication Out of Alignment / Service Information Octet
SIOS	Status Indication Out of Service
SIPO	Status Indication Processor Outage
SLC	Signalling Link Code
SLS	Signalling Link Selection
SLT	Signalling Link Test (message)
SP	Spare
SRST	Signalling Route Set Test (message)
SS	Signalling System
SSF	Sub-service field
STP	Signalling Transfer Point
SU	Signalling Unit
TFA	Transfer Allowed (message)
TFC	Transfer Controlled (message)
TFP	Transfer Prohibited (message)
TRA	Traffic Restart Allowed (message)
UPU	User Part Unavailable (message)

0.8 Scope

The purpose of PNO-ISC/SPEC/005 is to specify the requirements of the Message Transfer Part (MTP) that are standardised for use across a UK national interconnect between Public Network Operators.

1 General

This document specifies the requirements of the MTP that are standardised for use across a national interconnect between Public Network Operators.

Both STP and non STP functionality are specified in this document.

The term "Not Required" is taken to mean that implementation of the item so described does not contravene this document. It is not necessary to actively disable "Not Required" items. Implementations shall not rely on "Not Required" items being disabled or enabled across the network interconnection.

2 The Form Of The Requirements

The MTP of ITU Signalling System No.7 is specified and described in the following ITU Recommendations /4/, /6/, /7/ and /8/;

- Q.700 - Introduction to CCITT Signalling System No. 7
- Q.701 - Functional Description of MTP
- Q.702 - Signalling Data Link
- Q.703 - Signalling Link
- Q.704 - Signalling Network Functions and Messages
- Q.705 - Signalling Network Structure
- Q.706 - Signalling Network Performance
- Q.707 - Testing and Maintenance
- Q.752 - Measurements and Monitoring

Several MTP Implementor's Guides, /10/-/13/, have also been produced by ITU-T which record updates to some of the Recommendations listed above since their last formal issue. Where an Implementor's Guide contains information of direct impact to UK MTP Interconnect this will be indicated in the section relating to the Recommendation concerned.

Since these Recommendations are comprehensive, and since the difference in requirements of the PNO-ISC version of the MTP consists of exercising permitted options and adding some mechanisms, the Recommendations are used as the main text of the Specification. Thus the PNO-ISC MTP Specification is in the form of exceptions to the ITU Recommendations.

The requirements of the MTP and its monitoring and measurement are therefore the specifications given in ITU Recommendations Q.700, Q.701, Q.702, Q.703, Q.704, Q.706, Q.707 and Q.752, /4/, /6/, /7/ and /8/. These are modified by the requirements specified in Sections 3 - 5 which follow.

Sections 3 - 5 are referenced to the principal relevant parts of the ITU Recommendations. Where a discrepancy exists between the requirements in Sections 3 - 5 and other unreferenced parts of the Recommendations (for example in the detailed state transition diagrams) these requirements shall be deemed to modify the ITU Recommendations.

This Specification covers interconnect situations where STP working is agreed, and where it is agreed not to support STP working.

Section 3 gives the mandatory requirements for interconnect where STP working is agreed.

Section 4 gives the mandatory requirements for interconnect where STP working is not agreed.

Other desirable requirements may be agreed bilaterally and based on the recommendations of /9/. By this means the UK specification can move forwards from "the lowest common denominator" to full ITU-T recommendation compliance plus any UK specific requirements found necessary.

3 Mandatory Requirements Where STP Working Applies

3.1 Treatment of received Level 2 signal units which are not understood.

Reference Q.700; Q.701, §6; Q.703, §7, §8, & §11

All Link Status Signal Units which are not understood shall be ignored and discarded.

3.2 Treatment of Spare Bits and Additional Fields in Level 3 received Messages.

Reference Q.700; Q.701, §6; and Q.704, §15

Spare bits not coded to zero, and/or additional fields, received in an otherwise recognisable, valid message, shall not affect the processing of that message. No attempt should be made to interpret or process such spare bits or additional fields. This does not apply to spare values of defined fields, nor remove the requirement that spare bits shall be coded to zero.

3.3 Point Code Allocation

Reference Q.701, §3.2.1

/5/, UK Point Code numbering scheme applies.

3.4 Message Length

Reference Q.701, §7.2.6; Q.703 §2.3.8

The national option of Q.701, §7.2.6 shall NOT be used.

3.5 Digital Bearers Derived from Multiplexes other than 2048kbit/s

References Q.702, §5.2, §5.3, §5.4 and §5.5

These interfaces shall NOT be used. Digital bearers will be derived from 2048kbit/s multiplexes. It shall be possible to establish a signalling data link using any timeslot other than Timeslot 0. There should be the capability of multiplexing several such signalling link data streams (i.e. up to 31 as required) onto a single 32 time-slot PCM system.

3.6 Bit Rate of Analogue Signalling Data Links

Reference Q.702, §6

Analogue signalling data links shall NOT be used.

3.7 Use of the Length Indicator

Reference Q.703, §2.3.3

The Length Indicator (LI) is a field generated by a transmitting Level 2 which shall always be set correctly as specified in Q.703.

3.8 Flags

Reference Q.703, §3.1

The opening flag of a Signal Unit (SU) shall be the closing flag of the preceding SU. However, the Q.703 reference quoted is interpreted as requiring the MTP to have the ability to receive multiple flags between signal units.

3.9 Repetition of Signal Units

Reference Q.703, §5.3

A signal unit shall not be repeated unless in response to a negative acknowledgement.

3.10 Error Correction Procedure

Reference Q.703, §5 and §6

The basic error correction method is required; preventive cyclic retransmission shall NOT be used.

3.11 Processor Outage

Reference, Q.703, §8, Q.704, §3.3.5.1 & Q.704, §5.6.2

The ITU Recommendations are interpreted as requiring sequence numbers not to be re-initialised following changeback, i.e. the sequence prior to changeover should continue following changeback.

It is, however, recognised that, under certain failure situations, this may not be possible. Should this occur, re-alignment of the link shall take place to re-initialise the sequence numbers at both ends simultaneously.

Note: Blue Book/96 edition nodes should interwork without difficulty. Q.704, §5.6.2 has been clarified in the 96 edition to cover, in the case of PO, ways of minimising message loss

3.12 Threshold for Error Rate Monitor

Reference Q.703, §10.2.5

A single threshold for the error rate monitor will be required; parameters being as specified for 64kbit/s only.

3.13 Time-out Values

Reference Q.703, §12.3; Q.704, §16.8; & Q.707, §5.5

It shall be possible to set the time-outs to values in the ranges specified in the references above (for 64kbit/s) unless agreed otherwise by the interconnecting operators.

3.14 Signalling Network Management

References Q.704, §1.3, §3.1.3, §3.4.3, §3.5.3, §4, 7, §13.4, §13.5, & §13.9

Transfer Restricted and Signalling Route Set Congestion Test procedures shall not be used. TFR and SRSCCT messages, if received, shall be treated as unrecognised messages. If a message is received for an unavailable destination (including when the destination is not in the routing tables), then the TFP sending procedures shall be invoked.

The footnote against Q.704 §13.2.2 iii) shall therefore not apply.

3.15 Routing of Messages

Reference Q.704, §2.3

If the configuration of the interconnect interfaces are such as to make circular routing of messages possible under route failure conditions, then a means of overcoming this problem shall be agreed between the interconnecting operators.

3.16 Load Sharing Among Linksets

Reference Q.704, §2.3.2

At any signalling point, or signalling transfer point, all messages for any given destination point code, shall be carried by the same link set.

The ability to share traffic for a given destination point code over a number of link sets in a route set is NOT mandatory, and shall not be used between interconnecting operators, unless by specific agreement between the Operators concerned.

3.17 The Number of Links in a Linkset

Reference Q.704, §2.3

It shall be possible for a link set to comprise any number of signalling links up to and including 16. The actual number for a particular interconnect will be determined by bi-lateral agreement.

3.18 Bit Rates of Links within a Linkset

Reference Q.702, §2

Links shall operate only at a rate of 64kbit/s.

3.19 Load Sharing within a Linkset

Reference Q.704, §2.3.2

The choice of a link within a link set on which a message will normally be transmitted shall depend on the value of the Signalling Link Selection (SLS) field, the number of links in the link set, and the load sharing algorithm employed. Exceptionally it shall be possible to direct certain messages (including test messages) to particular links. Unless bilaterally agreed otherwise, traffic shall be distributed evenly across the links in a linkset. Any suitable algorithm that produces an even distribution of SLS field values, to available Signalling Links (SLCs), may be employed. The difference in the number of SLS values allocated to any two available SLCs in a given linkset, shall not be greater than one .

3.20 Signalling Route Availability

Reference Q.704, §3.4

A signalling route shall also be considered unavailable if locally detected failures mean that signalling traffic to or towards the concerned destination cannot be transmitted over the concerned link set.

Similarly a signalling route shall become available only when the signalling point becomes aware that all causes, locally or remotely detected, of its being unavailable have been removed.

Transfer Restricted state shall NOT be used.

3.21 Signalling Network Congestion

Reference Q.704, §3.6, §3.8, §13.8, §15.15

The Transfer Controlled Procedure using multiple congestion states without congestion priorities shall be used. The procedure with congestion priorities (Q.704 §13.7) and that of the International Network (Q.704 §13.6) shall NOT be used.

It is required to indicate 3 levels of congestion in the Transfer Controlled Message. In order to make the procedure compatible with earlier procedures, the coding 00 of the spare bits in the TFC shall not be used in transmitted TFC messages, and, if coding 00 is marked in a received TFC message, it shall be interpreted as indicating congestion at Level 2. Hence, the TFC spare bits shall be coded as follows;

00	Not Used. If received, read as Congestion Level 2		
01	Congestion Level		1
10	"	"	2
11	"	"	3

Note: The method of determining the congestion level is implementation dependent.

The option of congestion priorities (§3.8.2.2) shall NOT be used.

Refer also /9/ regarding advice on § 3.8.4, Q.704.

3.22 Signalling Link Unavailability

Reference Q.704, §4.3, §4.4

The loadsharing requirement in 3.19 shall apply not only to normal operation, but also under conditions when changeover and changeback procedures have to be invoked.

Refer also to /9/ which gives additional guidance on congestion procedures.

3.23 Signalling Point Restart

Reference Q.704, §9

Interconnecting operators shall determine the requirements for SP Restart.

Note that the Blue Book SP Restart procedure is inadequate and shall not be referenced. The requirement shall be either, that based on the Red Book National Option of §12.4.2.b) (text repeated below), or that in § 9 of ITU-T Recommendation Q.704 (1996) /8/.

“A SRST message is sent from a signalling point When a previously unavailable link set, directly connecting the signalling point with a signalling transfer point (STP), becomes available. In this case SRST messages sent to the STP refer to all destinations which in the absence of failures are accessible via the STP. Implementation of this item is a national option.”

Refer also to /9/, PNO-ISC/INFO/007 UK Interconnect use of MTP& SCCP, which gives additional guidance on SP restart selection.

3.24 Management Inhibiting

Reference Q.704, §10

Management Inhibition shall NOT be mandatory over the interface, but may be supported subject to agreement between the Operators concerned.

3.25 Congestion Procedures

Reference Q.704, §11.2.3, §11.2.4, §11.2.5

The national option of multiple link congestion states without message priority shall be used.

The national option of congestion priorities (see Q704 §11.2.4) shall NOT be provided.

Refer also to /9/ which gives additional guidance on congestion procedures.

3.26 Link Management Procedures

Reference Q.704, §12

The basic set of link management procedures as described in Q.704, §12.2, including link set emergency restart (§12.2.4.2.), shall be provided.

3.27 Initial Testing of Signalling Links on Activation and Restoration

Reference Q.704, §12.2, Q.707, §2.2

On activation and restoration, if the initial alignment procedure is successful, a Signalling Link Test (SLT) procedure shall be carried out on the signalling link, over which traffic is to be conveyed. The test which shall be made in accordance with Q.707, may be initiated automatically or manually. This must be successful before signalling traffic is allowed onto the link.

If the procedure is not successful, then, in addition to a management system being informed, either processor outage should be set on the link concerned (i.e. SIPO should be transmitted continuously), or alternatively the link shall be marked as out of service and SIOS sent. This is to prevent the distant end from using the link, even if its own link test procedure is successful, and thus to avoid the possibility of a one way signalling relation. Whichever condition is set, it shall only be removed on instruction from management.

The periodic generation of Signalling Link Test messages shall NOT be used. However, if a request for SLT is received, the normal response shall be given.

3.28 Automatic Allocation of Signalling Data Links

Reference Q.704, §12.6

The MTP shall NOT support this service.

3.29 Allocation of Service Indicator Codes

Reference Q.704, §14.2.1

The SI code assignments of /9/ apply.

3.30 Signalling Network Management Messages

Reference Q.704, §15

/5/, UK Point Code numbering scheme applies.

The following messages shall NOT be sent;

- Transfer Restricted (§15.9)

- Signalling-route-set-test (restricted) (Part of §15.10)

- Signalling-data-link-connection-order (§15.13)

- Signalling-data-link-connection-acknowledgement (§15.14)

- Signalling-data-link-connection-successful signal

- Signalling-data-link-connection-not-successful signal

- Signalling-data-link-connection-not-possible signal

- Signalling-route-set-congestion-test (§15.16)

Any of the above messages, if received, shall be treated as unrecognised messages.

The UPU message User Part Identity codes of §15.17.4 Q.704 apply only to the International Signalling Network. For the UK National Interconnect Signalling Network the codes given in /9/ apply. Where the UPU message "affected PC" field and Routing Label OPC differ, the message shall be discarded and a report made to management.

3.31 Allocation of Signalling Link Codes

Reference Q.704, §15.2

Each signalling link shall be allocated a signalling link code which is unique within a link set. The signalling link code must be the same at both ends of the signalling link.

3.32 Signalling Traffic Throughput

Reference Q.706, §1.4

a) Signalling Link Throughput.

The MTP shall be able to receive a continuous stream of any signal units (MSUs, FISUs and/or LSSUs) separated by single flags, and deliver them to the appropriate destination (e.g. MSUs to level 3 and above).

b) Level 2 to Level 3, and Level 3 to MTP User, Throughput.

This is a matter which is dependent on the use to which the node is being put, and is therefore a nodal/implementation dimensioning question which cannot be specified in a general requirements document.

3.33 Message Transfer Times

Reference Q.706, §4.3

The transfer times shall approximate the figures given below in milliseconds, which are based on the design objectives of the reference.:-

Transfer Times	Signalling Point Loading							
	Normal		+15%		+30%		+40%	
	Mean	95%	Mean	95%	Mean	95%	Mean	95%
Tms (ms)	13+n	38+n	23+n	63+n	48+n	123+n	78+n	198+n
Tmr (ms)	8+n	23+n	18+n	48+n	33+n	88+n	48+n	123+n
Tcs (ms)	18+n	38+n	38+n	78+n	98+n	198+n	183+n	368+n

Tms = MTP Sending Time

Tmr = MTP Receiving Time

Tcs = Message Transfer Time at STPs

n = message length in octets divided by 8.

The following assumptions apply:-

- Normal loading is the quantity of signalling traffic in messages per second for which the signalling point is designed.
- Signalling data link bit rate = 64kbit/s.
- Average link occupancy = 0.2

3.34 Monitoring and Measurements

Reference Q.752

Requirements for Monitoring and Measurements shall be based on Q.752, but details will be documented by the Network Operator concerned.

4 Mandatory Requirements Where STP Working Does Not Apply

Where STP working is not part of the interconnect agreement, the following subset of the Requirements shall form the minimum requirement.

The Requirements of Section 3 shall be met except that Paragraphs 3.14, 3.15, & 3.30 shall be replaced by 4.14, 4.15, & 4.30 below.

4.14 Signalling Network Management

References Q.704, §1.3, §3.1, §3.4, §3.5, §4, §7, & §13

Transfer Prohibited, Transfer Allowed, Transfer Controlled and Signalling Route Set Test procedures are Not Required.

Transfer Restricted and Signalling Route Set Congestion Test procedures shall not be used. TFR and SR SCT messages, if received, shall be treated as unrecognised messages.

4.15 Routing of Messages

Reference Q.704, §2.3

The reference shall apply, but no means of preventing Circular Routing is required.

4.30 Signalling Network Management Messages

Reference Q.704, §15

/5/, UK Point Code numbering scheme applies.

The following messages shall NOT be sent;

Transfer Restricted (§15.9)

Signalling-data-link-connection-order (§15.13)

Signalling-data-link-connection-acknowledgement (§15.14)

Signalling-data-link-connection-successful signal

Signalling-data-link-connection-not-successful signal

Signalling-data-link-connection-not-possible signal

Signalling-route-set-congestion-test (§15.16)

Any of the above messages, if received, shall be treated as unrecognised messages.

The UPU message User Part Identity codes of §15.17.4 Q.704 apply only to the International Signalling Network.

For the UK National Interconnect Signalling Network the codes given in /9/ apply.

Where the UPU message "affected PC" field and Routing Label OPC differ, the message shall be discarded and a report made to management.

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