



INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

Q.781

(04/2002)

SERIES Q: SWITCHING AND SIGNALLING

Specifications of Signalling System No. 7 – Test
specification

MTP level 2 test specification

ITU-T Recommendation Q.781

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ITU-T Recommendation Q.781

MTP level 2 test specification

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Summary

This Recommendation contains a set of detailed tests of Signalling System No. 7 MTP level 2 protocol. These tests intend to validate the protocol specified in ITU-T Rec. Q.703.

This Recommendation conforms to ITU-T Rec. Q.780 which describes the basic rules of the Test Specification. In addition, the conditions which are specific to level 2 tests are described.

Source

ITU-T Recommendation Q.781 was prepared by ITU-T Study Group 11 (2001-2004) and approved under the WTSA Resolution 1 procedure on 13 April 2002.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

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ITU-T Recommendation Q.781

MTP level 2 test specification

1 Introduction

This Recommendation contains a set of detailed tests of signalling system No. 7 MTP level 2 protocol. These tests intend to validate the protocol specified in ITU-T Rec. Q.703.

This Recommendation conforms to ITU-T Rec. Q.780 which describes the basic rules of the Test Specification. In addition, the conditions which are specific to level 2 tests are described in the following clauses.

2 General principles of level 2 tests

2.1 Presentation of test descriptions

The level 2 tests aim at testing the level 2 protocol conformance in a given implementation.

Each test description indicates in the "type of test" column; "Validation" (VAT) or "Validation" (VAT) and "compatibility" (CPT).

Although signal units are transmitted and received continuously on level 2, only the signal units which cause and/or indicate the changes of level 2 status are shown in the EXPECTED SIGNAL UNIT SEQUENCE column of each test description.

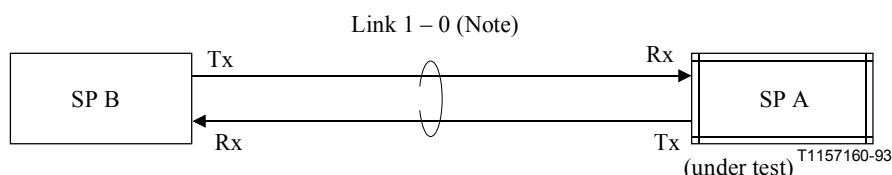
2.2 Presentation of the test list

These tests as a whole, aim at a complete validation of the level 2 protocol without redundancies. Each test is described as simply as possible to check precisely each elementary function of the protocol, which is referred in the columns "reference", "title" and "subtitle" of each test description.

This list is presented in the form of a succession of tests. The presentation order is essentially functional. However, the operator performing these tests may change this order, taking into account some other practical criteria such as: use pre-test conditions to order the list, the end of a given test may be the pre-test condition of another test.

3 Test configuration

A single link will be used for level 2 tests. Figure 1 shows a single link between SP A and SP B. Test specifications are written to test the level 2 of the SP A.



NOTE – First digit: linkset number.
Second digit: link number.

Figure 1/Q.781 – Test configuration of MTP level 2 test configuration 1

4 Test environment

See 6.2/Q.780.

5 Test list

NOTE – Compatibility test items are indicated in this list by an asterisk (*).

The abbreviations *PO*, *LPO*, *RPO*, *EM* and *EDA* are used for processor outage, local processor outage, remote processor outage, emergency and expected delay of acknowledgement, respectively.

1 *Link State Control – Expected signal units/orders* (see Figures 8 and 9/Q.703)

- * 1.1 Initialisation (Power-up)
- * 1.2 Timer T2
- 1.3 Timer T3
- 1.4 Timer T1 and T4 (Normal)
- * 1.5 Normal alignment – correct procedure (FISU)
- 1.6 Normal alignment – correct procedure (MSU)
- 1.7 SIO received during normal proving period
- 1.8 Normal alignment with PO set (FISU)
- 1.9 Normal alignment with PO set (MSU)
- 1.10 Normal alignment with PO set and clear
- 1.11 Set RPO when "Aligned not ready"
- 1.12 SIOS received when "Aligned not ready"
- 1.13 SIO received when "Aligned not ready"
- 1.14 Set and clear LPO when "Initial alignment"
- 1.15 Set and clear LPO when "Aligned ready"
- 1.16 Timer T1 in "Aligned not ready" state
- 1.17 No SIO sent during normal proving period
- 1.18 Set and cease emergency prior to "start alignment"
- * 1.19 Set emergency while in "not aligned state"
- 1.20 Set emergency when "aligned"
- 1.21 Both ends set emergency
- 1.22 Individual end sets emergency
- 1.23 Set emergency during normal proving
- 1.24 No SIO sent during emergency alignment
- * 1.25 Deactivation during initial alignment
- 1.26 Deactivation during aligned state
- 1.27 Deactivation during aligned not ready
- 1.28 SIO received during link in service
- * 1.29 Deactivation during link in service
- 1.30 Deactivation during LPO
- 1.31 Deactivation during RPO
- * 1.32 Deactivation during the proving period

- 1.33 SIO received instead of FISUs
- 1.34 SIOS received instead of FISUs
- 1.35 SIPO received instead of FISUs
- 2 *Link State Control – Unexpected signal units/orders* (see Figure 8/Q.703)
 - 2.1 Unexpected signal units/orders in "Out of service" state
 - 2.2 Unexpected signal units/orders in "Not aligned" state
 - 2.3 Unexpected signal units/orders in "Aligned" state
 - 2.4 Unexpected signal units/orders in "Proving" state
 - 2.5 Unexpected signal units/orders in "Aligned ready" state
 - 2.6 Unexpected signal units/orders in "Aligned not ready" state
 - 2.7 Unexpected signal units/orders in "In service" state
 - 2.8 Unexpected signal units/orders in "Processor outage" state
- 3 *Transmission failure* (see Figure 8/Q.703)
 - 3.1 Link aligned ready (Break Tx path)
 - 3.2 Link aligned ready (Corrupt FIBs – Basic)
 - 3.3 Link aligned not ready (Break Tx path)
 - 3.4 Link aligned not ready (Corrupt FIBs – Basic)
 - * 3.5 Link in service (Break Tx path)
 - 3.6 Link in service (Corrupt FIBs – Basic)
 - 3.7 Link in processor outage (Break Tx path)
 - 3.8 Link in processor outage (Corrupt FIBs – Basic)
- 4 *Processor Outage Control* (see Figure 10/Q.703)
 - 4.1 Set and clear LPO while link in service
 - 4.2 RPO during LPO
 - 4.3 Clear LPO when "Both processor outage"
- 5 *SU Delimitation, Alignment, Error Detection and Correction* (see Figures 11 and 12/Q.703)
 - 5.1 Seven or more "1"s between MSU opening and closing flags
 - 5.2 Greater than maximum signal unit length
 - 5.3 Below minimum signal unit length
 - 5.4 Reception of single and multiple flags between FISUs
 - 5.5 Reception of single and multiple flags between MSUs
- 6 *SUERM Check* (see Figure 18/Q.703)
 - 6.1 Error rate of 1 in 256 – Link remains in service
 - 6.2 Error rate of 1 in 254 – Link into out of service
 - 6.3 Consecutive corrupted SUs
 - 6.4 Time controlled break of the link

- 7 *AERM check* (see Figure 17/Q.703)
 - 7.1 Error rate below the normal threshold
 - 7.2 Error rate at the normal threshold
 - 7.3 Error rate above the normal threshold
 - 7.4 Error rate at the emergency threshold
- 8 *Transmission and reception control (Basic)* (see Figures 13 and 14/Q.703)
 - 8.1 MSU transmission and reception
 - 8.2 Negative acknowledgement of MSU
 - 8.3 Check RTB full
 - 8.4 Single MSU with erroneous FIB
 - 8.5 Duplicated FSN
 - 8.6 Erroneous retransmission – Single MSU
 - 8.7 Erroneous retransmission – Multiple FISUs
 - 8.8 Single FISU with corrupt FIB
 - 8.9 Single FISU prior to RPO being set
 - 8.10 Abnormal BSN – Single MSU
 - 8.11 Abnormal BSN – Two consecutive FISUs
 - 8.12 Excessive delay of acknowledgement
 - 8.13 Level 3 Stop Command
- 9 *Transmission and reception control (PCR)* (see Figures 15 and 16/Q.703)
 - * 9.1 MSU transmission and reception
 - 9.2 Priority control
 - 9.3 Forced retransmission with the value N_1
 - 9.4 Forced retransmission with the value N_2
 - 9.5 Forced retransmission cancel
 - 9.6 Repetition of forced retransmission
 - 9.7 MSU transmission while RPO set
 - 9.8 Abnormal BSN – Single MSU
 - 9.9 Abnormal BSN – Two MSUs
 - 9.10 Unexpected FSN
 - 9.11 Excessive delay of acknowledgement
 - 9.12 FISU with FSN expected for MSU
 - 9.13 Level 3 Stop Command

10 *Congestion Control* (see Figure 19/Q.703)

10.1 Congestion abatement

10.2 Timer T7

10.3 Timer T6

10.4 Congestion and RTB empty

ITU-T Rec. Q.781 (04/2002)

6 Test descriptions

MTP, LEVEL 2

TEST NUMBER: 1.1		PAGE: 1 OF 1																										
REFERENCE: Clause 7/Q.703 STD: Fig. 8; Fig. 12; Fig. 13																												
TITLE: Link State Control – Expected signal units/orders																												
SUBTITLE: Initialization (Power-up)																												
PURPOSE: To check that the No. 7 terminal equipment enters the correct state on power-up																												
PRE-TEST CONDITIONS: Line equipment – ON; No. 7 equipment – OFF																												
CONFIGURATION: 1		TYPE OF TEST: VAT, CPT																										
EXPECTED SIGNAL UNIT SEQUENCE: <table border="0"> <tr> <td>SP</td> <td>B</td> <td></td> <td>SP</td> <td>A</td> </tr> <tr> <td>Link</td> <td></td> <td></td> <td>Link</td> <td></td> </tr> <tr> <td>1 – 0</td> <td>SIOS</td> <td>-----></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td>: Power ON</td> </tr> <tr> <td></td> <td></td> <td><-----</td> <td>1 – 0</td> <td>SIOS</td> </tr> </table>				SP	B		SP	A	Link			Link		1 – 0	SIOS	----->							: Power ON			<-----	1 – 0	SIOS
SP	B		SP	A																								
Link			Link																									
1 – 0	SIOS	----->																										
				: Power ON																								
		<-----	1 – 0	SIOS																								
TEST DESCRIPTION																												
1.	Check link enters correct state.																											
2.	At "Power – On" or Initialization the FIB, BIB, FSN, and BSN shall be as follows: FIN = BIB = 1 : FSN = BSN = 127 (HEX 7F).																											
3.	Repeat test in reverse direction.																											

MTP, LEVEL 2

TEST NUMBER: 1.2	PAGE: 1 OF 1														
REFERENCE: Clause 7/Q.703 STD: Fig. 8; Fig. 9; Fig. 11; Fig. 13; Fig. 14															
TITLE: Link State Control – Expected signal units/orders															
SUBTITLE: Timer T2															
PURPOSE: To check "Not Aligned" Timer T2															
PRE-TEST CONDITIONS: Link out of service															
CONFIGURATION: 1	TYPE OF TEST: VAT, CPT														
EXPECTED SIGNAL UNIT SEQUENCE: <table style="width: 100%; border: none;"> <thead> <tr> <th style="text-align: left;">SP B</th> <th style="text-align: left;">SP A</th> </tr> </thead> <tbody> <tr> <td>Link</td> <td>Link</td> </tr> <tr> <td>1 – 0 SIOS -----></td> <td>1 – 0 SIOS</td> </tr> <tr> <td style="text-align: center;"><-----</td> <td style="text-align: left;">: start</td> </tr> <tr> <td style="text-align: center;"><-----</td> <td style="text-align: left;">1 – 0 SIO</td> </tr> <tr> <td style="text-align: center;"><-----</td> <td style="text-align: left;"> T2</td> </tr> <tr> <td></td> <td style="text-align: left;">1 – 0 SIOS</td> </tr> </tbody> </table>		SP B	SP A	Link	Link	1 – 0 SIOS ----->	1 – 0 SIOS	<-----	: start	<-----	1 – 0 SIO	<-----	T2		1 – 0 SIOS
SP B	SP A														
Link	Link														
1 – 0 SIOS ----->	1 – 0 SIOS														
<-----	: start														
<-----	1 – 0 SIO														
<-----	T2														
	1 – 0 SIOS														
TEST DESCRIPTION															
1.	Timer T2 shall be in the range 5 secs to 150 secs.														

MTP, LEVEL 2

TEST NUMBER: 1.3	PAGE: 1 OF 1																																																																		
REFERENCE: Clause 7/Q.703 STD: Fig. 9; Fig. 14																																																																			
TITLE: Link State Control – Expected signal units/orders																																																																			
SUBTITLE: Timer T3																																																																			
PURPOSE: To check "Aligned" Timer T3																																																																			
PRE-TEST CONDITIONS: Link out of service																																																																			
CONFIGURATION: 1	TYPE OF TEST: VAT																																																																		
EXPECTED SIGNAL UNIT SEQUENCE: <table style="width: 100%; border: none;"> <thead> <tr> <th style="text-align: left;">SP</th> <th style="text-align: left;">B</th> <th style="text-align: left;">Link</th> <th style="text-align: left;">SP</th> <th style="text-align: left;">A</th> <th style="text-align: left;">Link</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td style="text-align: center;"><-----</td> <td></td> <td></td> <td style="text-align: center;">1 – 0</td> </tr> <tr> <td>1 – 0</td> <td>SIOS</td> <td style="text-align: center;">-----></td> <td></td> <td></td> <td style="text-align: center;">SIOS</td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;"><-----</td> <td></td> <td>:</td> <td style="text-align: center;">start</td> </tr> <tr> <td>1 – 0</td> <td>SIO</td> <td style="text-align: center;">-----></td> <td></td> <td></td> <td style="text-align: center;">1 – 0</td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;"><-----</td> <td></td> <td></td> <td style="text-align: center;">SIO</td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;"><-----</td> <td></td> <td></td> <td style="text-align: center;">1 – 0</td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;"><-----</td> <td></td> <td></td> <td style="text-align: center;">SIN</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td style="text-align: center;"> </td> <td style="text-align: center;">T3</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td style="text-align: center;">1 – 0</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td style="text-align: center;">SIOS</td> </tr> </tbody> </table>		SP	B	Link	SP	A	Link			<-----			1 – 0	1 – 0	SIOS	----->			SIOS			<-----		:	start	1 – 0	SIO	----->			1 – 0			<-----			SIO			<-----			1 – 0			<-----			SIN						T3						1 – 0						SIOS
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		<-----			1 – 0																																																														
1 – 0	SIOS	----->			SIOS																																																														
		<-----		:	start																																																														
1 – 0	SIO	----->			1 – 0																																																														
		<-----			SIO																																																														
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					T3																																																														
					1 – 0																																																														
					SIOS																																																														
TEST DESCRIPTION																																																																			
1.	Timer T3 shall be in the range 1 sec to 1.5 secs.																																																																		

MTP, LEVEL 2

TEST NUMBER: 1.4				PAGE: 1 OF 1			
REFERENCE: Clause 7/Q.703 STD: Fig. 8; Fig. 9							
TITLE: Link State Control – Expected signal units/orders							
SUBTITLE: Timer T1 and Timer T4 (Normal)							
PURPOSE: To check "Aligned ready" Timer T1 and "Proving period" Timer T4 (Normal)							
PRE-TEST CONDITIONS: Link out of service							
CONFIGURATION: 1				TYPE OF TEST: VAT			
EXPECTED SIGNAL UNIT SEQUENCE:							
SP B Link 1 – 0 SIOS 1 – 0 SIO 1 – 0 SIN				SP A Link 1 – 0 SIOS 1 – 0 SIO 1 – 0 SIN 1 – 0 FISU 1 – 0 SIOS			
TEST DESCRIPTION							
1.	At 64 kbit/s Timer T4 shall be in the range 7.5 secs to 9.5 secs (nominally 8.2 secs) and Timer T1 shall be in the range 40 secs to 50 secs.						
2.	At 4.8 kbit/s Timer T4 shall be in the range 100 secs to 120 secs (nominally 110 secs) and Timer T1 shall be in the range 500 secs to 600 secs.						

MTP, LEVEL 2

TEST NUMBER: 1.5				PAGE: 1 OF 1																																																																			
REFERENCE: Clause 7/Q.703 STD: Fig. 8; Fig. 9																																																																							
TITLE: Link State Control – Expected signal units/orders																																																																							
SUBTITLE: Normal alignment – correct procedure (FISU)																																																																							
PURPOSE: To check normal alignment procedure																																																																							
PRE-TEST CONDITIONS: Link out of service																																																																							
CONFIGURATION: 1				TYPE OF TEST: VAT, CPT																																																																			
MESSAGE SEQUENCE:																																																																							
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	SP	B		SP	A																																																																		
Link				Link																																																																			
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1 – 0	SIOS		----->																																																																				
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			<-----	1 – 0	FISU																																																																		
1 – 0	FISU		----->																																																																				
TEST DESCRIPTION																																																																							
1.	Start normal alignment procedure.																																																																						
2.	Check link aligns and enters "In service" state.																																																																						
3.	Check that "In service" state is maintained.																																																																						
4.	In VAT only check it is possible to perform a normal alignment procedure in the following cases: – use LSSU in point B with a status field of 8 bits; – use LSSU in point B with a status field of 16 bits.																																																																						

MTP, LEVEL 2

TEST NUMBER: 1.6	PAGE: 1 OF 1																								
REFERENCE: Clause 7/Q.703 STD: Fig. 8; Fig. 9																									
TITLE: Link State Control – Expected signal units/orders																									
SUBTITLE: Normal alignment – correct procedure (MSU)																									
PURPOSE: To check normal alignment procedure																									
PRE-TEST CONDITIONS: Link out of service																									
CONFIGURATION: 1	TYPE OF TEST: VAT																								
EXPECTED SIGNAL UNIT SEQUENCE: <table style="width: 100%; border: none;"> <thead> <tr> <th style="text-align: left;">Link</th> <th style="text-align: left;">SP B</th> <th style="text-align: left;">Link</th> <th style="text-align: left;">SP A</th> </tr> </thead> <tbody> <tr> <td>1 – 0</td> <td>SIOS</td> <td>1 – 0</td> <td>SIOS</td> </tr> <tr> <td></td> <td></td> <td></td> <td>: start</td> </tr> <tr> <td>1 – 0</td> <td>SIO</td> <td>1 – 0</td> <td>SIO</td> </tr> <tr> <td>1 – 0</td> <td>SIN</td> <td>1 – 0</td> <td>SIN</td> </tr> <tr> <td>1 – 0</td> <td>MSU</td> <td>1 – 0</td> <td>FISU</td> </tr> </tbody> </table>		Link	SP B	Link	SP A	1 – 0	SIOS	1 – 0	SIOS				: start	1 – 0	SIO	1 – 0	SIO	1 – 0	SIN	1 – 0	SIN	1 – 0	MSU	1 – 0	FISU
Link	SP B	Link	SP A																						
1 – 0	SIOS	1 – 0	SIOS																						
			: start																						
1 – 0	SIO	1 – 0	SIO																						
1 – 0	SIN	1 – 0	SIN																						
1 – 0	MSU	1 – 0	FISU																						
TEST DESCRIPTION																									
1.	Start normal alignment procedure.																								
2.	Check link aligns and enters "In service" state.																								
3.	Check that "In service" state is maintained.																								

MTP, LEVEL 2

TEST NUMBER: 1.7				PAGE: 1 OF 1			
REFERENCE: Clause 7, 10.3/Q.703 STD: Fig. 9; Fig. 17							
TITLE: Link State Control – Expected signal units/orders							
SUBTITLE: SIO received during normal proving period							
PURPOSE: To test the response to the reception of an SIO during the normal proving period							
PRE-TEST CONDITIONS: Link out of service							
CONFIGURATION: 1				TYPE OF TEST: VAT			
EXPECTED SIGNAL UNIT SEQUENCE:							
SP B Link 1 – 0 1 – 0 1 – 0 1 – 0 1 – 0 1 – 0 1 – 0 1 – 0 1 – 0 1 – 0				SP A Link 1 – 0 1 – 0 1 – 0 1 – 0 1 – 0 1 – 0 1 – 0 1 – 0 1 – 0 1 – 0			
SIOS SIO SIN SIO (one only) SIN				SIOS SIO SIN T4 Stopped SIN T4(Pn) FISU			
TEST DESCRIPTION							
1.	Send an SIO at B during normal proving period.						
2.	Check that new normal period is entered.						

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MTP, LEVEL 2

TEST NUMBER: 1.8			PAGE: 1 OF 1		
REFERENCE: Clauses 7 and 8/Q.703 STD: Fig. 8					
TITLE: Link State Control – Expected signal units/orders					
SUBTITLE: Normal alignment with PO set (FISU)					
PURPOSE: To check the response following normal alignment when PO has been set					
PRE-TEST CONDITIONS: Link out of service					
CONFIGURATION: 1			TYPE OF TEST: VAT		
EXPECTED SIGNAL UNIT SEQUENCE:					
Link			Link		
1 – 0 SIOS			1 – 0 SIOS		
			: set LPO		
			: start		
1 – 0 SIO			1 – 0 SIO		
1 – 0 SIN			1 – 0 SIN		
1 – 0 FISU			1 – 0 SIPO		
			1 – 0 SIPO		
TEST DESCRIPTION					
1.	Check that normal alignment is carried out with LPO set at A.				
2.	Check that SIPO is returned when aligned, and that A stays in "processor outage" state.				
3.	Repeat test with LPO set at B.				

MTP, LEVEL 2

TEST NUMBER: 1.9		PAGE: 1 OF 1		
REFERENCE: Clauses 7 and 8/Q.703 STD: Fig. 8				
TITLE: Link State Control – Expected signal units/orders				
SUBTITLE: Normal alignment with PO set (MSU)				
PURPOSE: To check the response following normal alignment when PO has been set				
PRE-TEST CONDITIONS: Link out of service				
CONFIGURATION: 1		TYPE OF TEST: VAT		
EXPECTED SIGNAL UNIT SEQUENCE:				
	SP	B	SP A	
Link			Link	
		<-----	1 – 0	SIOS
1 – 0	SIOS	----->		
				: set LPO
				: start
		<-----	1 – 0	SIO
1 – 0	SIO	----->		
		<-----	1 – 0	SIN
1 – 0	SIN	----->		
		<-----	1 – 0	SIPO
1 – 0	MSU	----->		
		<-----	1 – 0	SIPO
TEST DESCRIPTION				
1.	Check that normal alignment is carried out with LPO set at A.			
2.	Check that SIPO is returned when aligned, and that A stays in "processor outage" state.			
3.	Repeat test with LPO set at B.			

MTP, LEVEL 2

TEST NUMBER: 1.10		PAGE: 1 OF 1	
REFERENCE: Clauses 7 and 8/Q.703 STD: Fig. 8			
TITLE: Link State Control – Expected signal units/orders			
SUBTITLE: Normal alignment with PO set and clear			
PURPOSE: To check the response following normal alignment when PO has been set and cleared			
PRE-TEST CONDITIONS: Link out of service			
CONFIGURATION: 1		TYPE OF TEST: VAT	
EXPECTED SIGNAL UNIT SEQUENCE:			
	SP	B	SP A
Link			Link
		<-----	1 – 0 SIOS
1 – 0	SIOS	----->	
			: set LPO
			: clear LPO
			: start
		<-----	1 – 0 SIO
1 – 0	SIO	----->	
		<-----	1 – 0 SIN
1 – 0	SIN	----->	
		<-----	1 – 0 FISU
1 – 0	FISU	----->	
TEST DESCRIPTION			
1.	Check that normal alignment is carried out.		
2.	Check that link aligns and enters "In service" state.		

MTP, LEVEL 2

TEST NUMBER: 1.11		PAGE: 1 OF 1																																																																														
REFERENCE: Clauses 7 and 8/Q.703 STD: Fig. 8																																																																																
TITLE: Link State Control – Expected signal units/orders																																																																																
SUBTITLE: Set RPO when "Aligned not ready"																																																																																
PURPOSE: To check the response following normal alignment when PO has been set																																																																																
PRE-TEST CONDITIONS: Link out of service; ability to set PO																																																																																
CONFIGURATION: 1		TYPE OF TEST: VAT																																																																														
EXPECTED SIGNAL UNIT SEQUENCE:																																																																																
<table><tr><td></td><td>SP</td><td>B</td><td></td><td></td><td>SP</td><td>A</td></tr><tr><td>Link</td><td></td><td></td><td></td><td>Link</td><td></td><td></td></tr><tr><td></td><td></td><td></td><td><-----</td><td>1 – 0</td><td></td><td>SIOS</td></tr><tr><td>1 – 0</td><td></td><td>SIOS</td><td>-----></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td>: set LPO</td><td></td><td></td><td></td><td>: set LPO</td></tr><tr><td></td><td></td><td></td><td><-----</td><td>1 – 0</td><td></td><td>SIO</td></tr><tr><td>1 – 0</td><td></td><td>SIO</td><td>-----></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td><-----</td><td>1 – 0</td><td></td><td>SIN</td></tr><tr><td>1 – 0</td><td></td><td>SIN</td><td>-----></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td><-----</td><td>1 – 0</td><td></td><td>SIPO</td></tr><tr><td>1 – 0</td><td></td><td>SIPO</td><td>-----></td><td></td><td></td><td></td></tr></table>					SP	B			SP	A	Link				Link						<-----	1 – 0		SIOS	1 – 0		SIOS	----->						: set LPO				: set LPO				<-----	1 – 0		SIO	1 – 0		SIO	----->							<-----	1 – 0		SIN	1 – 0		SIN	----->							<-----	1 – 0		SIPO	1 – 0		SIPO	----->			
	SP	B			SP	A																																																																										
Link				Link																																																																												
			<-----	1 – 0		SIOS																																																																										
1 – 0		SIOS	----->																																																																													
		: set LPO				: set LPO																																																																										
			<-----	1 – 0		SIO																																																																										
1 – 0		SIO	----->																																																																													
			<-----	1 – 0		SIN																																																																										
1 – 0		SIN	----->																																																																													
			<-----	1 – 0		SIPO																																																																										
1 – 0		SIPO	----->																																																																													
TEST DESCRIPTION																																																																																
1.	Set LPO at A and B.																																																																															
2.	Start alignment.																																																																															
3.	Check that both LPO and RPO after alignment completes.																																																																															

MTP, LEVEL 2

TEST NUMBER: 1.12		PAGE: 1 OF 1			
REFERENCE: Clauses 7 and 8/Q.703 STD: Fig. 8					
TITLE: Link State Control – Expected signal units/orders					
SUBTITLE: SIOS received when "Aligned not ready"					
PURPOSE: To check the response following normal alignment when PO has been set					
PRE-TEST CONDITIONS: Link out of service					
CONFIGURATION: 1		TYPE OF TEST: VAT			
EXPECTED SIGNAL UNIT SEQUENCE:					
Link	SP	B	Link	SP	A
			1 – 0		SIOS
1 – 0		SIOS			
				:	set LPO
				:	start
			1 – 0		SIO
1 – 0		SIO			
			1 – 0		SIN
1 – 0		SIN			
			1 – 0		SIPO
1 – 0	:	stop			
		SIOS			
			1 – 0		SIOS
TEST DESCRIPTION					
1.	Soon after alignment completes, A enters "Aligned not ready".				
2.	Before alignment completes, stop command is given at B.				
3.	Check that, on reception of SIOS, A enters "Out of service" state.				
4.	Repeat test with LPO set at B.				

MTP, LEVEL 2

TEST NUMBER: 1.13			PAGE: 1 OF 1		
REFERENCE: Clauses 7 and 8/Q.703 STD: Fig. 8					
TITLE: Link State Control – Expected signal units/orders					
SUBTITLE: SIO received when "Aligned not ready"					
PURPOSE: To check the response following normal alignment when PO has been set					
PRE-TEST CONDITIONS: Link out of service					
CONFIGURATION: 1			TYPE OF TEST: VAT		
EXPECTED SIGNAL UNIT SEQUENCE:					
Link			Link		
1 – 0 SP B SIOS <----- ----->			1 – 0 SP A SIOS		
			: set LPO		
			: start		
1 – 0 SIO <----- ----->			1 – 0 SIO		
1 – 0 SIN <----- ----->			1 – 0 SIN		
1 – 0 SIO <----- ----->			1 – 0 SIPO		
			1 – 0 SIOS		
TEST DESCRIPTION					
1.	Soon after alignment completes, A enters "Aligned not ready".				
2.	Before alignment completes at B, SIO is sent to A.				
3.	Check that, on reception of SIO, A enters "Out of service" state.				
4.	Repeat test with LPO set at B.				

MTP, LEVEL 2

TEST NUMBER: 1.14		PAGE: 1 OF 1			
REFERENCE: Clauses 7 and 8/Q.703 STD: Fig. 8					
TITLE: Link State Control – Expected signal units/orders					
SUBTITLE: Set and clear LPO when "Initial alignment"					
PURPOSE: To check normal alignment when PO set and clear during "Initial alignment"					
PRE-TEST CONDITIONS: Link out of service					
CONFIGURATION: 1		TYPE OF TEST: VAT			
EXPECTED SIGNAL UNIT SEQUENCE:					
Link	SP	B	Link	SP	A
		<-----	1 – 0	SIOS	
1 – 0	SIOS	----->		:	start
		<-----	1 – 0	SIO	
1 – 0	SIO	----->			
		<-----	1 – 0	SIN	
				:	set LPO
1 – 0	SIN	----->			
		<-----	1 – 0	FISU	
1 – 0	FISU	----->			
		<-----	1 – 0	FISU	
TEST DESCRIPTION					
1.	Set LPO at A during "Initial alignment" state.				
2.	Check A remains in "Initial alignment" state.				
3.	Clear LPO before alignment completes at A.				
4.	Check A enters "In service" state after normal alignment.				
5.	Repeat the test at B.				

MTP, LEVEL 2

TEST NUMBER: 1.15			PAGE: 1 OF 1		
REFERENCE: Clauses 7 and 8/Q.703 STD: Fig. 8					
TITLE: Link State Control – Expected signal units/orders					
SUBTITLE: Set and clear LPO when "Aligned ready"					
PURPOSE: To test the response to LPO when "aligned ready" and to ensure that the aligned ready state resumes when LPO is cleared					
PRE-TEST CONDITIONS: Link out of service					
CONFIGURATION: 1			TYPE OF TEST: VAT		
EXPECTED SIGNAL UNIT SEQUENCE:					
SP B			SP A		
Link			Link		
		<-----	1 – 0	SIOS	
1 – 0	SIOS	----->		:	start
		<-----	1 – 0	SIO	
1 – 0	SIO	----->			
		<-----	1 – 0	SIN	
1 – 0	SIN	----->			
		<-----	1 – 0	FISU	
		<-----	1 – 0	:	set LPO
					SIPO
				:	wait 5 secs.
				:	clear LPO
		<-----	1 – 0	FISU	
TEST DESCRIPTION					
1.	Start link at A.				
2.	At "aligned ready" state set LPO at A. (Suppress return of FISUs at B to maintain "aligned ready" state.)				
3.	Clear LPO at A.				
4.	Check A resumes "aligned ready" state.				

MTP, LEVEL 2

TEST NUMBER: 1.16				PAGE: 1 OF 1			
REFERENCE: Clauses 7 and 8/Q.703 STD: Fig. 8							
TITLE: Link State Control – Expected signal units/orders							
SUBTITLE: Timer T1 in "Aligned not ready" state							
PURPOSE: To test the operation of Timer T1 when in the "aligned not ready" state							
PRE-TEST CONDITIONS: Link out of service							
CONFIGURATION: 1				TYPE OF TEST: VAT			
EXPECTED SIGNAL UNIT SEQUENCE:							
SP B Link 1 – 0 SIOS 1 – 0 SIO 1 – 0 SIN				SP A Link 1 – 0 SIOS : set LPO : start 1 – 0 SIO 1 – 0 SIN 1 – 0 SIPO T1 1 – 0 SIOS			
TEST DESCRIPTION							
1.	Set LPO and start link at A.						
2.	Check A enters the "aligned not ready" state.						
3.	Check A takes the link out of service after time T1.						
4.	Timer T1 shall be in the range 40 secs to 50 secs.						

MTP, LEVEL 2

TEST NUMBER: 1.17			PAGE: 1 OF 1																																																																										
REFERENCE: Clause 7/Q.703 STD: Fig. 9																																																																													
TITLE: Link State Control – Expected signal units/orders																																																																													
SUBTITLE: No SIO sent during normal proving period																																																																													
PURPOSE: To ensure that normal alignment still occurs when SIO is omitted																																																																													
PRE-TEST CONDITIONS: Link out of service																																																																													
CONFIGURATION: 1			TYPE OF TEST: VAT																																																																										
EXPECTED SIGNAL UNIT SEQUENCE:																																																																													
<table><tr><td></td><td>SP</td><td>B</td><td></td><td>SP</td><td>A</td></tr><tr><td>Link</td><td></td><td></td><td></td><td>Link</td><td></td></tr><tr><td></td><td></td><td></td><td><-----</td><td>1 – 0</td><td>SIOS</td></tr><tr><td>1 – 0</td><td>SIOS</td><td></td><td>-----></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td>:</td><td>start</td></tr><tr><td></td><td></td><td></td><td><-----</td><td>1 – 0</td><td>SIO not aligned</td></tr><tr><td>1 – 0</td><td>SIN</td><td></td><td>-----></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td><-----</td><td>1 – 0</td><td>SIN</td></tr><tr><td>1 – 0</td><td>SIN</td><td></td><td>-----></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td>T3</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td>T4(Pn)</td></tr><tr><td></td><td></td><td></td><td><-----</td><td>1 – 0</td><td>FISU</td></tr></table>							SP	B		SP	A	Link				Link					<-----	1 – 0	SIOS	1 – 0	SIOS		----->							:	start				<-----	1 – 0	SIO not aligned	1 – 0	SIN		----->						<-----	1 – 0	SIN	1 – 0	SIN		----->								T3						T4(Pn)				<-----	1 – 0	FISU
	SP	B		SP	A																																																																								
Link				Link																																																																									
			<-----	1 – 0	SIOS																																																																								
1 – 0	SIOS		----->																																																																										
				:	start																																																																								
			<-----	1 – 0	SIO not aligned																																																																								
1 – 0	SIN		----->																																																																										
			<-----	1 – 0	SIN																																																																								
1 – 0	SIN		----->																																																																										
					T3																																																																								
					T4(Pn)																																																																								
			<-----	1 – 0	FISU																																																																								
TEST DESCRIPTION																																																																													
1.	Check normal alignment occurs with no SIO sent from SP B.																																																																												

MTP, LEVEL 2

TEST NUMBER: 1.18				PAGE: 1 OF 1			
REFERENCE: Clause 7/Q.703 STD: Fig. 8							
TITLE: Link State Control – Expected signal units/orders							
SUBTITLE: Set and cease emergency prior to "start alignment"							
PURPOSE: To test the normal proving period is employed having "emergency" set and cleared							
PRE-TEST CONDITIONS: Link out of service							
CONFIGURATION: 1				TYPE OF TEST: VAT			
EXPECTED SIGNAL UNIT SEQUENCE:							
SP B Link 1 – 0 SIOS 1 – 0 SIO 1 – 0 SIN				SP A Link 1 – 0 SIOS : set EM : clear EM : start 1 – 0 SIO 1 – 0 SIN T4(Pn) FISU			
TEST DESCRIPTION							
1.	Check emergency set and cleared prior to start of alignment.						
2.	Check normal proving period is carried out.						

MTP, LEVEL 2

TEST NUMBER: 1.19		PAGE: 1 OF 1				
REFERENCE: Clause 7/Q.703 STD: Fig. 8; Fig. 9						
TITLE: Link State Control – Expected signal units/orders						
SUBTITLE: Set emergency while in "not aligned state"						
PURPOSE: To test that emergency proving can be set during normal initial alignment						
PRE-TEST CONDITIONS: Link out of service						
CONFIGURATION: 1		TYPE OF TEST: VAT, CPT				
EXPECTED SIGNAL UNIT SEQUENCE:						
	SP	B			SP	A
Link				Link		
			<-----	1 – 0	SIOS	
1 – 0	SIOS		----->			
			<-----	1 – 0	SIO	: start
						: set EM
1 – 0	SIO		----->			
			<-----	1 – 0	SIE	
1 – 0	SIN		----->			
			<-----	1 – 0	FISU	
						T4(Pe)
TEST DESCRIPTION						
1.	Check that emergency proving period is used after set EM during normal initial alignment.					
2.	The timing of this test is critical, emergency must be set once the start command has been given and before SIO is received (i.e. during Timer T2 operation).					
3.	At 64 kbit/s Timer T4 shall be in the range 0.4 sec to 0.6 sec (nominally 0.5 sec).					
4.	At 4.8 kbit/s Timer T4 shall be in the range 6 secs to 8 secs (nominally 7 secs).					

MTP, LEVEL 2

TEST NUMBER: 1.20		PAGE: 1 OF 1																																																													
REFERENCE: Clause 7/Q.703 STD: Fig. 9																																																															
TITLE: Link State Control – Expected signal units/orders																																																															
SUBTITLE: Set emergency when "aligned"																																																															
PURPOSE: To test that emergency proving period is used when emergency set prior to receiving SIN																																																															
PRE-TEST CONDITIONS: Link out of service																																																															
CONFIGURATION: 1		TYPE OF TEST: VAT																																																													
EXPECTED SIGNAL UNIT SEQUENCE:																																																															
<table><tr><td></td><td>SP</td><td>B</td><td></td><td>SP</td><td>A</td></tr><tr><td>Link</td><td></td><td></td><td></td><td>Link</td><td></td></tr><tr><td>1 – 0</td><td>SIOS</td><td></td><td><----- -----></td><td>1 – 0</td><td>SIOS</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td>: start</td></tr><tr><td>1 – 0</td><td>SIO</td><td></td><td><----- -----></td><td>1 – 0</td><td>SIO</td></tr><tr><td></td><td></td><td></td><td></td><td>1 – 0</td><td>SIN</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td>: set EM</td></tr><tr><td>1 – 0</td><td>SIN</td><td></td><td><----- -----></td><td>1 – 0</td><td>SIE</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td>┆ T4(Pe)</td></tr><tr><td></td><td></td><td></td><td><-----</td><td>1 – 0</td><td>FISU</td></tr></table>					SP	B		SP	A	Link				Link		1 – 0	SIOS		<----- ----->	1 – 0	SIOS						: start	1 – 0	SIO		<----- ----->	1 – 0	SIO					1 – 0	SIN						: set EM	1 – 0	SIN		<----- ----->	1 – 0	SIE						┆ T4(Pe)				<-----	1 – 0	FISU
	SP	B		SP	A																																																										
Link				Link																																																											
1 – 0	SIOS		<----- ----->	1 – 0	SIOS																																																										
					: start																																																										
1 – 0	SIO		<----- ----->	1 – 0	SIO																																																										
				1 – 0	SIN																																																										
					: set EM																																																										
1 – 0	SIN		<----- ----->	1 – 0	SIE																																																										
					┆ T4(Pe)																																																										
			<-----	1 – 0	FISU																																																										
TEST DESCRIPTION																																																															
1.	Check that emergency proving period is used after SIE sent during "aligned" state.																																																														
2.	The timing of this test is critical. Emergency must be set once SIN has been sent but before Timer T3 expires.																																																														

MTP, LEVEL 2

TEST NUMBER: 1.21				PAGE: 1 OF 1																																																																															
REFERENCE: Clause 7/Q.703 STD: Fig. 8; Fig. 9																																																																																			
TITLE: Link State Control – Expected signal units/orders																																																																																			
SUBTITLE: Both ends set emergency																																																																																			
PURPOSE: To check the emergency alignment procedure and Timer T4(Pe)																																																																																			
PRE-TEST CONDITIONS: Link out of service																																																																																			
CONFIGURATION: 1				TYPE OF TEST: VAT																																																																															
EXPECTED SIGNAL UNIT SEQUENCE:																																																																																			
<table><tr><td></td><td>SP</td><td>B</td><td></td><td>SP</td><td>A</td></tr><tr><td>Link</td><td></td><td></td><td></td><td>Link</td><td></td></tr><tr><td></td><td></td><td></td><td><-----</td><td>1 – 0</td><td>SIOS</td></tr><tr><td>1 – 0</td><td>SIOS</td><td></td><td>-----></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td>: set EM</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td>: start</td></tr><tr><td></td><td></td><td></td><td><-----</td><td>1 – 0</td><td>SIO</td></tr><tr><td>1 – 0</td><td>SIO</td><td></td><td>-----></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td><-----</td><td>1 – 0</td><td>SIE</td></tr><tr><td>1 – 0</td><td>SIE</td><td></td><td>-----></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td> </td></tr><tr><td></td><td></td><td></td><td><-----</td><td>1 – 0</td><td>T4(Pe)</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td>FISU</td></tr></table>							SP	B		SP	A	Link				Link					<-----	1 – 0	SIOS	1 – 0	SIOS		----->								: set EM						: start				<-----	1 – 0	SIO	1 – 0	SIO		----->						<-----	1 – 0	SIE	1 – 0	SIE		----->												<-----	1 – 0	T4(Pe)						FISU
	SP	B		SP	A																																																																														
Link				Link																																																																															
			<-----	1 – 0	SIOS																																																																														
1 – 0	SIOS		----->																																																																																
					: set EM																																																																														
					: start																																																																														
			<-----	1 – 0	SIO																																																																														
1 – 0	SIO		----->																																																																																
			<-----	1 – 0	SIE																																																																														
1 – 0	SIE		----->																																																																																
			<-----	1 – 0	T4(Pe)																																																																														
					FISU																																																																														
TEST DESCRIPTION																																																																																			
1.	Check correct emergency alignment procedure is performed.																																																																																		

MTP, LEVEL 2

TEST NUMBER: 1.22		PAGE: 1 OF 1	
REFERENCE: Clause 7/Q.703 STD: Fig. 9			
TITLE: Link State Control – Expected signal units/orders			
SUBTITLE: Individual end sets emergency			
PURPOSE: To check emergency alignment procedure, Emergency set at the other end			
PRE-TEST CONDITIONS: Link out of service			
CONFIGURATION: 1		TYPE OF TEST: VAT	
EXPECTED SIGNAL UNIT SEQUENCE:			
SP B		SP A	
Link		Link	
	<-----	1 – 0	SIOS
1 – 0	SIOS ----->		
1 – 0	SIO ----->		
			: start
	<-----	1 – 0	SIO
1 – 0	SIE ----->		
	<-----	1 – 0	SIN
			T4(Pe)
	<-----	1 – 0	FISU
TEST DESCRIPTION			
1.	Emergency alignment set at B.		
2.	Start alignment at A.		
3.	Check that alignment occurs with the emergency proving period.		