Template for submitting comments/inputs on draft Test Guide titled "
Signalling Transfer Point **"**
(Draft Test Guide No. TEC 58121:2015)

Name of Manufacturer/Stakeholder:

Organisation:

Contact Details:

S. No	Clause No.	Clause	Comments	Other Remarks, if any

Note: The comments/inputs on the draft Test Guide (Draft Test Guide No. **TEC 58121:2015**) may be provided in the above format vide email to **director-al.tec-dot@gov.in, ddglte.tec@gov.in**

अनंतिम टेस्ट गाइड

टीईसी 58121:2015

(पूर्व सं: टीएसटीपी/टीईसी/जीआर/एसडब्लू/एसटीपी-01/04/दिसम्बर-2015)

PROVISIONAL TEST GUIDE

TEC 58121:2015

(Earlier No. : TSTP/TEC/GR/SW/STP-01/04/DEC-2015)

सिग्नल्लिंग ट्रान्सफर पॉइंट

Signalling Transfer Point

(STANDARD No.: TEC 58120:2015)

ISO 9001:2015

दूरसंचार अभियांत्रिकी केंद्र

खुर्शीदलाल भवन, जनपथ, नई दिल्ली-110001, भारत

TELECOMMUNICATION ENGINEERING CENTRE

KHURSHID LAL BHAWAN, JANPATH, NEW DELHI– 110001, INDIA

www.tec.gov.in

Release: December 2015

Cost: Fee of Cost

FOREWORD

Telecommunication Engineering Centre (TEC) is the technical arm of Department of Telecommunications (DOT), Government of India. Its activities include:

- Framing of TEC Standards for Generic Requirements for a Product/Equipment, Standards for Interface Requirements for a Product/Equipment, Standards for Service Requirements & Standard document of TEC for Telecom Products and Services
- Formulation of Essential Requirements (ERs) under Mandatory Testing and Certification of Telecom Equipment (MTCTE)
- Field evaluation of Telecom Products and Systems
- Designation of Conformity Assessment Bodies (CABs)/Testing facilities
- Testing & Certification of Telecom products
- Adoption of Standards
- Support to DoT on technical/technology issues

For the purpose of testing, four Regional Telecom Engineering Centers (RTECs) have been established which are located at New Delhi, Bangalore, Mumbai, and Kolkata.

ABSTRACT

This document enumerates detailed test schedule and procedure for evaluating conformance / functionality / requirements / performance of Generic Requirements of STP as per IR No TEC/GR/SW/STP-01/04/NOV 2015

CONTENTS

A. INTRODUCTION

This document enumerates detailed test schedule and procedure for evaluating conformance / functionality / requirements / performance of Generic Requirements of STP as per जीR No TEC/GR/SW/STP-01/04/OCT 2015

B. HISTORY SHEET

Sl. No.	*Standard TSTP No.*	*Equipment/Interface*	*Issue*
1.	TSTP/ TEC/GR/ SW/ STP-01/04/DEC2015	GENRIC REQUIREMENTS OF STP	Provisional Issue 1
Document number changed as per Revised Numbering scheme of TEC for conversion of existing TEC document to Standard vide document no.4-47/2019-RC/TEC dated 07-09-2020			

Note:

1. Since the documents have been renumbered as per revised numbering scheme, kindly refer the Mapping- Listing Table pertaining to old and revised document number available on TEC website www.tec.gov.in/. In case of further clarification, please contact at e mail id adgdoc.tec@gov.in
2. Inside the document, General Requirements may be read as Standard for General Requirements, Interface Requirements as Standard for Interface Requirements, Service Requirements as Standard for Service Requirements and Test Schedule & Test Procedure (TSTP) as TEC Test Guide."

C. General information:

Sn.	General Information	Details *(to be filled by testing team)*	
1	Name and Address of the Applicant		
2	Date of Registration		
3	Name and No. of GR/IR/Applicant's Spec. against which the approval sought		
4	Details of Equipment		
	Type of Equipment	Model No.	Serial No.
(i)			
(ii)			
5	Any other relevant Information:-		

D. Testing team: *(to be filled by testing team)*

Sno.	Name	Designation	Organization	Signature
1.				
2.				

E. List of the Test Instruments:

Sno.	Name of the test instrument	Make /Model *(to be filled by testing team)*	Validity of calibration *(to be filled by testing team)* dd/mm/yyy
1.	CCS7 Protocol analyser and simulator		
2.	Call Generator		
3.	Analog & ISDN Telephone instruments		
4.	BER Meter		
5.			

CCS7 Analyser/Simulator should have at least the following capabilities:

i. Should record and analyse CCS7 messages calls including general messaging and call flow scenarios. Logging and pass/fail results should be reported.

ii. Should verify conformance of actions

iii. Should monitor progress of simultaneous calls with bidirectional data traffic.

iv. Supports Call Capturing based on Link or called / calling numbers or link-set

v. Should provide detailed protocol analysis, traffic analysis, and packet data analysis

vi. It should have inbuilt test scenarios for testing CCS7 based component for feature conformance and functionality. The various scenarios for MTP testing tool to simulate messaging

vii. It should have filter capability to filter message based on

- The Frame number.
- Date/Time
- Call Number.
- IP Address.
- String matching e.g. any call, where some CCS7 message in that call has a header that contains the specified.

F. Equipment Configuration Offered: *(to be filled by testing team)*

(a) <Equipment/product name> Configuration:

S.No.	Item	Details	Remarks

(b) <Other equipment name> Configuration:

S.No.	Item	Details	Remarks

G. Equipment/System Manuals: *(to be filled by testing team)*

Availability of Maintenance manuals, Installation manual, Repair manual & User Manual etc. **(Y/N)**

NOTE:

The goals of this TSTP, is to understand how to test STPs for protocol conformance, interoperability and performance. By applying traffic from simulated nodes/SSP to a real STP, processing delays are measured using monitoring equipment. Although signal units are transmitted and received continuously on level 2, only the signal units relevant to test are shown in the expected signal unit sequence of each test description. Tests described in this document are to check elementary function of CCS7. The test set-up given in this document are tentative and may be changed by testing officer, taking in to account, network/testers/ analyzer/simulator availability. In case of any discrepancy between this TSTP and GR, GR clause shall prevail.

H. Clause-wise Test Type and Test No.:

Clause No.	***Clause***	***Type of Test / Test No. etc. ****
General	The hardware equipped should conforms to the document supplied	*Physical Check*
General	Software version taken from the system should match with document provided by the supplier.	*Physical Check*
1.1	This document describes the basic operational, functional requirement and performance standards of Signalling Transfer Point (STP) used in the Indian Telecom networks. STP is used for PSTN, PLMN and Intelligent networks. STP is also used for implementation of 'Number portability' among various license service areas	*Information*
1.2	This GR is intended to facilitate the verification of the capability of the equipment for correct receipt and transfer of message between SPs/STPs deployed in the Indian Telecom networks	*Information*
1.3	a) For all ITU–T/IEEE recommendations, TEC standards/specification and other standards referred in this document, the latest release/issue with all associated amendments, addendum and corrigendum shall be applicable. (b) The RFC's documents of IETF are subject to periodic revision. Hence, where ever RFC's are mentioned in this document, the offered product shall meet either the referred RFC or its previous version or its previous draft or its updated version. Wherever a feature of RFC is mentioned, the product shall comply with the part of RFC specifying the feature. (c) For all IETF RFC's, the interpretation of clauses of RFC's shall be as per RFC 2119	*Information*
1.4	All the requirements described in chapter 2 of this document are suggestive requirements and shall be decided by the purchaser at the time of procurement/ tender as per its requirements. However, the requirements described in Chapter-2 shall not be tested/ verified by TEC at the time of initial certification.	*Information*
2.0 and 2.1	STPs are packet switches in the Common Channel Signalling (CCS) network that transfer messages from one signalling link to another at Level 3. It is also used to carry user information for services and features between switching offices and databases. STP uses information contained in the message in conjunction with information stored in its memory to route the message to appropriate signalling point. STP's main function is to identify the best path between two SEPs to communicate.	*Information*
2.2	The STP system acts as a transit system for the transfer of signalling data from one location to a distant location through defined transmission network. Signalling System No. 7 (SS7) is a signalling protocol that is employed globally, across telecommunications networks, to provide signalling. The Short Message Service (SMS) is also treated as signalling data.	*Information*

Clause No.	*Clause*	*Type of Test / Test No. etc. **
2.3	The CCS7 Network consists of following nodes, interconnected by transmission links, called Data Signalling Links (SLK). a) Service Switching Points [SSP] A Service Switching Point (SSP) is a voice switch that incorporates SS7 functionality. An SSP can originate and terminate messages, but it cannot transfer them. If a message is received with a point code that does not match the point code of the receiving SSP, the message is discarded b) Signalling Transfer Points [STP] Nodes that serve as intermediate signalling message transport switches are called STPs. STP's main function is to identify the best path for two SSPs to communicate. c) Service Control Points [SCP] Service Control Points (SCPs) are the SPs that provide database access to support transaction-based services. SCP acts as an interface between telecommunications databases and the SS7 network.	*Information*
2.4	SS7 can deploy different types of signalling network structures. The choice between these different structures depends upon the factors such as administrative aspects and the structure of the telecommunication network to be served by the signalling system. Accordingly, there are two types of STPs, namely. I) Type-1 ; Integrated STP When STP functionality is incorporated along with 'Service Switching Point' in the 'Service Switching Node', it is known as Integrated Signalling Transfer Point. It performs call switching functions as well as Signalling transfer functions. II) Type -2 : Standalone STP Standalone STP performs only the core function of SS7 signalling transfer. It enables the operator to manage the network resources in more effective way and to host more applications.	*Information*
2.5	Link Types - Links employed in the SS7 network are divided into 6 different types depending on which two network nodes are connected by the link. Each type has a maximum allowed and a minimum required number of links in the linkset. (a) A-links - An "A" (access) link connects a signalling end point (e.g., an SCP or SSP) to an STP. Only messages originating from or destined to the signalling end point are transmitted on an "A" link. Each linkset has at least one and at most 16 A links supporting it. (b) B-links- A "B" (bridge) link connect one mated STP pair to another mated STP pair at the same hierarchical level (two pairs of regional STPs for example). Typically, a quad of "B" links interconnect peer (or primary) STPs (e.g., the STPs from one network to the STPs of another network) (c) C-links- A "C" (cross) link connects STPs performing identical functions into a mated pair. They only carry user traffic in case of congestion or network failure but usually are reserved for network management messages. They are always deployed in pairs for redundancy	*Information*

Clause No.	*Clause*	*Type of Test / Test No. etc. **
	(d) D-links- A "D" (diagonal) link connect mated (e.g., local or regional) STP pairs at one hierarchical level to mated STPs at another hierarchical level in a quad-link configuration. They are deployed in the same fashion as B links. Secondary STPs within the same network are connected via a quad of "D" links. (e) E-links- An "E" (extended) link are used to connect an SSP to a remote STP. They are used when there is a significant amount of traffic going between the nodes to avoid congestion. "E" links are not usually provisioned unless the benefit of a marginally higher degree of reliability justifies the added expense. (f) F-links- An "F" (fully associated) link connect two signalling end points (i.e., SSPs and SCPs) when there is either a large amount of traffic between the two SSPs or when the SSPs cannot be connected through an STP.	
2.6	Depending upon in which network (National or international) STP is used, at there are three types of STPs: i National Signalling Point (NSP) which belongs to the national signalling network only and is identified by a Signalling point code according to national numbering plan of signalling points; ii International signalling point (ISP) which belongs to the international signalling network only and is identified by a Signalling point code according to international numbering plan of signalling points; iii Signalling Gateway which function both as an ISP and NSP and therefore belongs to both the international signalling network and a national signalling network and accordingly is identified by a specific signalling point code in each of the signalling networks.	*Information*
2.7	If discrimination between international and national signalling point code is necessary at a signalling point, the network indicator is used	*Information*
2.8	Global Title Translation (GTT) Global Title Translation (GTT) is an indirect addressing method. GTT is a process where the GT address is mapped to a signalling point code for routing purposes. This function is provided by the Signalling Connection Control Part (SCCP), where the addressing identity is placed in a field named Global Title, together with other information such as Translation Type, Numbering Plan, Encoding Scheme and Nature of Address. GTT eliminates the need for the originating nodes to determine where a message should be routed. Instead, the Signal Transfer Points (STPs) determine the routing based on the type of query and some identifying numbers like Type of Number (TON) or Nature of Address Indicator (NAI) parameter, scope of the address value, (such as whether it is an international number including the country code), a subscriber Mobile Identification Number (MIN), a Mobile Directory Number (MDN), or other type of number. All nodes in the network are identified by a unique point code. This point code is used by CCS #7 as the Origination Point Code (OPC) and the Destination Point Code (DPC) in the routing label of all Message Signalling Units (MSUs). SCCP translates addresses (Global titles) from signalling messages that do not contain explicit information thereby allowing the MTP to route the message. MTP routing is data base	*Information*

Clause No.	*Clause*	*Type of Test / Test No. etc. **
	application (for example, database transactions to support IN/cellular, toll-free number and so on) at the SCP. In general, ANSI networks are interconnected with ITU networks through a gateway, which does the translation between the ANSI signalling format and the ITU format by means of mapping the signalling addresses, irrespective of where the gateway in located.	
3.0	**Functional/Operational Requirements:** All the functional requirements described in clause 3.1 to 3.29, shall be complied by both types of STPs irrespective of type of STP for which the applicant has sought the approval.	*Information*
3.1	General- Functions of various elements of signalling systems shall be in accordance with level concept in which the functions of Message Transfer Part are separated in to three functional levels namely ▪ Level 1 – Signalling data link ▪ Level 2 – Signalling Link Functions ▪ Level 3 - Signalling Network Functions The User Parts (If applicable) shall constitute parallel element at the fourth functional level	*Information*
3.1.1	Above functions shall be in accordance with functional description as given in ITU-T Recommendations Q.701 (1993). However inter-working of Yellow, Red and Blue book implementations (Refer clause 7.1, 7.2, 7.3 of ITU-T rec. Q.701) and SIF (Service Information Field) Compatibility mechanism (Refer clause 7.2.6 of ITU-T rec. Q.701) shall not be used.	*Information*
3.2	Signalling Data Link The signalling data link provided for CCS7 shall be as per ITU-T Rec. Q.702.	*Information*
3.2.1	Only Standard bit rate of 64 kbps shall be used for digital signalling data link which shall be derived either from 2048-kbits/s or from STM-1	*Information*
3.2.2	Interface at point C shall follow Q.703 ITU-T Recommendation for electrical characteristics and G.704 for functional characteristics, the frame structure. (Refer figure 3 below)	*Information*
3.2.3	Interface specifications at points A and B are not applicable (Refer clause 4 of ITU-T Recommendation Q.702).	*Information*
3.3	Signalling Link - The functions and procedures related to transfer of signalling messages over a data link shall be as per ITU-T Recommendation Q.703. This provides the layer 2 functions for the CCS7 protocol stack.	*Information*
3.3.1	All the facilities as per ITU-T Recommendation Q.703, including the following for National use, shall be provided. STP initialization, alignment, activation shall be as described in ITU-T rec. Q.781	Test No.1
3.3.2	The STP shall be capable of transmitting and receiving MSUs with Signalling Information Field (SIF) greater than or equal to 2 octets and less than or equal to 272 octets.	Make some calls (so that signaling pass through STP under test) using CCS7 signalling and verify MSU format It should be as given in Table-1 given on page 74

Clause No.	***Clause***	***Type of Test / Test No. etc. ****
3.3.3	Both Basic and Preventive Cyclic Retransmission (PCR) method of error correction shall be provided (Refer clauses 5 and 6 of ITU-T Rec. Q.703).	*from the applicant*
3.3.4	Values of N 1 and N 2 (Refer clause 6.4.2 of ITU-T recommendation Q.703): The range for N1 shall be 1 to 127 and the nominal value shall be 127. The range for N2 shall be 1 to 4095 and the nominal value for satellite links shall be 2001.	*Information*
3.3.5	Only 64 kbps Signal unit error rate monitor values of T, D and N shall be used. (Refer clause 10.2.5 of ITU-T recommendation Q.703). The three parameters which determines the signal unit error rate are: the number T (signal unit), of consecutive signal unit received in error, 1/D is unit errors/signal unit and N is the number of octets Value of the three parameters for 64 kbps are: T = 64 signals unit D = 256 signal units/signal unit error N = 16 octets	Send large number of messages from simulator and check message SUs available for retransmission (N1) and number of MSU octets available for retransmission (N2). Repeat the observation number of times. N1 should be between 1 to 127 And N2 should be between 1 to 4095
3.4	Synchronization	Heading
3.4.1	The synchronization method shall be master/slave.	Check the system has integrated synchronization with external clock. Test are given in Test no. 2 & 3
3.4.2	The acceptable slip rate shall be in accordance with ITU-T recommendation G.822.	Test no. 2
3.4.3	Bit Error Rate - I. A long term bit error rate of the signalling data link should be less than 10-6 II. A medium term bit error rate should be less than 10-4	Test no. 3 BER should be < 10-6 normally < 10-4
3.3.4	Due to random errors and errors bursts including long bursts which might occur in the signalling link (e.g. due to loss of frame, alignment or octet slip) maximum interruption should not be more than 128 ms.	
3.5	Level 2 Timer- All the level 2 timers shall be provided as per ITU-T Recommendation Q.703, including those given in TABLE 1 of this GR document, for National use (Refer clause 12.3 of ITU-T Recommendation Q.703).	Test no. 4
3.6	Signalling Network Functions and Messages The functions and procedures relating to transfer of signalling messages between the signalling points shall be as per ITU-T Recommendation Q.704. This provides the layer 3 functions for the case protocol stack.	Test no. 5
3.6.1	All the facilities, except those which are barred in following clauses of this document, shall be provided as per ITU-T Recommendation Q.704, including the following for National use	Test no. 5
3.6.2	Standard Routing label shall be used (Refer from clause 2.2.1 to clause 2.2.5 of ITU-T Recommendation Q.704).	Test no. 5

Clause No.	*Clause*	*Type of Test / Test No. etc. **
3.6.2	The following cases of load sharing shall be applicable (Refer clause 2.3.2 of ITU-T Recommendation Q 704): a. Load sharing between signalling links belonging to the same link set. b. Load sharing between signalling links not belonging to same link set	Test no. 5
3.6.4	If UPU message is received, then the actions recommended in clause 11.2.7 of ITU-T Recommendation Q.704 shall be taken.	Test no. 5
3.6.5	Procedures used in connection with link status changes: All the sub-clauses of clause 3.3 of ITU-T Recommendation Q.704 shall be applicable except "Transfer-Restricted" facility.	Test no. 5
3.6.6	Congestion status of signalling links (Refer clause no 3.8.2 of ITU-T Recommendation Q.704). In the national signalling network one congestion and one congestion abatement shall be provided similar to international signalling network as given in clause 3.8.2.1(a) of ITU-T recommendation Q.704.	Test no. 5
3.6.7	Congestion status of signalling route sets (Refer clause no. 3.8.4 of ITU-T Recommendation Q.704). In the national signalling network two states shall be provided similar to International signalling network as given in clause 3.8.4 (a) of ITU-T Recommendation Q.704.	Test no. 5
3.6.8	Controlled re-routing- (Refer clause 8 of ITU-T Recommendation Q.704). All clauses shall be applicable with the exception that clauses pertaining to 'transfer-restricted message' are not applicable.	Test no. 5
3.6.8	MTP restart procedure as defined in clause 9 of ITU-T Recommendation Q.704, shall be used.	Test no. 5
3.6.10	Signalling route set congestion (International network) as defined in clause 11.2.3 of ITU-T Recommendation Q.704 shall be applicable.	Test no. 5
3.6.11	Basic Signalling link management procedure as defined in clause 12.2 of ITU-T Recommendation Q.704 shall be used.	Test no. 5
3.6.12	Signalling-route-set-test (Refer clause 13.5 of ITU-T Recommendation Q.704). All clauses shall be applicable with the exception that "transfer restricted'' message shall not be used.	Test no. 5
3.6.13	Transfer controlled (Congestion priorities) message of ITU-T Recomm. Q.704 shall be applicable.	Test no. 5 & 6 of ITU-T rec. Q.782 (Page No. 61 & 62)
3.6.14	Signalling-route-set-congestion test as defined ITU-T Recomm. Q.704 shall be applicable.	
3.6.15	STP MSU routing, load sharing, congestion shall be handled as described in ITU-T rec. Q.781	Test no. 7.6.1 & 7.7 of ITU-T rec. Q.782
3.7	Signalling message handling: The measurements as given below (as per Table 6 of ITU-T Recommendation Q.752) shall be feasible.	Start traffic and measure the following parameters: ▪ Number of SIF and SIO octets ▪ Received/ transmitted with a given OPC and set of OPCs ▪ handled with a given SI or SI set

Clause No.	*Clause*	*Type of Test / Test No. etc. **
		▪ received/handled with a given OPC or OPCs set and SI or SI set ▪ transmitted with a given DPC or DPCs set and SI or SI set ▪ Number of MSU handled with a given OPC set, DPC set and SI set Repeat the above observation for 15 min. and 30 minutes duration All measurements should be possible
3.8.1	Routing The routing label shall not be modified for national use (Refer clause 2.2.6 of ITU-T Recommendation Q 704).	*Information*
3.8.2	The service indicator shall not be used for routing purpose. Note to clause 2.3.1 of ITU-T Recommendation Q.704 shall not apply.	*Information*
3.8.3	Local processor shall not be blocked when signalling traffic is diverted from affected link to alternative link (Refer clause 3.3.5.1 of Q.704).	*Information*
3.8.4	"Signalling route restricted" as given in clauses 3.4.3 and 3.5.3 of ITU-T Recommendation Q 704, shall not be used.	*Information*
3.8.5	Signalling route congestion procedure shall not be used.	*Information*
3.8.6	"Signalling route restricted" as defined in clauses 4.1.2 and 4.7 of ITU-T Recommendation Q 704 shall not be used.	*Information*
3.8.7	'Transfer-restricted' procedure as defined in clause 6.2.3 of ITU-T Recommendation Q.704 shall not be used.	*Information*
3.8.8	The clause 6.2.4 of ITU-T recommendation Q.704, regarding "Restricted destination'' shall not be applicable.	*Information*
3.8.9	Signalling route set congestion (National option with and without congestion priorities) as defined in clauses 11.2.4 and 11.2.5 of ITU-T Recommendation Q.704 shall not be used.	*Information*
3.8.10	Transfer Restricted" facility as defined in clause 13.4 of ITU-T Recommendation Q.704 shall not be used.	*Information*
3.8.11	"Transfer controlled'' facility (International network and National option without congestion priorities) as defined in clauses 13.6 and 13.8 of ITU-T Recommendation Q 704, shall not be used.	*Information*
3.8.12	The service indicator as defined in clause 14.2.1 of ITU-T recommendation Q.704 shall not be used to perform message routing.	*Information*
3.8.13	The two spare bits as defined in clause 14.2.2 of ITU-T Recommendation Q.704 shall not be used for any special purpose.	*Information*
3.8.14	Routing messages: The STP shall use the MTP to transport messages among switching offices, SCPs and other STPs. A message route refers to a succession of signalling links on which a message is transported from the originating SP to the destination SP. The message route for a given message is predetermined by the routing label, but routing does allow for the traffic to a given destination to be transported over multiple message routes. That is, two messages with	Information

Clause No.	*Clause*	*Type of Test / Test No. etc. **
	different routing labels may be transmitted over a different succession of signalling links to a given destination	
3.8.15	The STP shall use the message discrimination and distribution functions of the MTP designed to deliver the message to the proper application in the STP.	*Information*
3.8.16	Using SCCP, STP shall perform Global Title Translation (GTT) functions on certain type of messages, which do not explicitly contain sufficient information, allowing MTP to route the message. (Refer clause 2.4 of ITU-T recom. Q.714).	Create routing of CCS7 messages on the basis of Signalling Point Code and network indicator and on GTT basis It should be possible to create routing on the basis of SP Code or network indicator or GTT
3.8.17	SCCP management procedures allow alternate routing to replicated applications if an application is failed or inaccessible. SCCP management procedures shall allow alternate routing to replicate applications if an application is failed or inaccessible.	Create routing on the basis of application with alternate routing. Make calls for particular application (block direct link to application) and check call is successful
3.8.18	STP shall support routing of CCS7 messages on the basis of Signalling Point Code as well as following codes network indicator defined in ITU-T recommendation Q.704 clause 14 Bits D C 0 0 International Network 0 1 Spare (for international use o 1 0 Indian Telecom Network 1 1 Reserved for Indian Telecom I	Covered in 3.8.16
3.9	Formats and codes The level 3 messages, formats and codes, except those mentioned below shall be provided as per ITU-T Recommendation Q.704 (07/96) a. RSR- Signalling- route-set-test signal for restricted destination b. TFR- Transfer restricted signal	Undertaking from the applicant/ manufacturer may be taken that format & codes are as per ITU-T rec. Q.704
3.10	Timers and timer values (Refer clause 16.8 of ITU-T rec. Q.704)	
3.10.1	All level 3 timers, given in TABLE-3 of this GR document shall be provided. The level 3 timers given in TABLE-4 of this GR document shall not be provided.	Check all timers as per test procedure (test no. as given below) given in ITU-T rec. Q.782 Timer (Test no) T1 (3.17), T2 &T7 (3.19), T3 (4.11), T4 &T5 (13.4) T6 (6), T8 (9.1.1), T10 (9.6) T12 (7.7), T13 (7.11), T14 (7.3.1), T18 (10.6)
3.11	*Facilities to be Provided in the STP for MTP - The following facilities shall be provided in the STP for proper inter-working with the connected STPs in the network:*	*Information*
3.11.1	*It shall be possible to assign the signalling data link to any timeslot of the PCM except timeslot 0.*	▪ Assign different time slot of the PCM as signalling

Clause No.	*Clause*	*Type of Test / Test No. etc. **
3.11.2	*It shall be possible to assign multiple Signalling data links on the same PCM.*	data link . ▪ Assign multiple timeslot of the PCM as signalling data link ▪ Create fault on any signalling link It should be possible to create multiple links on any time slot (except time slot 0). Any case of link failure suitable alarm should be generated
3.11.3	The STP shall provide report for failure of any signalling data link.	
3.11.4	The STP shall provide audio-visual alarm on O&M terminal. NMC/OSS based alarm window shall be supported	
3.11.5	Basic error correction method and error correction by Preventive Cyclic Retransmission (Refer clauses 5 and 6 of ITU-T recommendation, Q.703): It shall be possible to assign a signalling link set to specifically follow one of the two methods. A STP may therefore have both the methods working simultaneously on different signalling link sets. The assignment of error correction method shall be programmable by MML.	
3.11.6	Values of N 1 and N2 (Refer Clause 6.4.2 of ITU-T recommendation Q.703): It shall be possible to set the values of N1 and N2 within the range specified, using MML command. The nominal values shall be set by the system as default.	Set the values of N1 and N2 within the range specified, using MML command It should be possible to set any values of N1 and N2 within the range specified
3.11.7	It shall be possible to set the values of Level 2 timers within the range specified. The nominal values shall be set by the system as default.	Set the values of Level 2 timers It should be possible to set any value within the specified range
3.11.8	If automatic allocation of Signalling link and signalling terminals have been provided, it shall be possible to use either this procedure or Basic procedure on a link set basis as defined in clauses 12.1.1 and 12.1.2 of ITU-T rec. Q.704.	Allocate signaling link to any SP by first by automatic allocation procedure and then by linkset basis. It should be possible to do so by both procedures
3.12	Signalling Connection Control Part - The STP should support the Signalling Connection Control Part (SCCP) given in National SCCP Standards (SD/CCS-03).	Information
3.13	Procedures to prevent unauthorized use of an STP	• Bar/allow transmission of message over some route • Inhibit/allow by a combination of designated incoming link sets to designated DPCs • Inhibit/allow by a combination of designated outgoing link sets to designated DPCs • Inhibit/allow by OPC and DPC combination Any combination should be possible
3.13.1	It shall be possible to authorize transmission of CCS7 message by Man-Machine communication as defined in ITU-T recommendation Q.705.	
3.13.2	Identifying unauthorized CCS7 messages In addition to the normal signalling message handling procedures specified in Recommendation Q.704, it shall be possible to inhibit/allow messages designated for another signalling point (SP) based on any one or combination of the following options: a. To inhibit/allow STP access by a combination of designated incoming link sets to designated DPCs. This combination of DPC/incoming link set shall effectively operate in the form of a single matrix. This matrix shall consist of a maximum of 512 DPCs and a maximum of 512 incoming link sets. b. To inhibit/allow STP access by a combination of designated outgoing link sets to designated DPCs. This combination of DPC/outgoing link set shall effectively operate in	

Clause No.	*Clause*	*Type of Test / Test No. etc. **
	the form of a single matrix. This matrix shall consist of a maximum of 512 DPCs and a maximum of 512 outgoing link sets. c. To inhibit/allow STP access by examination of OPC and DPC combination in the incoming STP message. This combination of DPC/OPC shall effectively operate in the form of a single matrix. This matrix shall consist of a maximum of 512 DPCs and a maximum of 512 OPCs	
3.13.3	Treatment of unauthorized messages a STP identifying unauthorized messages should be able, on a per link set or per signalling point code basis, to i. provide all unauthorized messages with the same handling as authorized traffic, or ii. discard all unauthorized messages b In addition, an STP should be able to i. allow all STP messages outside the designated ranges as given in clause 3.13.2 above; ii. bar (discard) all STP messages outside the designated ranges as given in clause 3.13..2 above	Allow/ discard unauthorized message It should be possible to allow or discard such massages
3.13.4	Measurements- An STP should be able to identify the unauthorized messages coming from another network and should count and record the details of the unauthorized messages on a per link set and/or signalling point code basis	Measure number of unauthorized messages on any link set or from a particular SP code It should be possible to measure and count such unauthorized messages and the same should be notified by generating For generating alarms/ unauthorized messages simulator can be used
3.13.5	Notification to unauthorized user – An STP identifying unauthorized messages from another network shall notify the Administration about unauthorized message(s). Whenever STP receives an unauthorized message, an urgent alarm shall be given with OPC, date, time, signalling link. In addition, a violation fault report shall be issued giving the unauthorized message content. It shall be possible to selectively restrict the number of violation reports per link set and/or signalling point code basis. It shall also be possible to inhibit the violation reporting mechanism on a point code/link set basis, nodal or on a message direction, i.e. if an inhibited message is destined for all ROA then it shall be possible to suppress the violation reports whilst allowing violation reports on inhibited messages from the ROA	
3.14	Screening functionality: Screening of MTP, SCCP and MAP messages shall be possible, allowing discard or further processing of messages. Rejected data shall be registered. Screening/ monitoring function shall be possible on all the signalling links.	Information
3.14.2	SCCP Screening : screening on following parameters shall be provided a. SCCP Message type b. SCCP Calling Party Address parameters {Routing Indicator, RI, Sub system number (SSN), Translation Type (TT), Numbering Plan, Point Code} c. SCCP Called Party Address before GTT d. SCCP Called Party Address after GTT e. GT digits	Test No. 6

Clause No.	*Clause*	*Type of Test / Test No. etc. **
	f. Screening Sub-system Managements messages by affected Point Code g. The STP shall be capable of analysing incoming messages and enforcing screening and filtering rules based on combinations of the following criteria: Originating node (e.g. SCCP CgPA GTA) + Destination node (e.g. SCCP CdPA GTA) + Message type (e.g. MAP Operation Code) h. It shall be possible to screen only on origination, only on destination, only on message type, or any combination thereof.	
3.14.1	MTP Screening shall provide a. OPC/DPC/SIO screening b. Incoming Linkset/DPC screening c. Network Indicator Screening d. Screening Network Managements messages by affected Point Code.	Test No. 6
3.14.3	MAP Screening: It shall provide screening of MAP operations code relating to SMS traffic providing following capabilities: a. Block SMS traffic from certain SMSCs of other Operators. b. Prevent misuse of self owned SMSC for SMS traffic coming from other Operators. c. Allow Roaming traffic for all services except SMS traffic.	Test No. 6
3.14.4	It shall support screening of ISUP message type per OPC & DPC.	Test No. 6
3.14.5	All screening violations should be recorded and reported	
3.14.6	A test mode functionality for screening shall be provided that can be applied per linkset. In the test mode, the potential screened out messages shall be reported but not discarded. They are passed through the network without any impact. It shall be possible to turn on/off/test mode screening per linkse	
3.14.7	It shall be possible to specify intelligent actions to be taken as a result of a received message matching the screening criteria (in addition to discard and report).	Covered in Test 6
3.14.8	It shall be possible to copy a message and deliver to an offline system for analysis, while allowing the original message to be routed (useful for monitoring)	Covered in Test 6
3.14.9	It shall also be possible to redirect a message based on the screening criteria such that it goes to a redefined destination other than the originally intended destination.	Covered in Test 6
3.15	Number Portability & Routing Applications: STP shall support number portability feature for mobile as well as fixed network application with any of the following mechanisms for implementing number portability. i. All call Query (ACQ) ii. Query on release (QOR) iii. Drop-back or release to Pivot (RPT) iv. Onward routing STP shall support at least "All call Query (ACQ)" for number portability. Other methods of number portability, if required, may be decided by	Check number portability by calls to some mobile numbers ported to some other operator. Check for Geographic number portability , Non-Geographic number portability and Location portability Calls to ported number

Clause No.	*Clause*	*Type of Test / Test No. etc. **
	the purchaser.	should be terminated successfully.
3.16	Alternate routes - Generally, the most direct route from an STP to a destination is provisioned as the normal route. It shall be possible to provision routes of 3 priorities not only to the primary SP, but also to the secondary SPs. The STP shall update the status of an affected signalling route when the status of a route changes, whether that route is the current route or not. On the failure of a current (combined) link set, traffic shall be diverted to the next highest priority (combined) link set that is available	Information
3.17	Addressing: (a) Each STP shall be uniquely identified by a network address called a Signalling Point Code (SPC). An SPC is a 24-bit address (as per ANSI standard) and a is a 14-bit address (as per ITU-T standard) as given in the GR. When used as 'National signalling Point' (NSP), 14-bit address shall be used. However, when used as International Signalling Point (ISP) in the International network or Signalling Gateway to function both as an ISP & NSP both 14-bit as well as 24-bit address shall be supported. Purchaser may decided if 14-bit address or 24-bit address or both type of address support is required as per its requirements. (b) The STP shall support IP addressing as per version 4 (IPv4) as per IETF RFC791 well as version 6 (IPv6) (if required) as per IETF RFC2460, RFC1981, RFC4443, RFC4861 and RFC 4862.	Information
3.18	It should be possible for STP to interface with Network Management system (NMS)) either directly or through Element management System (eMS). The north-bound interface from STP/eMS to NMS should support SNMP/XML/CORBA etc. From NMS/eMS, it shall be possible to create different user category for O&M terminal (i.e. LCTs) with different privilege for configuration & other management functions.	Test No. 7
3.18.1	Following FCAPS management functions shall be supported: Fault management – The system shall provide for visual/audible alarms to assist in efficient administration. The following minimum printouts/alarms are envisaged: a) The alarm program shall provide an alarm on O&M terminal to indicate the failure of power supply. b) A suitable message on O&M terminal shall be provided to indicate the operating status of the processors, signalling links e.g. link/linkset failure, inaccessibility of a signalling point c) A visual display of faults detected with identification of faulty units. The display/message shall contain the date and the time. d) Alarm and printout in case of failure of CCS7 signalling link/signalling route. Provision shall be available to extend the alarm message to a remotely located O&M terminal. e) Alarm Threshold Administration f) Alarm Monitoring SS7 network g) Logging and browsing of performance alarms	Test no. 7

Clause No.	*Clause*	*Type of Test / Test No. etc. **
3.18.2	Configuration management- MTP Routing Verification –In STP it shall be possible to verify the routing of signalling traffic between an originating point and the destination point within the SS7 network. (a) Verification of primary as well as alternate routes (b) Detection of MTP routing loops (c) Detection of unknown destination points (d) Checking bi-directional operation of a signalling relation. (e) Checking bi-directional operation of individual routes. (f) Tasks characterized by either a single command or scripts that combine a sequence of commands to one compound task. (g) Maintain an active archive of configuration files for managed network devices. (h) Maintain information on multiple configuration files and modifications made. (i) Export of configuration files to 3rd party applications for modelling, integrity checking or generating reports (j) The standard Event Report Management function shall be provided	
3.18.3	Accounting management – (Applicable only for SSTP) Accounting of MTP, SCCP and MAP messages shall be provided. It shall be possible to account the following resources per operator per week: (a) MTP Message accounting It shall record the traffic volume of transferred SS7 messages (number of MSUs and bytes). The system shall handle minimum 255 MTP accounts. Each account may comprise of one linkset or a group of linksets leading to an operator. Number of MSUs incoming to STP, which are transmitted by the MTP to other Signalling point per operator/signalling link shall be accounted. Any incoming MSU blocked by screening shall not be counted. MSU shall include CCS7 messages like MTP management messages, MTP test messages, ISUP messages, SCCP messages, INAP messages, MAP messages However, it shall not include MSU blocked/filtered The following set of MSU accounting data shall be stored: ▪ Number of transited MSU received per incoming signalling link per DPC per SI per operator combination. ▪ Number of transited octets (SIF + SlO) per DPC per SI per operator combination ▪ Number of transited MSUs sent per (OPC/DPC/SI) and operator combination. ▪ Number of transited octets (SIF + SIO) sent per (Outgoing signalling link DPC/SI) per operator combination (b) SCCP Message accounting SCCP messages received for Global Title Translation shall be accounted separately per operator. In this case DPC of SCCP message shall be signalling point code of STP. The following set of SCCP accounting data shall be stored: * Mobile Roaming transaction * SMS messages sent per operator	Test No. 8

Clause No.	*Clause*	*Type of Test / Test No. etc. **
	* Any SCCP message Octets SCCP accounting shall enable to determine what traffic is using the SCCP function of the STP. The system shall handle minimum 255 SCCP accounts, in which one or more point codes can be grouped together to identify SCCP gateways of another operator. The accounting functionality shall comprise all possibilities described in Screening. (c) It shall be possible to create number of different accounting class combinations (Number of accounting class required may be specified by the purchaser) for each MTP/SCCP/MAP account for accounting and billing purpose. It shall be possible to transfer the accounting data to Central NMS/EMS/Billing centre at configurable .periodic interval. (Minimum configurable period shall be specified by the purchaser) (d) Signalling Data Record generate by the STP for messages shall have at least following information. ASN notation shall be used for SDR: i. SDR Number ii. Date and time of message . . . iii. Message header code	
3.18.4	Performance management – Performance management module shall support collection, processing and presentation of the performance related data from all the network elements for the purpose of study of subscriber profile, traffic study, planning of capacities, monitoring of network health etc. it shall include (a) Collection of traffic measurement data (b) Data Storage in a relational database system (c) Generation of Historical Data yielding long-term-statistics (d) Web reports based performance analysis (e) Real Time Performance Alarms through Threshold Supervision and forwarding to umbrella management system via SNMP (f) Comprehensive and flexible reporting features to facilitate quick and easy investigations of network traffic problems. Various reports shall be possible to be generated such as: • Date & time of fault on circuit or network elements • Date & time of fault restoration on circuit or network elements • Circuit availability • Reports for evaluation of AMC performance etc. If any other parameter is required, it shall be specified by the purchaser (g) Customization of Reports: It shall be possible to customize the reports. The Purchaser shall be free to ask for customization of reports based on the data available in the database from time to time during warranty period & AMC period. It shall be possible to generate the customized reports as per purchaser requirement. (h) Correlation with, historical traffic values such as daily, weekly monthly statistics (i) Monitoring at programmed intervals.	Test no. 9

Clause No.	*Clause*	*Type of Test / Test No. etc. **
3.18.5	Security management - Security requirements shall be as described in Clause 8.1 of this GR.	Test No. 10
3.19	Priority Processing of Network Management Tasks The STP shall provide the capability to prioritize its network management functions to assure that critical network management functions receive high processing priority in its network management processors. This capability shall be particularly available when network management processor is overloaded	Information
3.20	Load Sharing – (a) STP shall provide MTP load sharing across multiple link-sets and multiple links within a single link-set. (b) STP shall provide SCCP load sharing up to 16 primary destinations at equal distribution across the destinations.	Covered in Test 5 (v)
3.21	Multiple SS7 network - STP shall be able to operate with number of independent and separate Networks simultaneously. (Number of SS7 networks shall be specified by the purchaser). It shall have independent SS7 functions for each of the multiple networks or SS7 domains with individual treatment of SCCP/MTP traffic streams in each domain.	Connect STP with at least 2 separate STPs. Route the calls through both STPs. Both STPs should handle the calls successfully Note: In case 2 STPs are not available, simulator can be used as 2nd STP or alternatively, same STP can be configured as 2 STPs by virtual portioning
3.22	The O&M terminal i.e. LCT shall be provided for exchange of information between the STP system and the maintenance and operating personnel. From LCT, it shall be possible to do System configuration, system supervision, fault monitoring, fault repairing etc. It shall also be possible to transfer system log to NMS/eMS. It shall be possible to create different user category for O&M terminal (i.e. LCTs) with different privilege for configuration & other management functions either locally or from NMS. In case of loss of eMS/NMS connectivity, LCT shall remain functioning for local management and after restoration of connectivity, LCT shall transfer system log to NMS/eMS. Note: In case of 'Integrated STP' If these functionalities have been tested for switching node in which STP is integrated, same need not be repeated	▪ Check the hardware of terminals provided and check some commands. Commands should be in English and check if it is GUI based terminal ▪ Give some command and abort before its execution. Command should be aborted and terminal should not hang ▪ Check all output from system contain time and date ▪ Give some wrong command. It should be rejected by the system and its function should not be affected. Output While testing NMS connectivity (Refer Test nos. 7, 8 & 9), give some commands from LCT. System should give same output as
3.22.1	The LCT shall support Graphical User Interface (GUI) for maintenance, configuration, management and supervision	
3.22.2	It shall provide facility for cancelling and aborting the execution of commands.	

Clause No.	*Clause*	*Type of Test / Test No. etc. **
		described in test no. 7, 8 & 9.
3.22.3	Where several such terminals are in use on a single system, a mechanism shall be available to avoid clashes.	Give same command with different parameters from different terminals simultaneously. Command should be executed as per parameters given from any one LCT.
3.23	Diagnostic a. On a faulty condition, the equipment shall identify the faulty sub-system and shall run diagnostic automatically and make it out of service. Normal function of the system shall not be affected due to invocation of any diagnostic program. The resolution of the fault diagnosis in the offered system shall be indicated. It shall be possible to diagnose up to single PCB level in at least 99% of the cases. In the rest of the cases, the fault diagnosis shall be limited to 2 cards. b. Details of the off-line diagnostic programs shall be given. The procedure for invoking such programs shall be described. The procedure for consulting fault dictionary for diagnostic programs should be made available. c. In case a fault requiring reloading of the program is detected, this shall be carried out automatically. In case of manual re-loading, it should be possible to stop and start at any particular point in the program.	▪ Block any sub-system, create a fault and give diagnostic command. Diagnostic programme should be able to detect the fault and should display the suspected PCB, module name, it's location in the rack and rack name etc. Repeat this test for different sub-systems ▪ Create a hardware/ software fault on any sub-system (in service). Check self diagnostics for fault localisation in case of any hardware/ software fault. Verify that in such a case, faulty element is automatically put out-of-service and stand by element is made in-service ▪ Repeat the above tests for all system elements. ▪ Check even when there is no fault, system should perform self- diagnostics (without any manual intervention) after at a pre-defined interval. ▪ Create a fault. Faulty Sub-system should be put out of service automatically

Clause No.	*Clause*	*Type of Test / Test No. etc. **
		and suitable alarm should be generated
3.24 3.24.1	Command/Command Log Under normal conditions, the execution of any command shall not result in malfunctioning and/or over loading of the system.	Information
3.24.2	It shall be implemented in such a way that errors in commands or control actions shall not cause the system to stop or unduly alter the system configuration.	Give some commands with wrong/ contradictory parameters. Commands should not be executed and terminal should not hang. System shall give some suitable output message
3.24.3	Command errors detected by the system shall be indicated by the output of error messages	
3.24.4	The system shall support priority messages to interrupt an input or output message of lower priority	Information
3.24.5	Commands which are used for modification of system program or data shall be logged in a file and it shall be possible to retrieve the same on demand whenever required, using MML command. It should not be possible to modify or delete log file by any MML command.	▪ Check system log record ▪ Edit some commands in the log ▪ All the commands given in the system should be logged ▪ It should not be possible to edit or delete log
3.23.6	It shall be possible to store at least the last 20 commands on the screen and by scrolling and editing any command can be re-executable.	Scroll the command on screen At least last 20 commands given from the terminal should be available
3.25 3.25.1	System back-up It should be possible to save system back-up automatically at a specified time in the system hard disk. In addition, it should also be possible to save system backup automatically in CD-ROM/DVD/ Optical disk /Cartridge etc. It shall be possible to define the above time by MMC.	▪ Copy system dump from hard disk into CD-ROM/ cartridge/ DVD/ optical disk etc. It should be possible to copy system back up from hard disk to any memory device. ▪ Copy system dump from CD-ROM/DVD/ cartridge/ optical disk etc. to hard-disk. It should be possible to copy system back up from any memory device to hard disk. ▪ Load dump from hard-disk into system and initialise. All sub-system should
3.25.2	It shall be possible to take complete system backup on the same device. It shall also be possible to load the system from the backup. It shall be possible to store multiple files of charging information, detailed billing information, traffic statistics, command log, system software, office data etc. on the same device	

Clause No.	*Clause*	*Type of Test / Test No. etc. **
		perform their normal functions after initialisation. ▪ Check automatic system back up at pre-defined time is taken automatically ▪ Take system backup, other data files on the same memory device. It should be possible Check retrieval of stored files.
3.26	Capacity: a. The signalling links of STP shall be dimensioned for traffic load of 0.1 Erlang per signalling link but it shall be capable of handling up to 0.8 Erlang per signalling link. b. STP shall meet the minimum performance requirements specified in clause 5 of this document with all features as defined by the purchaser turned on and with full capacity (including all accounting and screening features, if specified by the purchaser), with an average MSU length of 100 bytes. c. The link/terminal capacity of an STP, as well as memory capacity, shall be sufficient to allow E-link deployment for direct routing as well as back-up routing, without affecting the normal STP operations. d. The STP shall also provide the ability for the alternate route(s) to be engineered to handle all the normal traffic together with the traffic that is normally sent on the E-link set.	Implementation guidelines
3.27	3.1 System Redundancy (a) The equipment shall have availability figure of 99.999%. The MTBF (Mean Time Between Failure) and MTTR (Mean Time To Restore) Predicted and observed values shall be furnished along with calculations by the manufacturer. (b) Sufficient redundancy shall be built into the design of the system so that the failure of any component/sub-system STP shall not result in the total system failure. (c) System shall be equipped with redundancy for power supply	i. Start traffic and during the test continue to initiate more traffic ii. Create a software/ hardware fault on any active duplicated/load-sharing element/ link /power supply iii. Perform command-initiated change-over for any active duplicated/load-sharing sub-systems/ link iv. Check redundancy for each subsystem Repeat the above tests for different types of sub-systems and link sets

Clause No.	*Clause*	*Type of Test / Test No. etc. **
3.28	Hardware: The plug in units (if any) shall be hot swappable to allow their removal/ insertion while the equipment is in energized condition.	▪ Remove some plug in units and reinsert ▪ Perform hot swapping of some units It should not affect the system functioning
3.29 3.29.1	Software The normal operation of the system should not be adversely affected (excluding planned outage) while undertaking i. Extension to existing equipment (Hardware expansion). ii. Enhancement of facilities. iii. Correction to programs or functional blocks. iv. Software up-gradation	▪ Remove & then add some hardware. System functioning should not be affected during removal/addition of hardware ▪ Install, activate and remove a patch. During installation/ activation/ removal of a software patch, any system functioning, calls processing, observations etc. should not be affected.
3.29.2	Facilities shall be in-built to ensure automatic system recovery on detection of software fault.	Covered in testing of clause 3.23
3.29.3	The software shall not pose any problem, due to changes in date and time based by events such as changeover of millennium/century, leap year etc., in the normal functioning of the system.	Start traffic & some observations. Change the date & time to 28th Feb. 23.55 hrs. Wait for 10 minutes. Date should change to 1st March (or 29th Feb. in case of leap year). During changeover of date, traffic or observations should not be affected.
3.29.4	Software version of the equipment offered for type approval must be indicated.	Take print out of complete details regarding the software Version, checksum etc. shall be taken. Software version should match with the document submitted.
3.29.5	The functional modularity of the software shall permit addition or removal any functionality without disturbing the other functionality.	Covered in 3.29.1
3.29&3.29.1	Signalling Connection Control Part – STP shall provide Global Title Translation (GTT) as defined in ITU-T rec. Q.714 for following capabilities: a National and international roaming for mobile subscribers. b Routing of SMS messages as per defined rules.	▪ Make some national & international roaming calls from mobile ▪ Send some national & international messages

Clause No.	*Clause*	*Type of Test / Test No. etc. **
	c Efficient routing of calls when IN services is distributed across multiple SCPS. d To localize routing database in case of number portability. Network access verification for blocking call or allowing call for particular service (s).	from mobile ▪ Make some IN calls Make some calls to ported number All the calls should be processed successfully
3.31 3.31.1	Operation Maintenance and administration Part Provision shall exist in STP to support Operation Maintenance and Administration Part (OMAP) given in ITU-T recommendation Q 750, Q.753, Q.754 and other related ITU-T recommendation for MTP routing verification test MRVT.	From system OMAP, measure the following (by command) ▪ MTP signalling link faults and performance (Table-1/Q.752 ▪ MTP signalling link availability (Table-2/ Q.752) ▪ MTP signalling link utilization (Table 3 /Q.752) ▪ MTP signalling link set and route set availability (Table 4/ Q.752) ▪ MTP signalling point status (Table 5/ Q.752) ▪ MTP signalling traffic distribution (signalling route utilization) (Table 6/ Q.752) ▪ SCCP error performance (Table 7/ Q.752) ▪ SCCP subsystem availability (Table 8/ Q.752) ▪ SCCP – Utilization (Table 9/ Q.752) ▪ SCCP – Quality of Service (Table 9 bis) / Q.752) All measurements should be possible.
3.31.2	STP shall have provision to record processors load (% occupancy).	By command measure, processor occupancy. System should display processor occupancy.
3.31.3	All measurements (obligatory and others) included in Table 1 to 16 of Q.752 (ITU-T 06/97) shall be provided.	Covered in 3.31.1
3.31.4	Accounting of deferent utilization in multi-operators environment. Facility shall be provided to assemble information for setting accounts with different operators using resources of STP. Accounting of MTP, SCCP and MAP messages shall be provided, in accordance with ITU-T Q.751, Q.752, in order to bill and charge connected Operators. Volume of	Covered in Test No. 8

Clause No.	*Clause*	*Type of Test / Test No. etc. **
	transferred SS7 messages (number of MSUs and total bytes) and traffic type shall be accounted for.	
3.31.5	Sufficient redundancy shall be provided for storage and retrieval of the accounting data. It shall be possible to transfer the accounting data to a Central NMS location or any other accounting system for further processing.	Covered in clause 3.27
3.31	Power Supply Option 1: The equipment shall be capable of working with –40 V to -60 V. DC input from power supply. Switching mode Power Supply (SMPS) shall be used. Power supply and battery shall be modular and expendable to support the ultimate equipment configuration. Option 2: AC Mains supply of 220 Volts with a tolerance of -15% to + 10% would be available. The frequency may be 50 Hz + 2 Hz. UPS and other power requirements are to be specified by the system developer. Purchaser may decide option 1 or option 2 of power supply as per its requirement.	Check the power system supplied is as per option 1 or option 2. Same may be indicated in TAC
4.0& 4.1	Interface Requirements An STP shall be able to communicate with other nodes in the CCS network using the MTP, SCCP, and OMAP of the SS7 protocol as defined in following documents- (a) The STP shall transport the CCS7 messages as specified in TEC/IR/CCS-SIG and SD/INP-01. The TCAP provides the ability to exchange information between CCS7 nodes to provide services. The TCAP uses SCCP for transport. (b) STP shall inter-work with ANSI CCS7 standards used for CDMA technology.	▪ Check that STP shall be able to inter-work satisfactorily with different STPs/ SCPC/ SP satisfactorily ▪ Make some calls including IN calls and check message are in conformity with IR for CCS7 No. TEC/IR/CCS-SIG ▪ Connect STP with O&M centers
4.2	The STP interface to other SP/STP shall be by 2.048 Mbps/156 Mbps PCM links. It should be possible to use any time slot for signalling data link in any 2.048 Mbps/156 Mbps PCM system (digital system) except Time slot 0	Configure link/linkset on any PCM. It should be possible to configure all the time slots as links except time slot 0
4.3	The STP shall support standard interfaces to Operations Systems (OSs) for provisioning, administration, maintenance, and network management functions for on site and remote maintenance console	Covered in Test no 7, 8 & 9
4.4	IP capability in STP It shall be possible to connect STP with IP network over Ethernet interface.	Check the Ethernet port provided. Type of port provided should be written in TAC
4.4.1	The physical interfaces (Ethernet connections used) shall consist of Gigabit Ethernet interface and/or 10/100 Base T with 1+1 redundancy, built on separate card/hardware. Type of Physical Interface port supported shall be indicated in TAC."	

Clause No.	*Clause*	*Type of Test / Test No. etc. **
4.4.2	It shall support SCTP (Stream Control Transport Protocol) for reliable transportation of SS7 messages in the IP network. It shall convert the ISUP, SCCP, TCAP, INAP, Map and CAP messages in to IP packets and send them IP network.	Make different types of calls including IN calls so that calls are routed to IP network. Calls should be processed successfully.
4.4.3	STP shall support IETF RFCs as per GR.	Test No. 11
5.0	Quality Requirements. All the functional requirements described in all sub-clauses of this clause, shall be complied by both types of STPs irrespective of type of STP for which the applicant has sought the approval	information
5.1	For all User Parts, the following conditions shall be complied by the STP:- (a) Undetected errors - On a signalling link employing a signalling data link (which has the error rate characteristic as described in Recommendation Q.702) not more than one in 1010 of all message signal units will contain an error that is undetected by the STP (b) Loss of messages - Not more than one in 107 messages will be lost due to failure in the MTP. (c) Messages out-of-sequence - Not more than one in 1010 messages will be delivered out-of-sequence to the Use Parts due to failure In the STP. This value also includes duplication of messages.	Undertaking may be taken from the applicant/ manufacturer
5.2	Signalling Message Transfer Delay The maximum Signalling Message Transfer Delay STP shall not be worse than the value listed in the TARLE- 5 of this GR.	Undertaking may be taken from the applicant/ manufacturer
5.3	Changeover performance time: There are two performance times associated with link changeover. Both times are maximum time values (not normal values). They are defined to be the point at which 95% of the event should occur within the recommended performance time at a signalling point traffic load that is 30% above normal. The performance times are measured from outside the signalling point. (Refer clause 4.5.4 of ITU-T rec. Q.706)	Undertaking may be taken from the applicant/ manufacturer
5.3.1	Failure response time This time describes the time taken by a signalling point to recognize that a changeover is needed for a signalling link. This time begins when the signalling link is unavailable and ends when the signalling point sends a changeover (or emergency changeover) order to the remote signalling point. A link is unavailable when a signalling unit with status indication out of service (SIOS) or processor outage (SIOS) is sent or received on the link. Failure response time (maximum permissible): 500 ms	Test as per Test No.3.9 of ITU-T Rec. Q.782
5.3.2	Answer time to changeover order This time describes the time taken by a signalling link to answer a changeover (or emergency changeover) order. This time begins when the signalling point receives a changeover (or emergency changeover) order and ends when the signalling point sends a changeover (or emergency changeover) acknowledgement message. changeover order (maximum permissible): 300 ms.	Test as per Test No.3.19 of ITU-T Rec. Q.782

Clause No.	*Clause*	*Type of Test / Test No. etc. **
5.3.3	Estimates for message transfer times (Refer clause 5 of ITU-T rec. Q.706) The estimates must take account of - the length of the signal unit; - the signalling traffic load; - the signalling bit rate; - the signalling loop delay (terrestrial or satellite); - the error correction method used; - the bit error rate. The estimates are presented in the form of - mean values, - 95% level values. The figures are related to 64 kbits/s signalling bit rate. The normal signalling traffic load is that load for which the signalling transfer point is engineered. A mean value of 0.2 Erlang per signalling links assumed	Information
5.3.4	Estimates for Tcs The estimates for Tcs for a signalling transfer point are given in Table 6 of the GR	Information
5.3.5	Estimates for STP processor handling time Tph The delay times for Tph are implementation dependent. The implementation hardware depends on the state of technology at the time it was developed. Advances in technology may reduce the delay values presented in this section. …….	Information
5.4	In addition to functional requirements described in Sub-clauses of clause 5.1 to 5.3, Sub-clauses of this clause specifies the Signalling Connection Control Part (SCCP) Performance requirements of Standalone STP	information
5.4.1	Internal parameters for classes 0 and 1 (a) Transit time of a UDT message in a relay point The transit time of a UDT message in a relay point is composed time of a UDT message for the relay function in a relay point and of the time elapsed in the MTP at this relay point for the UDT message. It is measurable externally. It is described in Figure 2 of ITU-T recommendation Q.716 and it should not exceed the values given in TABLE- 8 of the GR. The normal traffic load for the translation function is the load for which the point is dimensioned. These figures assume a message length distribution as given in TABLE- 8 (short messages with a mean message length of 120 bits). Clause 4 considers the effect of longer messages and other factors on the SCCP performance. (b) Unavailability of a relay point - The unavailability of a relay point should not exceed 10-4.	System design parameters. Undertaking may be taken
5.4.2	Internal parameters for classes 2 and 3 (a) Transit time of a CR message at a relay point without coupling The transit time of a CR message at a relay point without coupling is composed of the transit time of a CR message for the relay function in a relay point without coupling and of the time elapsed in the MTP at this relay point without coupling for the CR message: it is measurable externally. It should not exceed the values given in TABLE- 9 of the GR. The normal traffic load for the relay function is the load for which	System design parameters. Undertaking may be taken

Clause No.	*Clause*	*Type of Test / Test No. etc. **
	the point is dimensioned. These figures assume a message length distribution as given in TABLE 9 (short messages with a mean message length of 120 bits). (b) Transit time of a CR message in a relay point with Coupling The transit time of a CR message at a relay point with coupling is composed of the transit time of a CR message for the relay function in a relay point with coupling and of the time elapsed m the STP at this relay point with coupling for the CR message, it is measurable externally. It should not exceed the values given in TABLE- 10 of the GR. The normal traffic load for the relay function is the load for rich the point is dimensioned	
	(c) Transit time of a CC message in a relay point with coupling The transit time of a CC message at a relay point with coupling is composed of the transit time of a CC message for the relay function in a relay point with coupling and of the time elapsed in the STP at this relay point with coupling for the CC message, it is measurable externally. It should not exceed the values given in TABLE- 11 of the GR. The normal tragic load for the relay function is the load for which the point is dimensioned. (d) Transit time of a DT message in a relay point with coupling The transit time of a DT message (DTI or DT2) at a relay point with coupling is composed of the transit time of a DT message for the relay function in a relay point with coupling and of the time elapsed in the MTP at this relay point with coupling for the DT message; it is measurable externally. It should not exceed the values given in TABLE- 12 of the GR. (e) Unavailability of a relay point without coupling The unavailability of a relay point without coupling should not exceed 10-4.	System design parameters. Undertaking may be taken
6.0 & 6.1	EMI/EMC Requirements against this clause	Report from Accredited test lab along with certificate from lab. may be accepted
7.0&7.1	The equipment shall conform to IS 13252 part 1:2010- "Information Technology Equipment – Safety- Part 1: General Requirements" [equivalent to IEC 60950-1 {2005} "Information Technology Equipment – Safety- Part 1: General Requirements" and IS 10437 {1986} "Safety requirements for radio transmitting equipments" [equivalent to IEC 60215]. A test certificate and test report shall be furnished from a test agency. The test agency for safety requirements tests shall be an ISO 17025 accredited agency and details of accreditation shall be submitted.	Report from Accredited test lab along with certificate from lab. may be accepted
8.0 8.1 8.1.1	Security Requirements Unauthorised Access Access to system operations shall be controlled through multi-level password and authentication checks	Covered in Test No. 10

Clause No.	*Clause*	*Type of Test / Test No. etc. **
8.1.2	The man-machine communication programs shall have the facility of restricting the use of certain commands or procedures to certain passwords and terminals	
8.1.3	It shall be possible to define users and user groups with different access rights	
8.1.4	It shall be possible to modify user password number of times	
8.1.5	Session ID shall be logged with information of user ID, password, time of login, commands/parameters given etc.	
8.1.6	All passwords shall be stored in encrypted form and no user including 'Network Manager' shall be able to read the password.	
8.1.7	The system must support 'session logout timing with configurable time periods	
8.1.8	The system should block the access from local as well from remote terminals after receipt of consecutive predefined (say 5) wrong login/passwords and unauthorised commands.	
8.1.9	Appropriate security mechanisms for authentication, integrity and confidentiality shall be used for secured transportation through IP network as per IETF RFC 2401and RFC 2402.	Check RFC 2401 & 2402
8.2 & 8.2.1	Monitoring It shall be possible to connect probes to STP. Through probes, it shall be possible to dump signalling data in LIM equipment. STP shall pose no limitation to transfer the signalling data to LIM equipment.	Undertaking from applicant may be taken
8.2.2	In case of IP connectivity with STP, the system shall have safe guards to prevent Denial of Service (DOS) attacks. It should be possible to configurable IP port linking it with IP address or port number interface identity (Applicable for IP interface only)	Undertaking from applicant may be taken
8.3	The equipment i.e. STP shall comply with relevant contemporary Indian or International Security Standards e.g. IT and IT related elements against ISO/IEC 15408 standards, for Information Security Management System against ISO 27000 series Standards, Telecom and Telecom related elements against 3GPP security standards, 3GPP2 security standards etc. The certification for the above shall be obtained only from the authorized and certified agencies/ labs in India or as may be specified by the DoT/Govt. of India.	Report from Accredited test lab along with certificate from lab
9.1	An STP can exist in one of two forms: a. Standalone STP: It is stand alone STP having only signalling functionalities. These are neither the source nor the destination for MTP user traffic. It is deployed in "mated" pairs for the purposes of redundancy. Under normal operation, the mated pair shares the load. If one of the STPs fails or isolation occurs because of signalling link failure, the other STP takes the full load until the problem with its mate has been rectified.	information

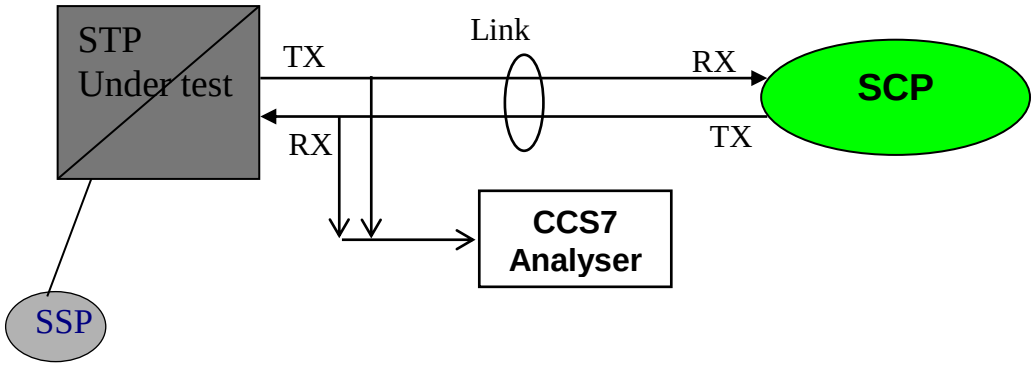
Clause No.	*Clause*	*Type of Test / Test No. etc. **
	b. Integrated STP (SP with STP): combine the functionality of an SSP and an STP. These are both the source and destination for MTP user traffic. They also can transfer incoming messages to other nodes.	
9.2	The applicant may seek type approval for any types of STP given below: i Type 1 – Integrated STP ii Type 2 - Standalone STP	information

Note:

(a) Where, it is not possible to conduct the test with public network exchange/ system or main exchange/SCP connectivity is not available, simulator may be used for testing purpose

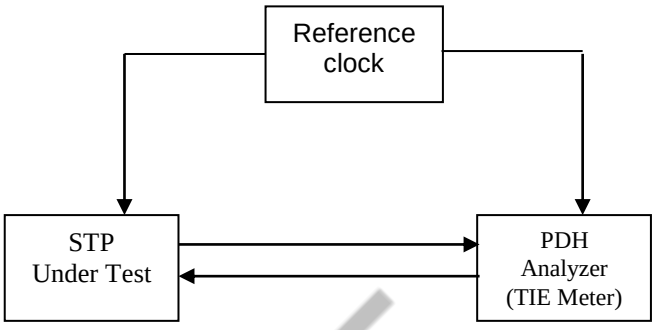
(b) Wherever any extension is required from main exchange, same should be available in premises where testing is being carried out.

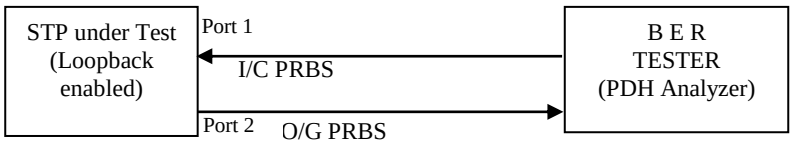
I. TEST SETUP & PROCEDURES:

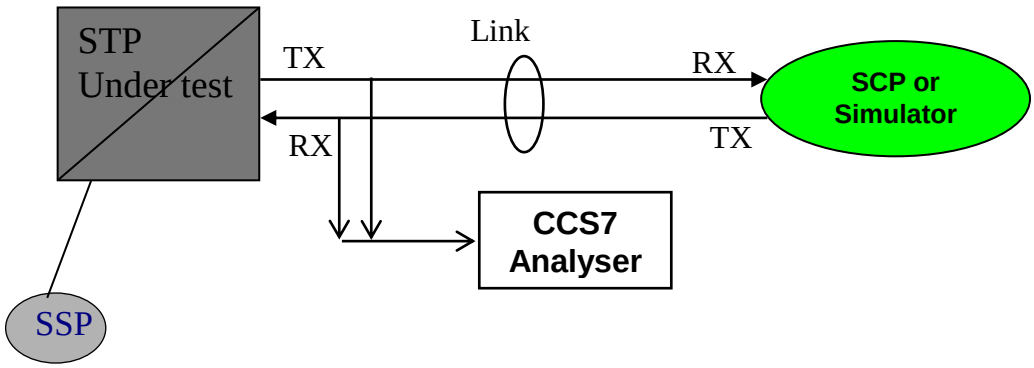
Test No.	**1**
Test Details	STP initialization, alignment, activation (Clause no. 3.3.1)
Test Setup	
Test Procedure	Start up procedure Some example are given below. For details refer to ITU-T rec. Q.781 I. Power on the SCP. STP under test still off-power II. Initial alignment procedure - Put the Link out of service and than put the link in service (FISU) III. Put the Link out of service and than put the link in service (MSU) IV. Put the Link out of service. From SCP send SIO towards STP V. Put the Link out of service. Repeat the test with LPO set at STP (FISU) VI. Put the Link out of service- Repeat the test with LPO set at STP (MSU) VII. Normal alignment with PO set and clear - Put the Link out of service VIII. Put the Link out of service. Set LPO at STP & SCP. Start alignment and check both LPO and RPO after alignment completes. IX. Put the Link out of service. Set LPO at SCP and start alignment. Soon after alignment, in STP enter 'stop'. Check reception of SIOS in SCP enter 'Out of Service'. Repeat the test with LPO set at STP X. Put the Link out of service. In SCP enter SIOS and start alignment. Soon after alignment, in STP enter 'SIO'. Check reception of SIO in SCP enter 'Out of Service'. Repeat the test with LPO set at STP XI. Put the Link out of service. In SCP enter Start and during alignment set LPO. Check SCP remains in 'Initial alignment' state. Clear LPO before alignment completes. Repeat the test with LPO set at STP XII. Put the Link out of service. Start link at SCP. At aligned ready state set LPO and than clear LPO. XIII. Alignment when SIO is omitted - Put the Link out of service. In SCP start link and ensure STP does not send SIO. XIV. Set and cease emergency prior to alignment- Put the Link out of service. In SCP set EM and clear EM followed by start. XV. Both ends set emergency- Put the Link out of service. Set emergency in SCP and start XVI. Emergency set at other end- Put the Link out of service. Set emergency alignment at STP. Start alignment at SCP. XVII. Deactivation during initial alignment- Put the Link out of service. At SCP give

	start, wait for 5 sec and then give stop before timer T2 expires. XVIII. Deactivation during alignment state - Put the Link out of service. At SCP give start. After SIN, give stop before timer T3 expires. XIX. SIO received instead of FISU- Put the Link out of service. At SCP give start. From other end send SIO instead of FISU XX. Unexpected SU are received – Put the Link out of service. At SCP give start. From STP send unexpected signal Unexpected signals: xxx may be taken successively as SIO, SIN, SIE, SIPO, SIB, LSSU, FISU & MSU. Repeat the test in reverse direction
Expected Results	I. Refer Signal Unit sequence 1, Check FIN=BIB=1, FSN=BSN=127 (Hex 7F) II. Refer Signal Unit sequence 2 III. Refer Signal Unit sequence 3 IV. Refer Signal Unit sequence V. Refer SU sequence 5. SIPO is returned when aligned and SCP stays in 'processor outage' state VI. Refer SU sequence 6. SIPO is returned when aligned and SCP stays in 'processor outage' state VII. Refer SU sequence 7. Check that normal alignment is carried out VIII. Normal alignment is carried out. Refer SU sequence 8 IX. Normal alignment is carried out. Refer SU sequence 9 X. Refer SU sequence 10 XI. SCP enters 'In service' state after normal alignment. Refer SU sequence 11 XII. SCP resumes 'aligned ready' state. Refer SU sequence 12 XIII. Normal alignment takes place in SCP. Refer SU sequence 13 XIV. In SCP normal alignment proving period is carried out. Refer SU sequence 14 XV. Check for correct emergency alignment. Refer SU sequence 15 XVI. Check for correct emergency alignment. Refer SU sequence 16 XVII. Refer SU sequence 17. T2 should be in range of 5 sec to 150 sec XVIII. Refer SU sequence 18. T3 should be in range of 1 sec to 1.5 sec. XIX. Link must go out of service. Refer SU sequence 19 XX. Unexpected signals must be ignored without an impact on the system. Refer SU sequence 20

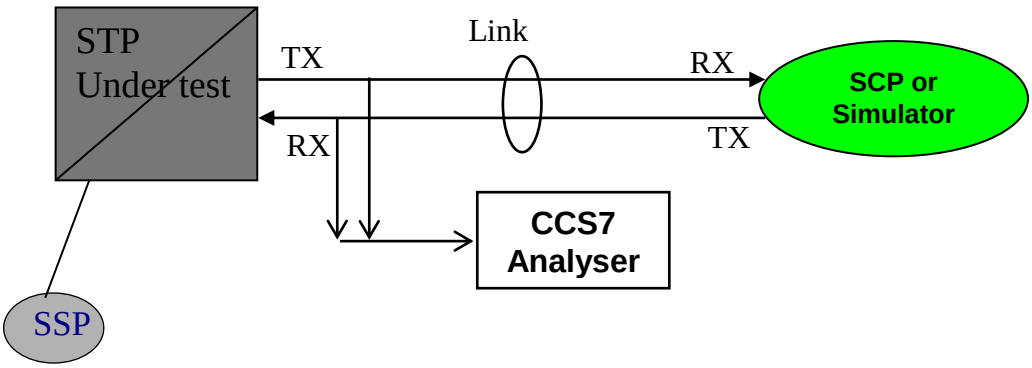
Note: Expected Signal Unit sequences are given from Page 49 onwards

Test No.	*2*
Test Details	*Test for Bit Slip Measurement* *Clause 3.4*
Test Instruments Required	PDH Analyzer
Test Setup	
Test Procedure	*1. Connect the Setup as shown in the figure.* *2. Measure the Slip using the PDH Analyzer for 96 Hrs.* *3. Check whether the SLIP is as given below* *Slip measurement: Synchronise the STP with 2048Kbit/s interface. Slip measurement should be made for a period of at least 96 hours of operation.*
Test Limits	Under synchronized condition, slips observed at the 2048 Kbits interface of digital exchange/ EUT shall be less than or equal to **2 slips in 24** hours.

Test No.	*3*
Test Details	*Test for Bit Error Ratio* *(Clause 3.4.3, 3.4.4)*
Test Set up	
Test Procedure	*1. Connect the Setup as shown in the figure.* *2. Measure the BER using the BER tester for 48 Hrs. Also measure PRBS loss, if any* *3. Check whether the BER is within limits as per clause*

Test No.	**4**
Test Details	Timers (Clause no. 3.5)
Test Setup	
Test Procedure	Start up procedure Some example are given below. For details refer to ITU-T rec. Q.781 I. Timer T1- Put the Link out of service In SCP set LPO and start link. Enter 'aligned not ready'. II. Timer T2- Not-Aligned ready Timer T2. Put the Link out of service III. Timer T3- Put the Link out of service. IV. Timer T4- Aligned ready Timer T1 & Proving Period T4. Put the Link out of service V. Timer T5- Put the Link in service- Make congestion at SCP. Check SCP sends SIB & STP receives SIBs at interval of T5. Clear congestion. SCP stops sending SIBs. VI. Timer T6- Put the Link in service. Generate MSU at SCP. Generate SIB from STP until link becomes out of service and SCP sends SIOS. VII. Timer T7- Put the Link in service. Set FISU at SCP. Generate MSU at SCP & discard MSU at STP. Do not send any acknowledgement to SCP. Link shall be taken out after T7 expires.
Expected Results	I. Refer Signal Unit sequence 21, Check SCP takes link out of service after time T1 (40 – 50 sec.) II. Refer SU sequence 22 III. Refer Signal Unit sequence 23 IV. Refer Signal Unit sequence 24 V. Refer Signal Unit sequence 25 VI. Refer Signal Unit sequence 26 VII. Refer Signal Unit sequence 27

Note: Expected Signal Unit sequences are given from Page 49 onwards

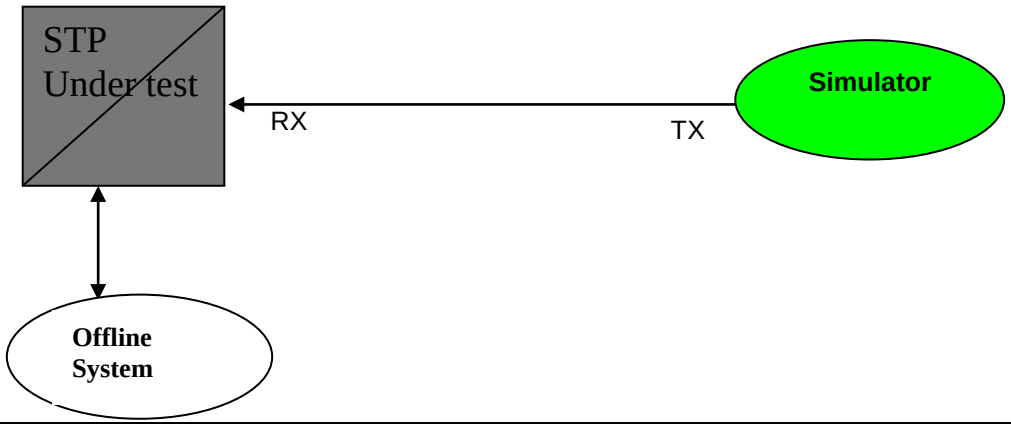
Test No.	**5**
Test Details	Activation/deactivation of link/linkset (Clause no. 3.6)
Test Setup	
Test Procedure	Start up procedure Some example are given below. For details refer to ITU-T rec. Q.782 i. First signalling link activation ▪ Check that the signalling link becomes available. ▪ Check the reception and sending of variable length messages on the activated linkset from/to the SCP at the other end of this linkset. ▪ Check that, after the alignment, the level 2 does not send any message received before or during the deactivation. ▪ Check that all messages are correctly received (no loss of messages, no duplication and no mis-sequencing). ▪ Stop traffic. ▪ Repeat the test with different SLC values. ii. Signalling linkset deactivation Deactivate the linkset. Check that the signalling linkset becomes unavailable iii. Signalling linkset activation with 4 signalling links The signalling link activation order is given simultaneously to all signalling links of the signalling linkset ▪ Check that the signalling links become available and start traffic ▪ Check the reception and sending of variable length messages on the activated linkset from/to the SCP at the other end of this linkset ▪ Check that, after the alignment, the level 2 does not send any message received before or during deactivation. ▪ Check that a ll messages are correctly received (no loss of messages, no duplication and no mis-sequencing). ▪ Stop traffic. iv. Response to a message with an invalid DPC ▪ Send a ECO message with an erroneous DPC. ▪ Check that a TFP is received. v. Load sharing within a linkset – All links available ▪ Start traffic from STP to SCP for all SLS. ▪ Stop traffic ▪ Check that the messages have been transmitted on the correct link in accordance with the SLS field. ▪ Check that there was no loss of messages, no duplication and no mis-sequencing.

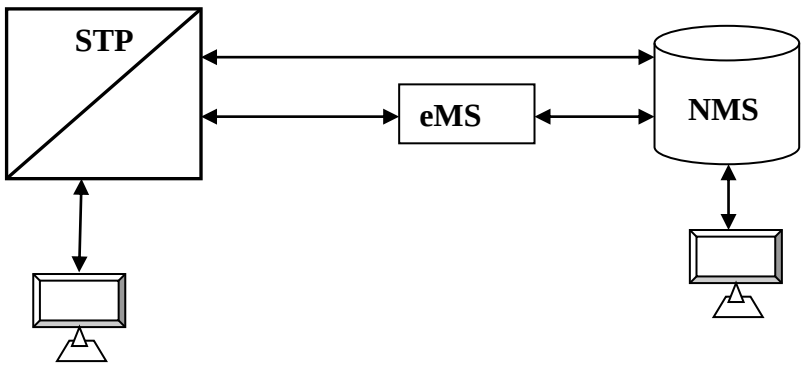
	vi. Load sharing within a linkset – One link unavailable ▪ Start traffic from STP to SCP for all SLS. ▪ Stop traffic ▪ Check that the messages have been transmitted on the correct link in accordance with the SLS field. vii. Inaccessible due to a linkset failure ▪ Start the traffic for all SLS to SPC ▪ Deactivate the last link 1 – 1 and check that the linkset becomes unavailable. ▪ Check that all messages stored or received after the unavailability of the linkset are discarded. viii. Inaccessible destination – Due to a route failure ▪ Start the traffic towards SCP for all SLS. ▪ Provoke the sending of a TFP (PC = C) from SCP to STP ▪ Check that the SP C becomes inaccessible. ▪ Stop traffic. ▪ Check that all messages stored or received after the inaccessibility have been discarded. ▪ Check that traffic to SCP has not been disturbed. ix. Transfer function in an STP ▪ Start traffic between SCP A and SCP B in both directions via STP. ▪ Check that transfer function is correctly performed. ▪ Stop traffic and check that there was no loss of messages, no duplication and no mis-sequencing. ▪ Check that the information field of these messages has not been corrupted. x. Changeover initiated at one side of a linkset (COO <–> COA) ▪ Start traffic to SCP on all the links. ▪ Deactivate link 1 – 1, check that a COO is sent from STP for 1 – 1 on 1 – 2 and respond with a COA within T2. ▪ Check that the time between the deactivation and the sending of the COO is inside the specified value ▪ Check that the traffic from link 1 – 1 is changed over to 1 – 2 and check that the traffic normally carried by 1 – 2 is passed over to 1 – 2. ▪ Stop traffic and check it has been received correctly (no lost messages, no duplication and no mis-sequencing). ▪ Repeat the test by sending the COO from SCP. In addition, check that the time between the reception of the COO and the sending of the COA is within the specified value (see rec. Q.706). xi. Changeover initiated at both ends at the same time (COO <–> COO) ▪ Start the traffic to SPC on all the links. ▪ Deactivate the link 1 – 1, check that the COOs and COAs for 1 – 1 are received on link 1 – 2. ▪ Check that the traffic from link 1 – 1 changed over to 1 – 2 and stop traffic. ▪ Repeat the test without sending of COA from SPC to STP xii. Changeover on expiration of timer T2 ▪ Start traffic to SPC on all the links. ▪ Deactivate link 1 – 1, check that a COO is received for 1 – 1 on link 1 – 2. ▪ After the expiration of T2, check that the changeover procedure is performed. ▪ Check that the duration of T2 is inside the specified range. ▪ Stop traffic and check that there was no duplication and no mis-sequencing, some messages may be lost as the system should not perform retrieval. ▪ Repeat the test but replacing COO by ECO.

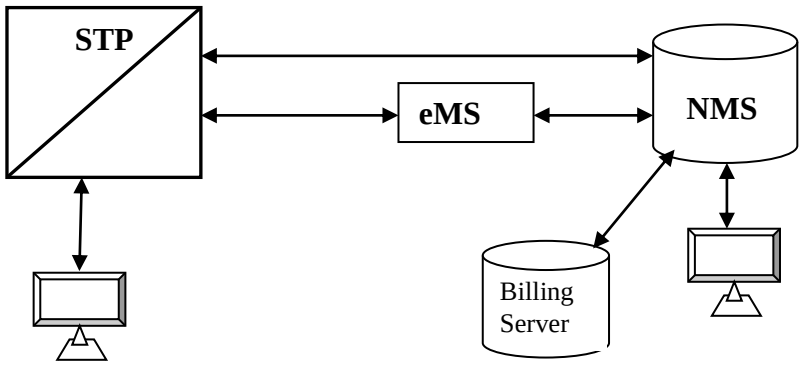
	xiii. Emergency changeover at one side of a linkset (COO <–> ECA) ▪ Start traffic to SPC on all links. ▪ Check the sending of a COO from STP for 1 – 1 on 1 – 2 and check that an ECA is sent inside T2. ▪ Check that the traffic is changed over from 1 – 1 to 1 – 2. ▪ Stop traffic and check that it has been received correctly; no duplication and no mis-sequencing. Some messages may be lost as the system should not perform retrieval. ▪ Repeat the test by sending COO from SPC xiv. Emergency changeover initiated at both ends at the same time (ECO <–> ECO) ▪ Start traffic to SPC on all links. ▪ Check that an ECO is received for 1 – 1 on 1 – 2 and that an ECO is sent before T2 expires and acknowledged with ECA. ▪ Check that traffic is changed over from 1 – 1 to 1 – 2. ▪ Stop traffic and check that it has been received correctly; no duplication and no mis-sequencing. Some messages may be lost as the system should not perform retrieval. Repeat the test without sending ECA from SPC xv. Reactivation of a link during a changeover procedure ▪ Start traffic to SPC & STP on all links. ▪ Deactivate the link 1 – 1 and reactivate this link immediately. ▪ Stop traffic and check that the changeover procedure has not been performed. Depending on the time between the deactivation and the reactivation, a COO may be sent or not. Check that the traffic used the links 1 – 1 and 1 – 2 normally. xvi. Changeover due to various reasons ▪ Start traffic to SPC & STP on links 1 – 1 and 1 – 2. ▪ Invoke deactivate of link 1 – 1 and check that the changeover is performed. ▪ Check that the traffic is changed over to 1 -2 ▪ Stop traffic. Repeat the test by invoking the different reasons such as high error rate, expiration of timer T1, T2, T6 & T7 of L2, equipment failure, reception of SIN, SIOS, SIE of L2 etc. xvii. Reception of a message for an inaccessible destination ▪ Link sets 1, 4 & 8 unavailable ▪ Send from SPT a message with OPC = D to SPC. ▪ Check that a TFP PC = D is sent in response. Check that a time out T8 is started. ▪ During T8, send a new message with OPC = D to SPC and check that no TFP is sent. xviii. To check the behavior of an STP in various traffic situations ▪ Start traffic between SPC B and C in both directions via STP using the traffic models presented in ITU-T rec. Q.706. ▪ Check that the time to cross the STP is better than 20 milliseconds. ▪ Stop traffic and check that it was not disturbed. ▪ Repeat test but with a traffic model including 5% of messages with an SIF = 272 octets. xix. To check the signalling link test procedure after activation of a signalling link ▪ Start traffic from STP ▪ Activate link 1 – 1 and check that an SLTM is received from SPC.

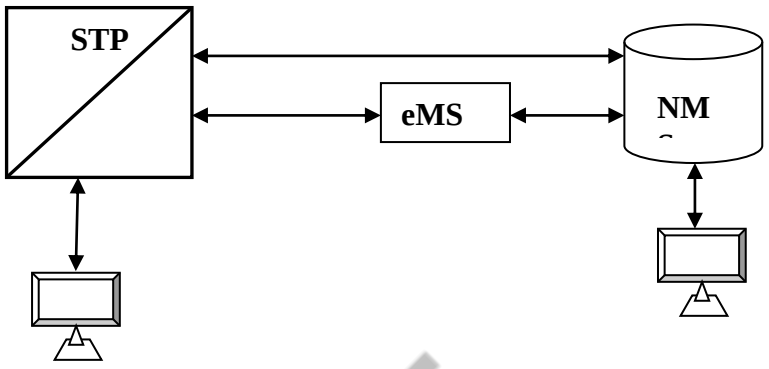
	▪ Send an SLTM and check that an SLTA is received. ▪ Check that the link 1 – 1 becomes available and that changeback is performed correctly. ▪ Stop traffic. xx. To check the actions of the system on reception of an invalid inhibition message ▪ Start traffic from STP ▪ Send the invalid messages (towards STP) such as LIN, LIA, LID, 0n non existing OPC and check that these are ignored. ▪ Stop traffic and check that it was not disturbed. xxi. Invalid signalling link test messages ▪ Start traffic from STP. ▪ Send the invalid SLTM and SLTA message towards STP and check that they are discarded without impact on the traffic. ▪ Stop traffic. xxii. Actions of the system on reception of an invalid user part unavailable message ▪ Start traffic from STP ▪ Send the invalid UPUs and check that these messages are ignored. ▪ Stop traffic and check that it was not disturbed.
Expected Results	i. Refer Signal Unit sequence 28 ii. Refer SU sequence 29 iii. Refer Signal Unit sequence 30 iv. Refer Signal Unit sequence 31 v. Refer Signal Unit sequence 32 vi. Refer Signal Unit sequence 33 vii. Refer Signal Unit sequence 34 viii. Refer Signal Unit sequence 35 ix. Refer Signal Unit sequence 36 x. Refer Signal Unit sequence 37 xi. Refer Signal Unit sequence 38 xii. Refer Signal Unit sequence 39 xiii. Refer Signal Unit sequence 40 xiv. Refer Signal Unit sequence 41 xv. Refer Signal Unit sequence 42 xvi. Refer Signal Unit sequence 43 xvii. Refer Signal Unit sequence 44 xviii. Refer Signal Unit sequence 45 xix. Refer Signal Unit sequence 46 xx. Refer Signal Unit sequence 47 xxi. Refer Signal Unit sequence 48 xxii. Refer Signal Unit sequence 49

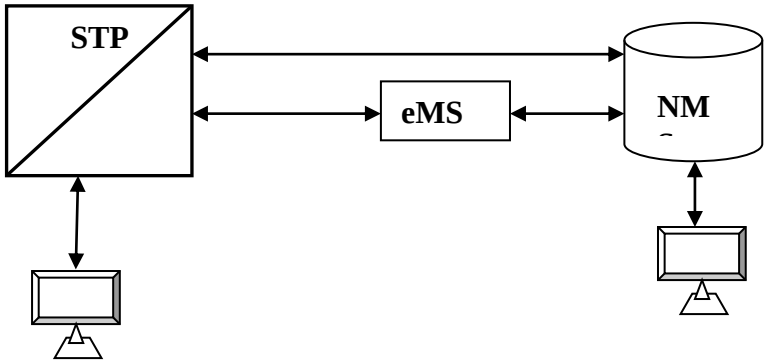
Note: Expected Signal Unit sequences are given from Page 49 onwards

Test No.	**6**
Test Details	For Clause no. 3.5
Test Setup	
Test Procedure	Screening normally is applied only to the incoming linkset coming from other networks. Generate traffic from simulator so that all types of Messages are generated. Redirect all discarded message to some other offline system. Now i. Apply Screening the Message Transfer Part (MTP) • Allow specified Originating Point Code (OPC) • Block specified OPC • Allow specified Destination Point Code (DPC) • Block specified DPC • Permitted Service Information Octet (SIO) values include priority values as per the Service Indicator (SI) subfield, network values as per the Network Indicator (NI) subfield, and the User Part values as per the Subservice field (SSF) • Allow certain MTP3 H0/H1 values (signaling network management messages) ii. Apply screening at SCCP (pre-GTT SCCP screening • Allow/Block specified SCCP message type • Allow / Block Calling Party Address (CgPA) parameters such as point code allowed, subsystem number allowed, allowed, routing indicator allowed, and translation type allowed iii. Apply screening at SCCP (post-GTT SCCP screening_ • Allow/Block specified SCCP message type • Allow / Block Calling Party Address (CgPA) parameters such as point code allowed, subsystem number allowed, allowed, routing indicator allowed, and translation type allowed iv. MAP screening Block/unblock SMC from a specified OPC Allow/block roaming traffic except SMS v. ISUP Screening Allow/block message from a specified OPC
Expected Results	i. Messages specified above are allowed or blocked as per screening method defined in STP ii. Check, it should be possible to define above rules per linkset basis iii. It should be possible to deliver all the discarded message to an offline system or some other predefined destination.

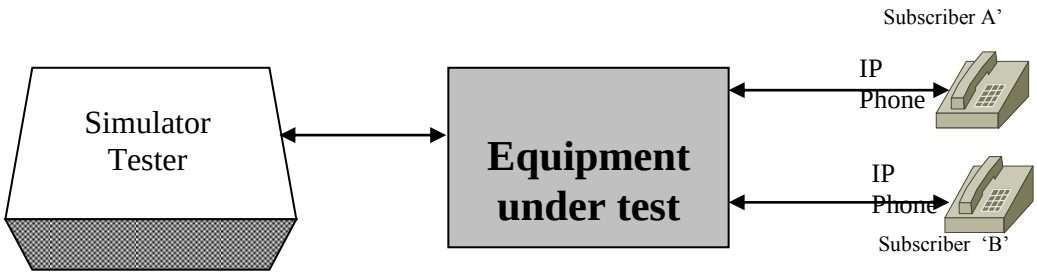
Test No.	*7*
Test Details	*NMS (Fault management & Configuration management)* *Clause 3.18, 3.18.1 & 3.18.2*
Test Setup	
Test Procedure	Connect STP to NMS/TMN either directly or through eMS and do all O&M function from NMS/TMN. From O&M terminal connected to NMS system carry out the following functions- a) Configure one of the terminal for alarm & check • Remove power supply card in STP • Create some fault in STP by removing some card/cable • Break some links from STP to SCP/Simulator • From terminal give command to configure alarm threshold limits b) MTP Routing Verification • Interrogate the routes to a specified DSP • Check routing loops • Check unknown destination points • Check bi-directional operation to a specified DSP c) Give some O&M command(s) , • Check configuration files are stored in an active archive file • Check information on multiple configuration files and modifications made are store in a file • Export some files to some other system
Expected Results	a) Observe on Alarm terminal • Power failure alarm should be provided on O&M terminal • O&M terminal should display status of the processors, signalling links e.g. link/linkset failure, inaccessibility of a signalling point • It should be possible to take the print of said alarms • On each alarm condition, O&M terminal should display identification of faulty units with date and the time. • It should be possible to configure threshold limits from O&M terminal • O&M terminal should display the alarms condition on completer SS7 links/linksets connected to STP under test • It should be possible to log & brows the alarms b) All the functions given above should be possible c) All the functions should be carried out successfully

Test No.	*8*
Test Details	*NMS (Accounting management)* *Clause 3.18.3 (Applicable for SSTP only)*
Test Setup	
Test Procedure	a) Create MTP accounts and get MTP message data from STP. b) Check that following measurements are available for each operator per weak ▪ Number of transited MSU received per incoming signalling link per DPC per SI per operator combination. ▪ Number of transited octets (SIF + SlO) per DPC per SI per operator combination ▪ Number of transited MSUs sent per (OPC/DPC/SI) and operator combination. ▪ Number of transited octets (SIF + SIO) sent per (Outgoing signaling link DPC/SI) per operator combination ▪ MTP management messages ▪ MTP test messages ▪ ISUP messages ▪ SCCP messages ▪ NAP messages ▪ MAP messages *c) SCCP message accounting* Create SCCP accounts. Create one SCCP account with more than one point codes. Following measurements should be available ▪ Mobile Roaming transaction ▪ SMS messages sent per operator ▪ Any SCCP message Octets *d) Check SDR data received.*
Expected Results	a) It should be possible to transfer MTP data from STP to NMS. It should be possible to create at least 255 MTP accounts. b) All types of measurements should be available for each operator per weak c) It should be possible to create single SCCP account with many point codes d) Above data should be transferred to NMS automatically at specified periodic interval. This period should be configurable. e) SDR data should contain all the information specified in GR in clause no. 3.18.3 (d)

Test No.	*9*
Test Details	*NMS (Performance management)* *Clause 3.18.4*
Test Setup	
Test Procedure	Transfer performance data from STP to NMS
Expected Results	It should be possible to transfer performance data from STP to NMS. All the performance related data as per clause 3.18.4 are available.

Test No.	*10*
Test Details	*NMS (Security management)* *Clause 3.18.4 , 8.1*
Test Setup	
Test Procedure	i. Attach a password to an I/O terminal and give some command from the terminal ii. Create command classes/levels and attach different commands to different classes/levels. Create different user and attach each user with different command classes. Interrogate command classes/users. iii. As an administrative user, shift any command from one command class to another command class. iv. Log on with different user and give different commands not allowed to the user. v. Shift a user from one command class to another command class vi. Attach a user with more than one command class. vii. Log in and modify own password. viii. Log in and modify password of some other user ix. Verify that password is secured x. After log in, leave the terminal un-used for some time. xi. Load any software patch or driver on the I/O terminal xii. Check log of above commands xiii. Log in as administrator.
Expected Results	i It should not be possible to log on the terminal without password. ii Each user and command class should be linked to command class and commands as defined. Any user gives any unauthorised command, than it should be rejected. iii Command should be shifted to another command class as defined iv User should be able to log in but commands should not be executed with suitable output message.

	v User should be shifted to new assigned command class vi It should be possible to attach user with more than one command classes. vii User should be able to change his password. viii It should not be possible to change password of another user. ix When a user log in or change his password, password should not be displayed on the terminal x After login password expired after some time (as set by service provider), terminal should be logged out automatically. If user accesses the terminal, it should not be possible without password. xi It should not be possible without password. xii Password should not be visible in the log. xiii Password should be stored in hash form and should not be visible to Administrator

Test No.	**11**
Test Details	For Clause no. 4.4.3 & 3.17 (b)
Test Setup	
Test Procedure	Check following RFCs compliance RFC 2719 RFC 3309, RFC 3286 RFC 2960 RFC 3332 RFC 4165 RFC 3868 RFC2460 RFC1981 RFC4443 RFC4861 RFC 4862.
Expected Results	All RFCs should be compliant

Expected Signal Unit Sequence

Expected Signal Unit Sequence 1

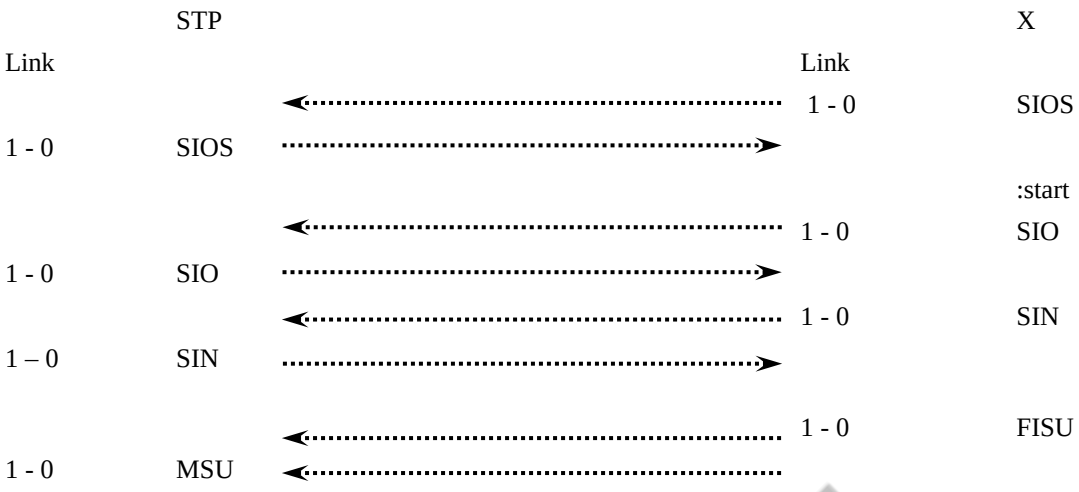
	STP			SCP
Link			Link	
1 - 0	SIOS	⇢		
				Power ON .
		⇠	1 - 0	SIOS

Expected Signal Unit Sequence 2

	STP			SCP
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	FISU	⇠		

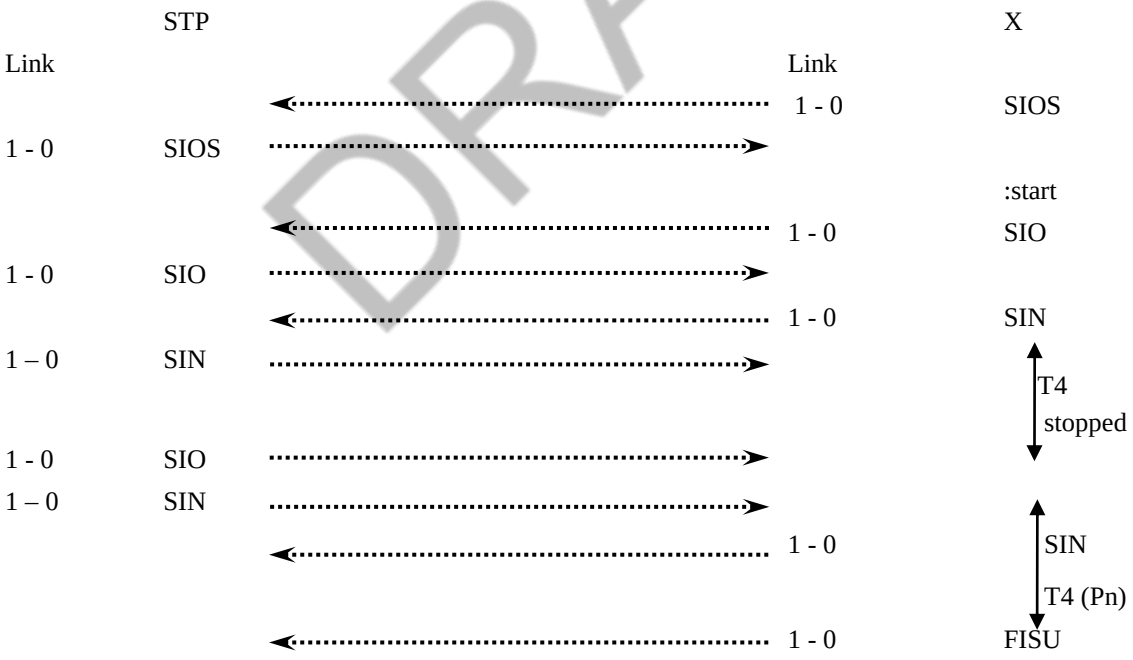
Check that ‘In-service’ state should be maintained

Expected Signal Unit Sequence 3



Check that ‘In-service’ state should be maintained

Expected Signal Unit Sequence 4



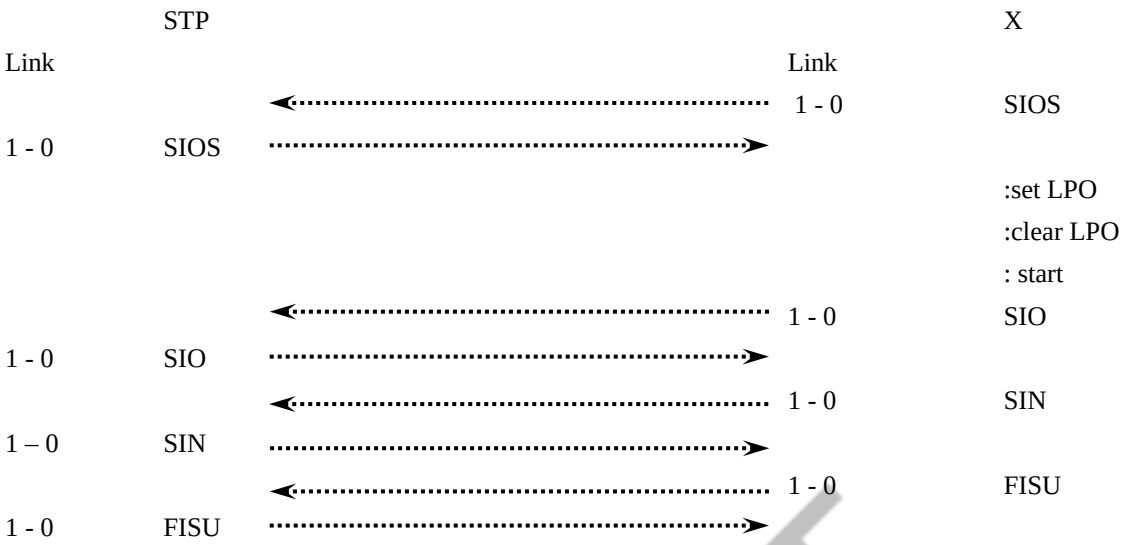
Expected Signal Unit Sequence 5

	STP			X
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	FISU	·····►		
		◄·····	1 - 0	SIPO

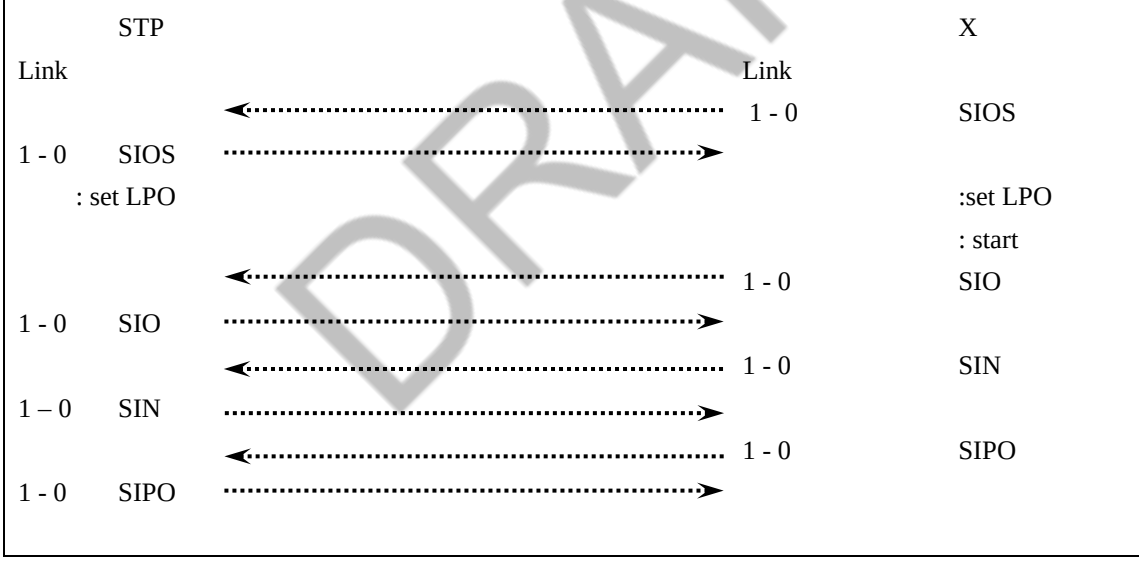
Expected Signal Unit Sequence 6

	STP			X
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

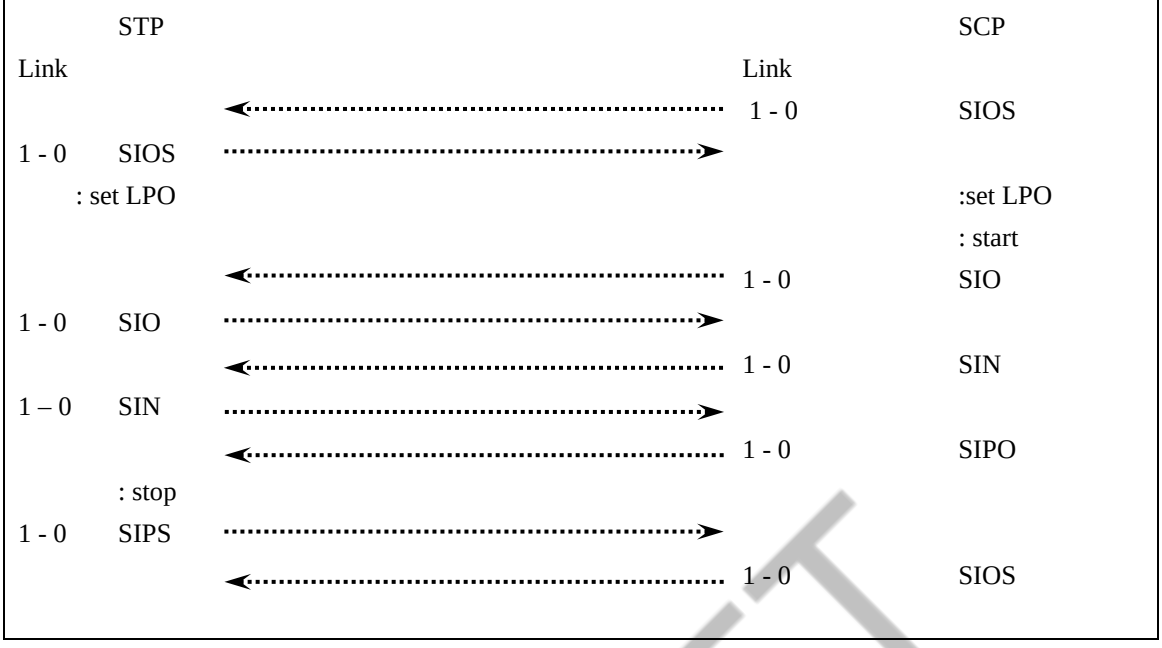
Expected Signal Unit Sequence 7



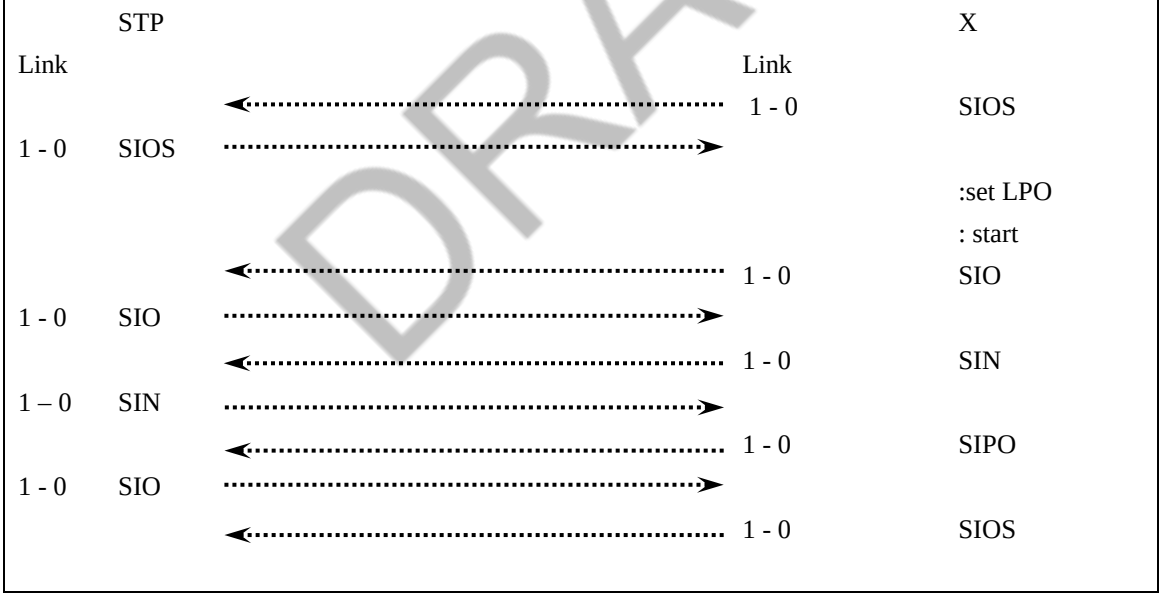
Expected Signal Unit Sequence 8



Expected Signal Unit Sequence 9



Expected Signal Unit Sequence 10



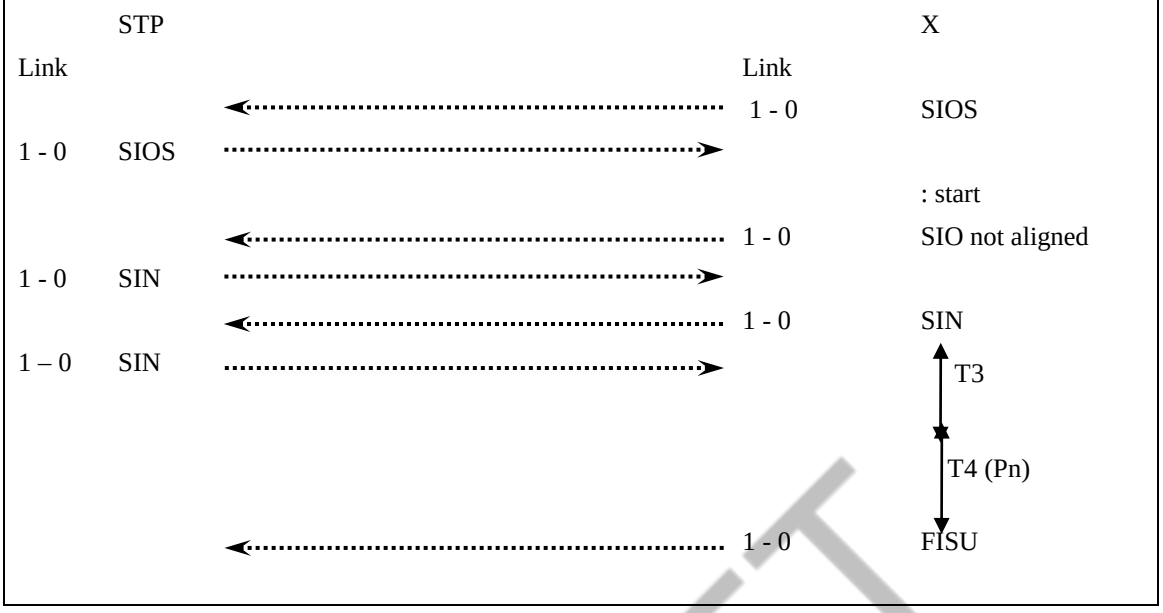
Expected Signal Unit Sequence 11

STP Link			Link	SCP
		◄·····	1 - 0	SIOS
1 - 0	SIOS	·····►		
				: start
		◄·····	1 - 0	SIO
1 - 0	SIO	·····►		
		◄·····	1 - 0	SIN
				: set LPO
1 – 0	SIN	·····►		
				: clear LPO
		◄·····	1 - 0	FISU
1 - 0	FISU	·····►		
		◄·····	1 - 0	FISU

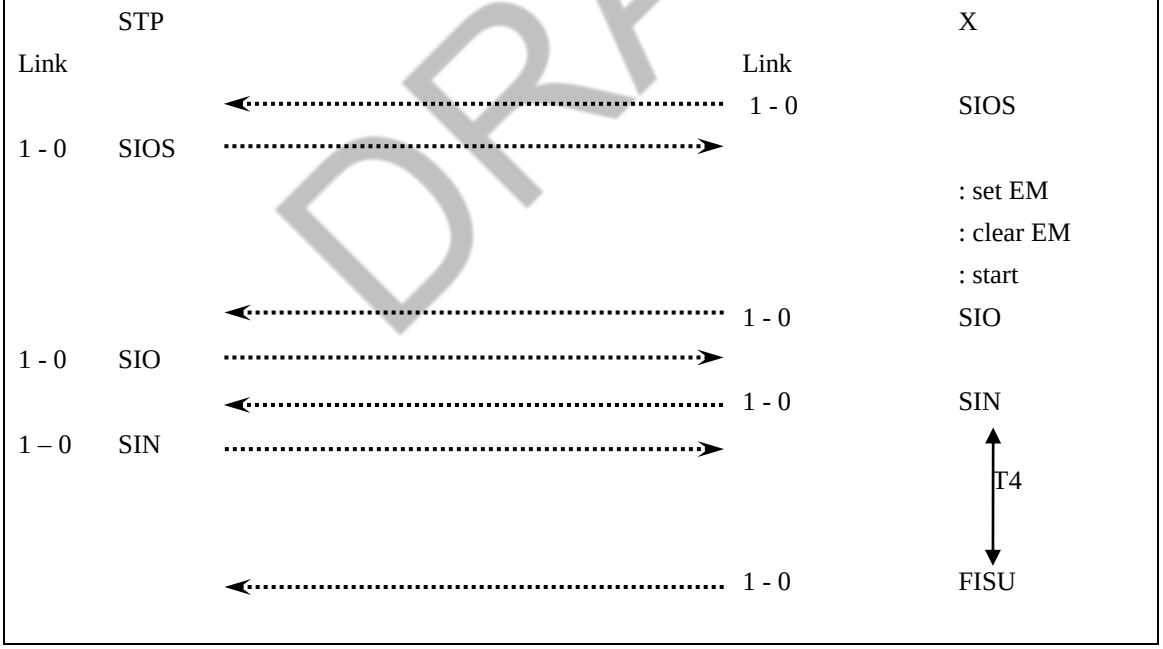
Expected Signal Unit Sequence 12

STP Link			Link	SCP
		◄·····	1 - 0	SIOS
1 - 0	SIOS	·····►		
				: start
		◄·····	1 - 0	SIO
1 - 0	SIO	·····►		
		◄·····	1 - 0	SIN
1 – 0	SIN	·····►		
		◄·····	1 - 0	FISU
				: Set LPO
		◄·····	1 - 0	SIPO
				: wait 5 sec
				: clear LPO
		◄·····	1 - 0	FISU

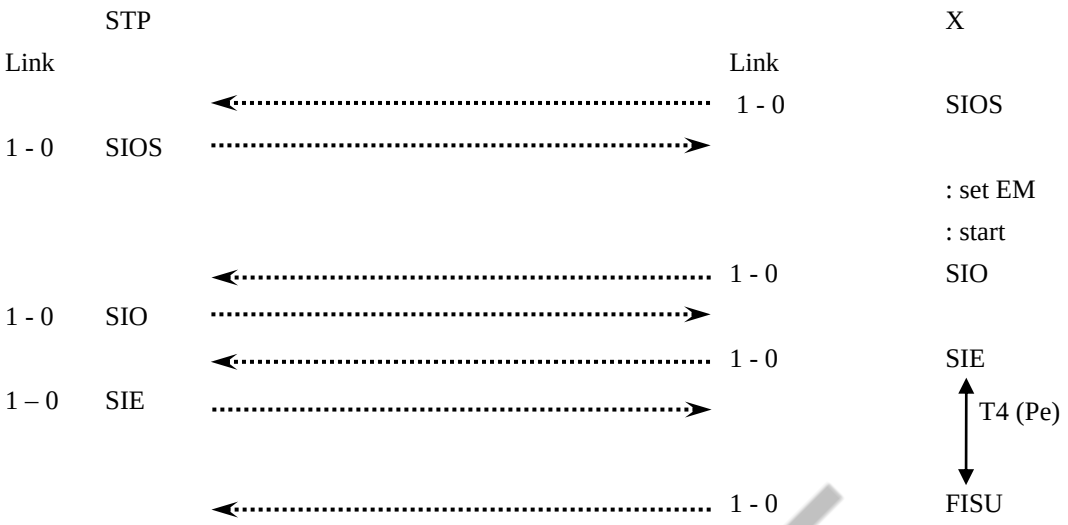
Expected Signal Unit Sequence 13



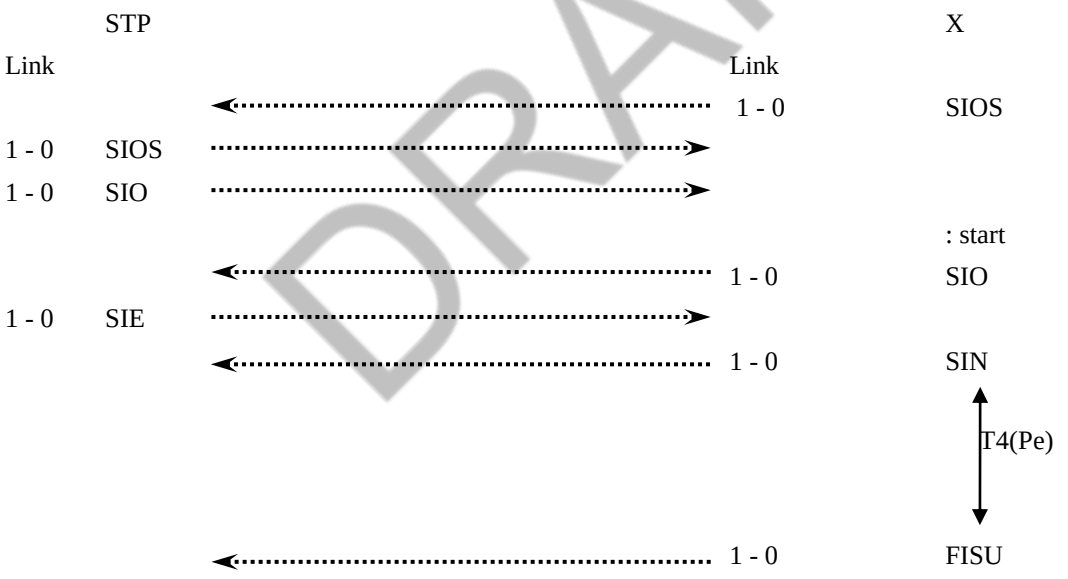
Expected Signal Unit Sequence 14



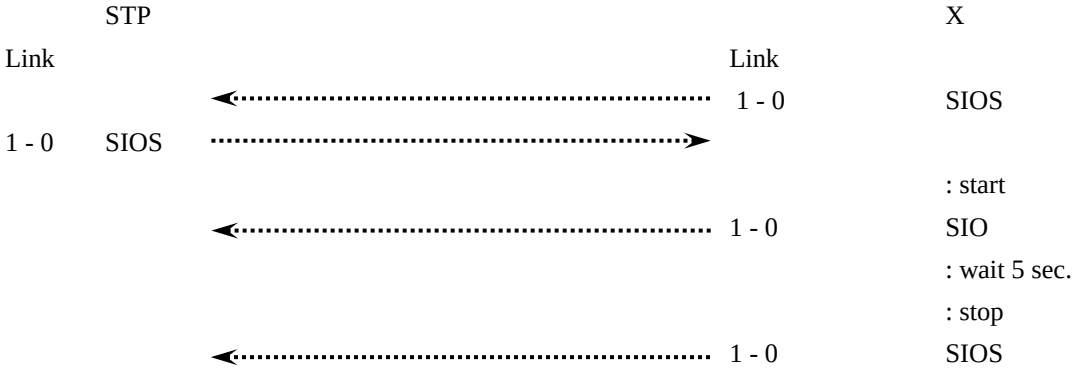
Expected Signal Unit Sequence 15



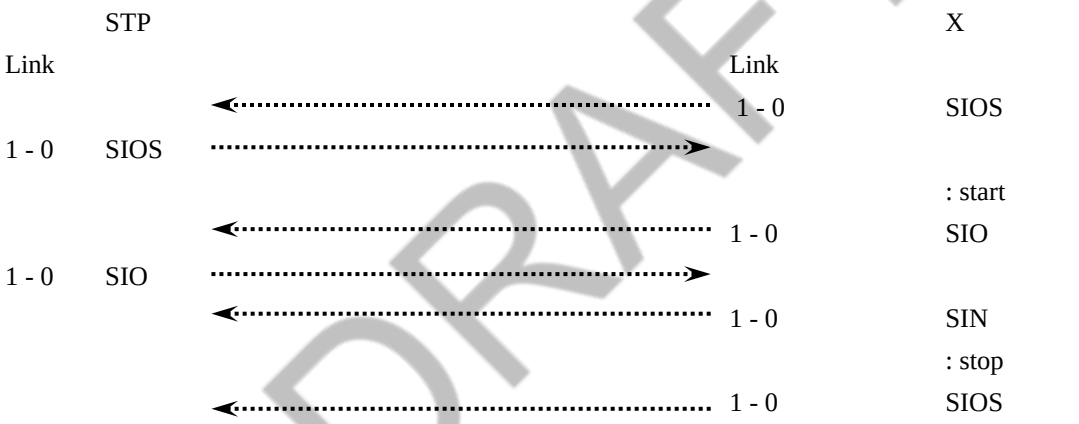
Expected Signal Unit Sequence 16



Expected Signal Unit Sequence 17



Expected Signal Unit Sequence 18



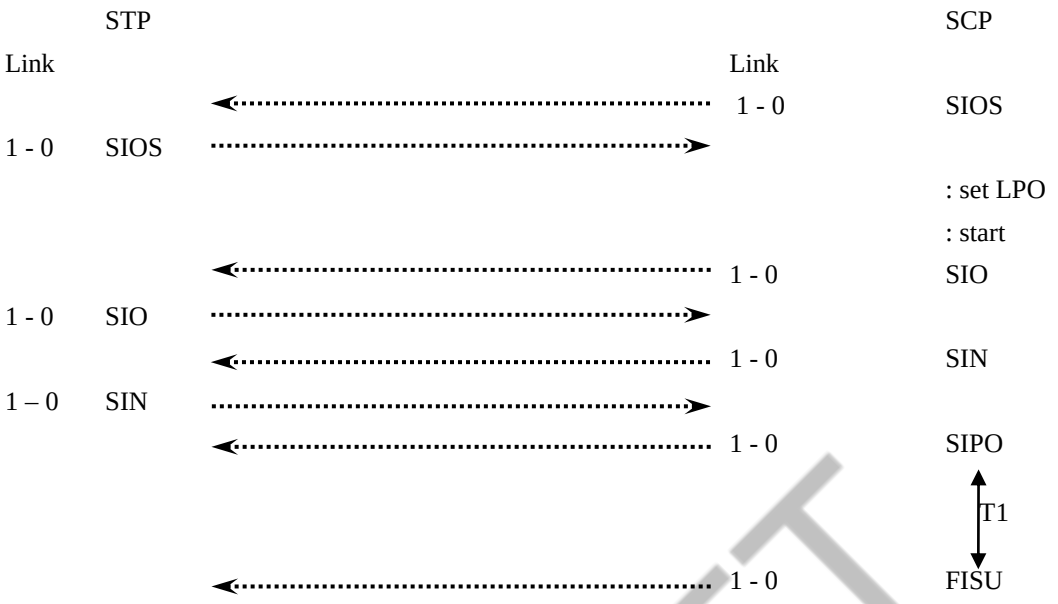
Expected Signal Unit Sequence 19

	STP			X
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	SIO	►		
		◄	1 - 0	SIOS

Expected Signal Unit Sequence 20

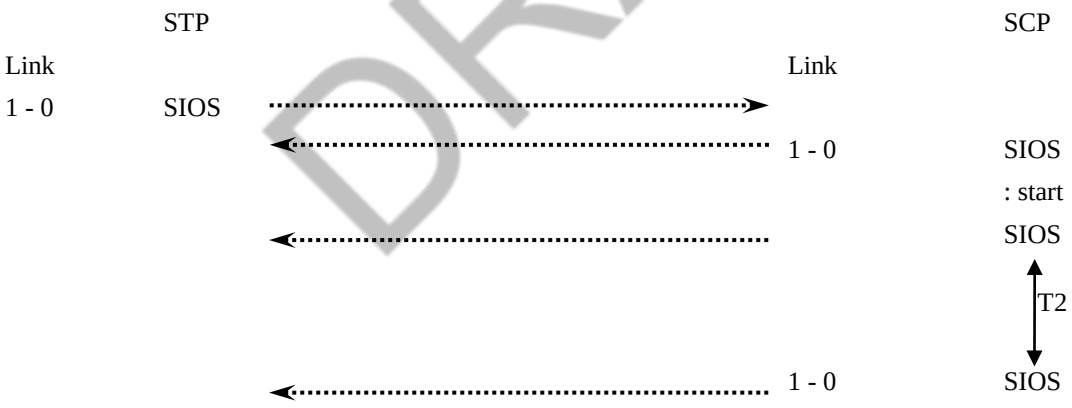
	STP			SCP
Link			Link	
		◄	1 - 0	SIOS
1 - 0	SIOS	►		
	xxx	►		
				yyy
				: start
		◄	1 - 0	SIO
1 - 0	SIO	►		
		◄	1 - 0	SIN
1 - 0	SIN	►		
		◄	1 - 0	FISU
1 - 0	FISU	►		

Expected Signal Unit Sequence 21



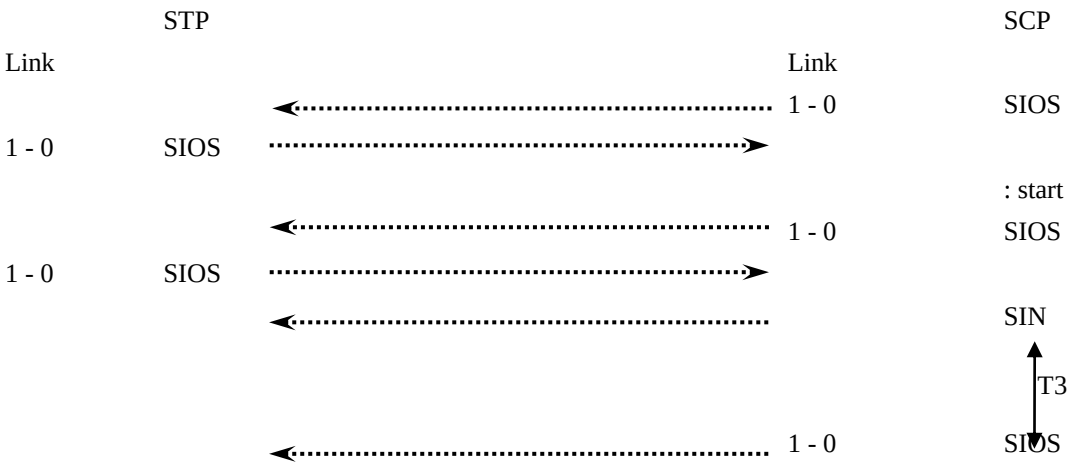
T1 should be in range of 40 secs to 50 secs.

Expected Signal Unit Sequence 22



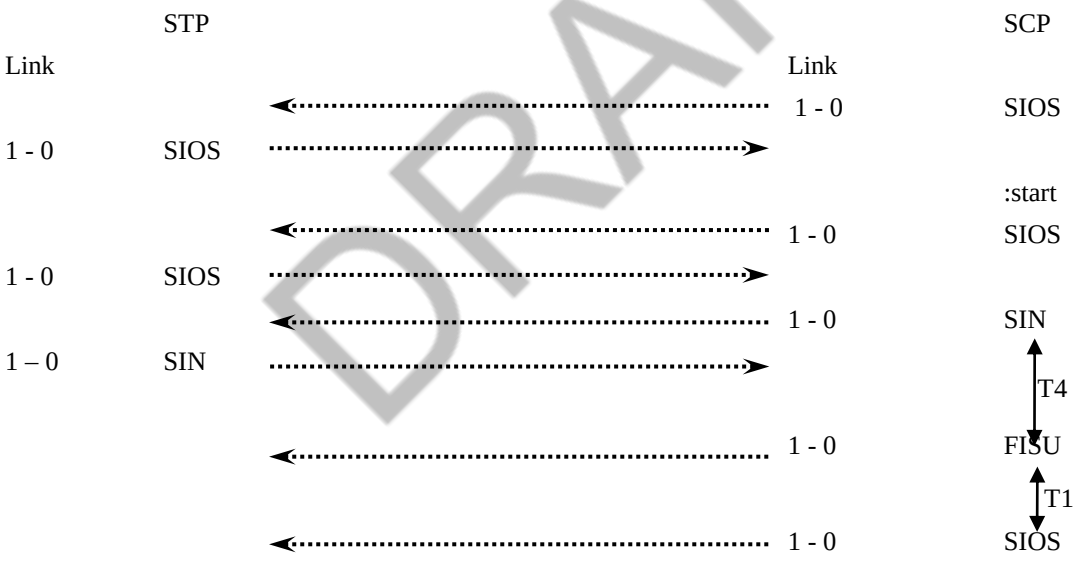
Timer T2 should be in the range 5 sec to 150 sec.

Expected Signal Unit Sequence 23



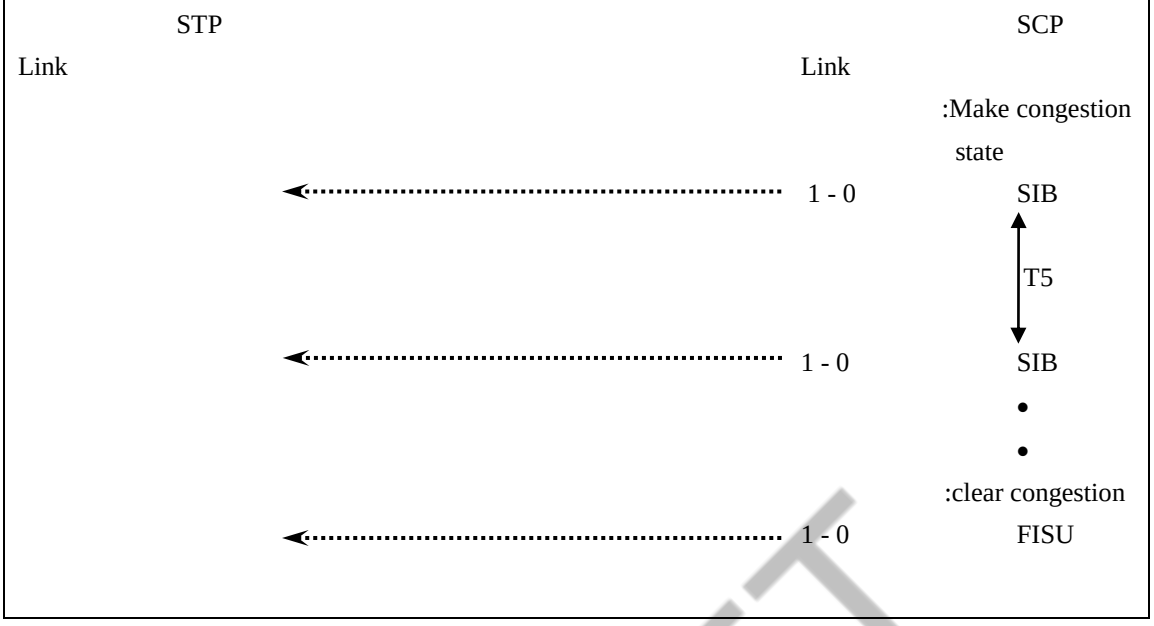
Timer T3 should be in the range 1 sec to 1.5 sec

Expected Signal Unit Sequence 24

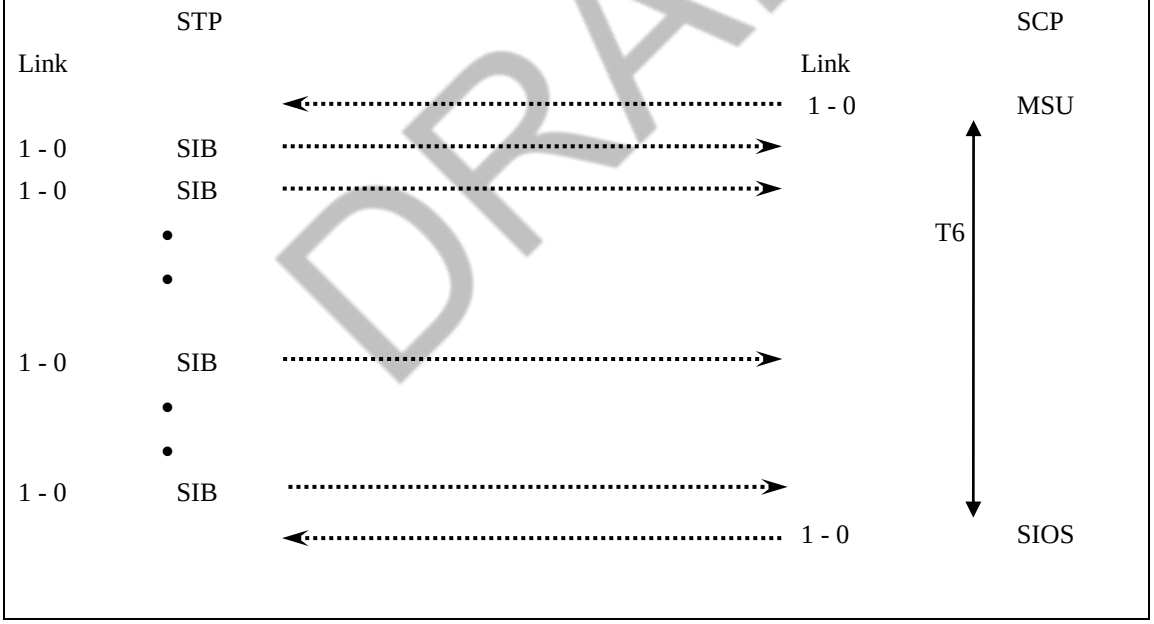


For 64 kbps
T4 should be in range of 7.5 secs to 9.5 secs.
T1 should be in range of 40 secs to 50 secs.

Expected Signal Unit Sequence 25



Expected Signal Unit Sequence 26



Expected Signal Unit Sequence 27

	STP			SCP
Link			Link	
		⟵	1 - 0	MSU
1 - 0	SIB	⟶		
1 - 0	SIB	⟶		
	• Ct •		T6	
1 - 0	SIB	⟶		
	• Bt •			
1 - 0	SIB	⟶		
		⟵	1 - 0	SIOS

Time T7 starts at reception of first SIB and ends when last SIB is received at SCP (it is less than T6)

Expected Signal Unit Sequence 28

	STP			SCP
Link			Link	
:Start traffic				
			1 - 1	Activate
1 – 1	Activate			
		⟵	1 - 1	SLTM
1 - 1	SLTA	⟶		
1 - 1	SLTM	⟶		
		⟵	1 - 1	SLTA
: start traffic				
1 - 1	Traffic	⟶		
		⟵	1 - 1	Traffic

: wait
: stop traffic.

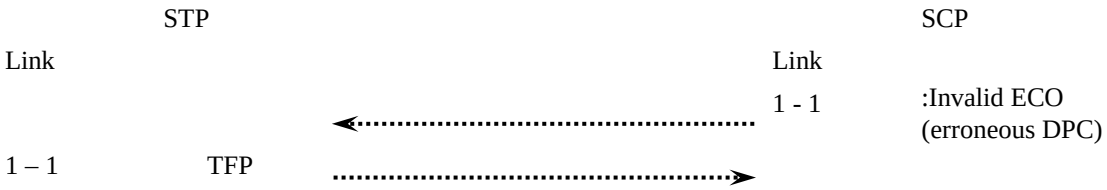
Expected Signal Unit Sequence 29

STP		SCP
Link		Link
1 – 1	Deactivate	

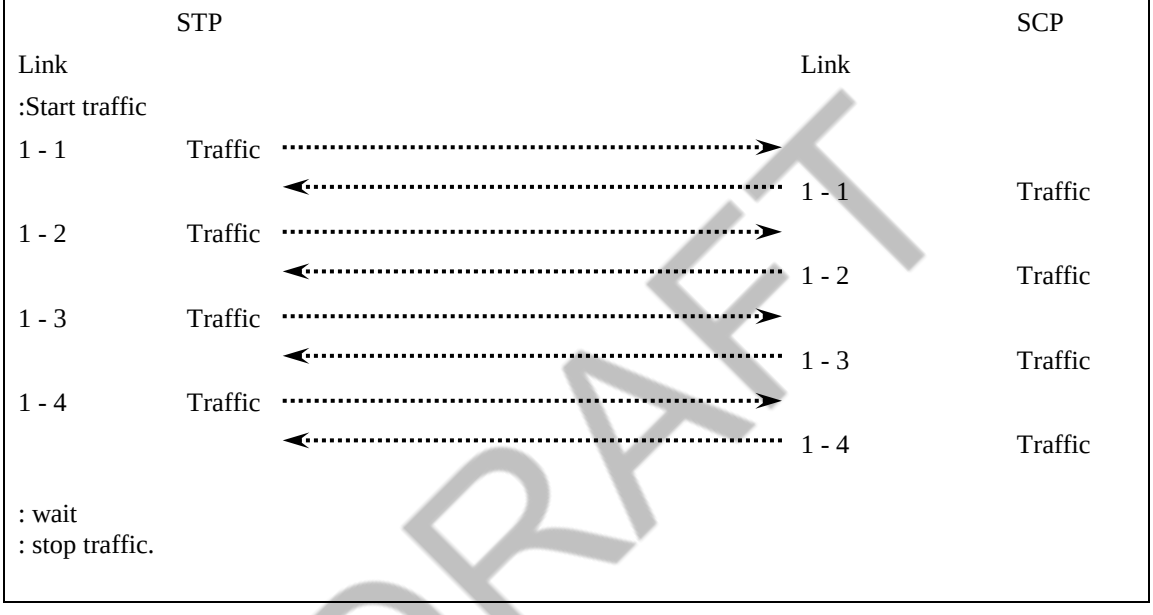
Expected Signal Unit Sequence 30

STP		SCP
Link		Link
:Start traffic		
		1 - 1 :Activate
1 – 1 :Activate		
		1 - 2 :Activate
1 – 2 :Activate		
		1 - 3 :Activate
1 – 3 :Activate		
		1 - 4 :Activate
1 – 4 :Activate		
: start traffic		
1 - 1	Traffic ····▶	
	◀····	1 - 1 Traffic
1 - 2	Traffic ····▶	
	◀····	1 - 2 Traffic
1 - 3	Traffic ····▶	
	◀····	1 - 3 Traffic
1 - 4	Traffic ····▶	
	◀····	1 - 4 Traffic
: wait		
: stop traffic.		

Expected Signal Unit Sequence 31



Expected Signal Unit Sequence 32



Expected Signal Unit Sequence 33

Link	STP		Link	SCP
:Start traffic				
1 - 1	Traffic	------------------------------>		
		<------------------------------	1 - 1	Traffic
1 - 2	Traffic	------------------------------>		
		<------------------------------	1 - 2	Traffic
1 - 4	Traffic	------------------------------>		
		<------------------------------	1 - 4	Traffic
: wait				
: stop traffic.				

Expected Signal Unit Sequence 34

Link	STP		Link	SCP
:Start traffic				
1 - 1	Traffic	------------------------------>		
		<------------------------------	1 - 1	Traffic
1 - 1	Deactivate			

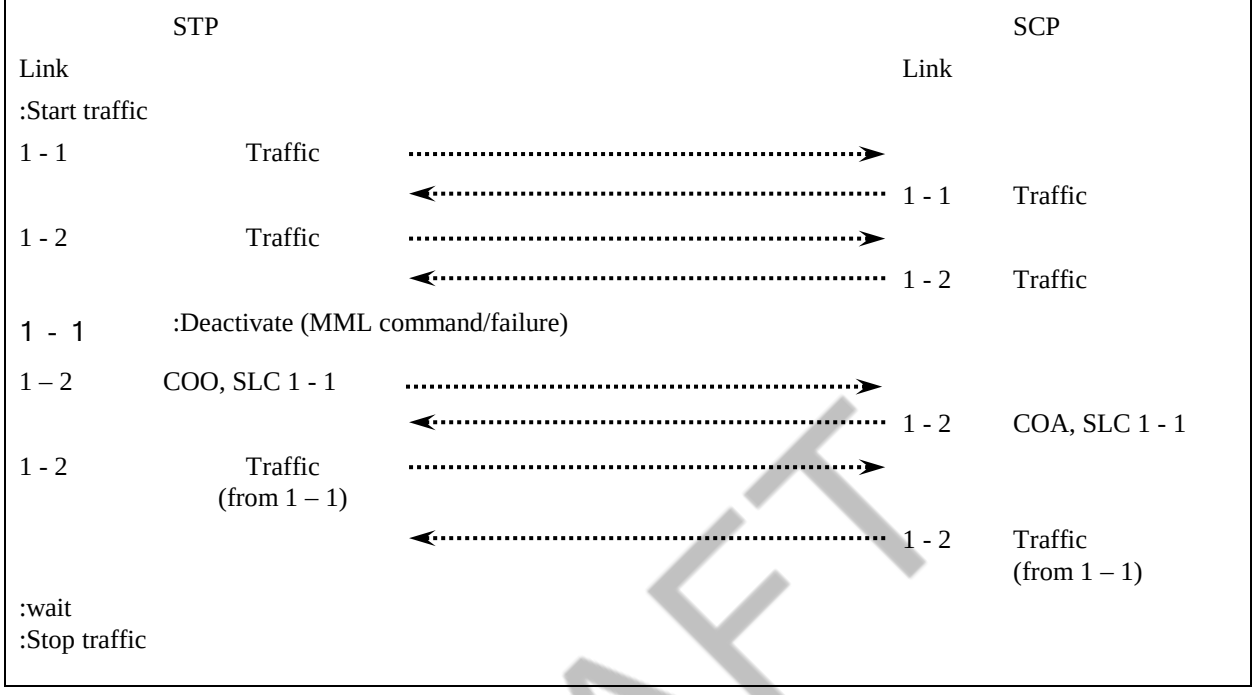
Expected Signal Unit Sequence 35

STP Link			Link	SCP
:Start traffic				
1 - 1	Traffic	⇢		
		⇠	1 - 1	Traffic
1 - 2	Traffic	⇢		
		⇠	1 - 2	Traffic
1 - 3	Traffic	⇢		
		⇠	1 - 3	Traffic
1 - 4	Traffic	⇢		
		⇠	1 - 4	Traffic
		⇠	1 - X	TFP, PC=C

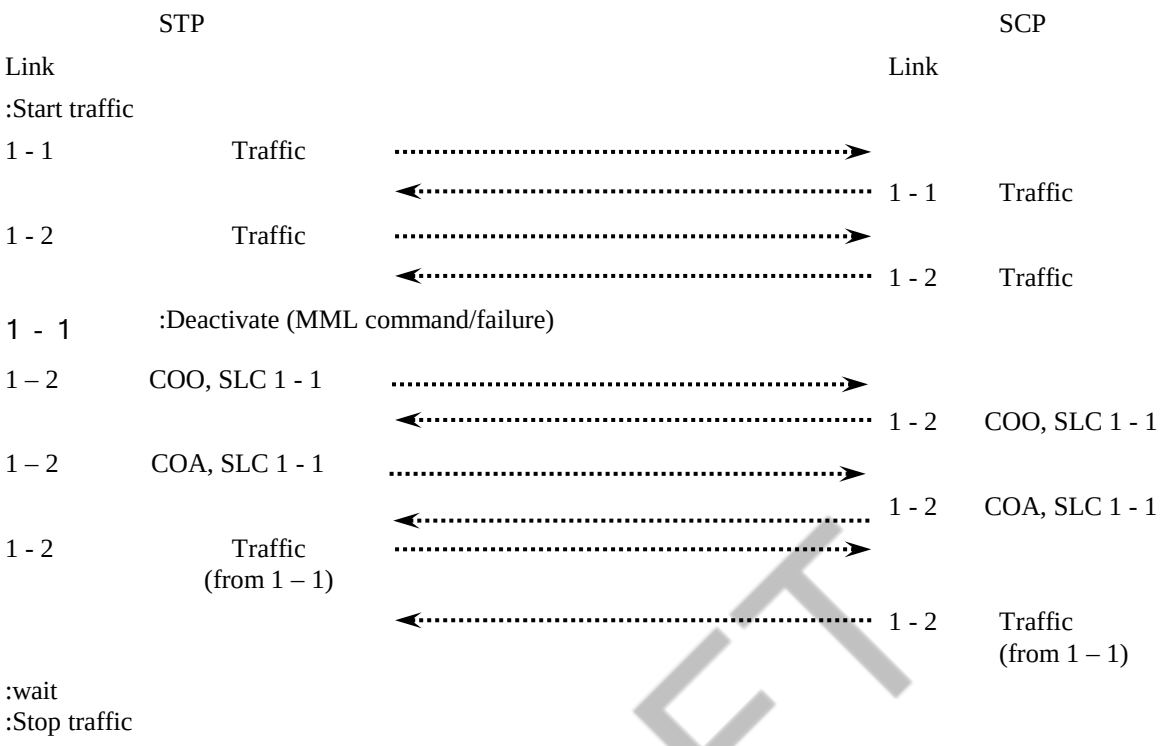
Expected Signal Unit Sequence 36

Link			Link		Link
:Start traffic					
1 - 1, 2	Traffic	⇢	2 - 1	⇢	
		⇠	1 – 1, 2	⇠	Traffic
: Wait					
: Stop traffic					

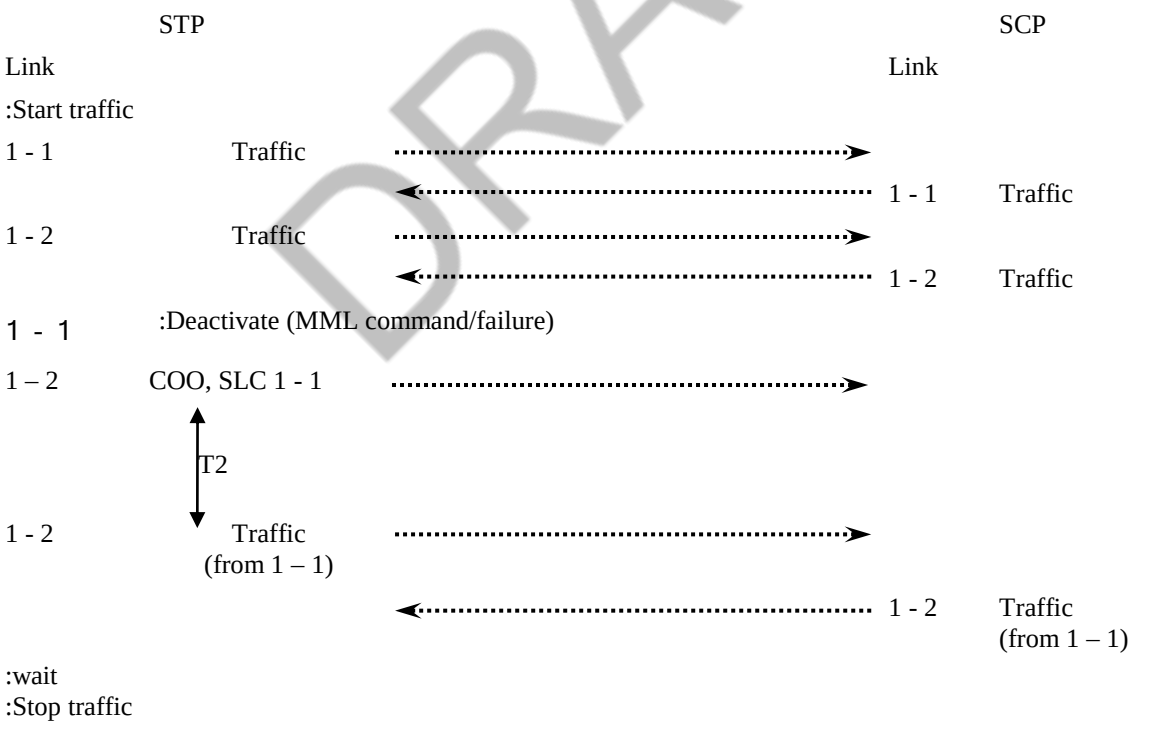
Expected Signal Unit Sequence 37



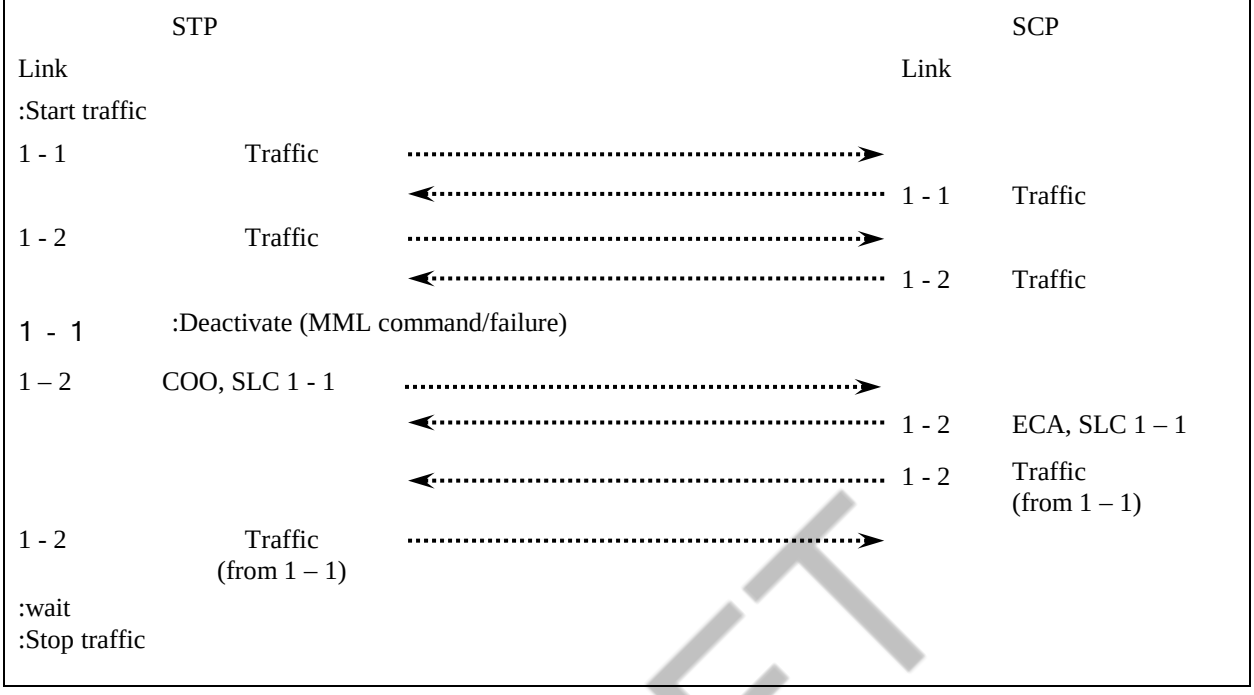
Expected Signal Unit Sequence 38



Expected Signal Unit Sequence 39

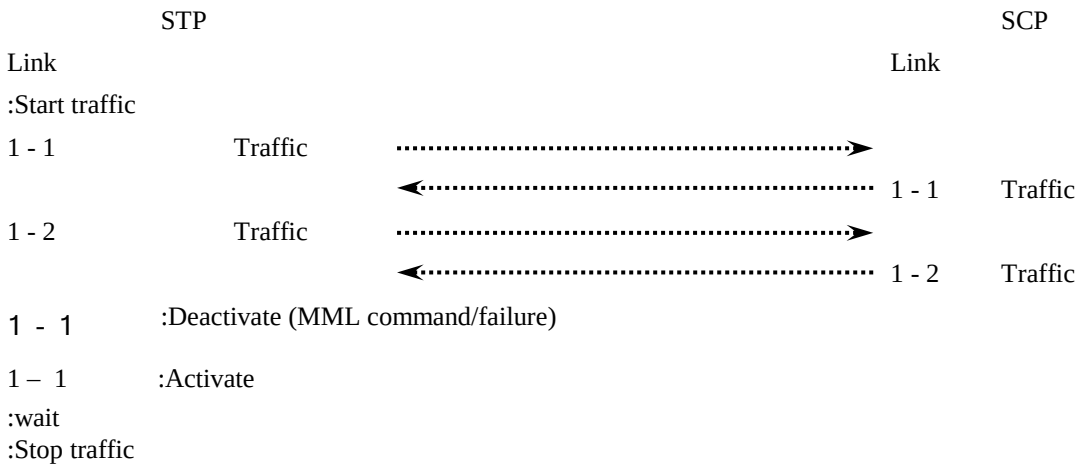


Expected Signal Unit Sequence 40



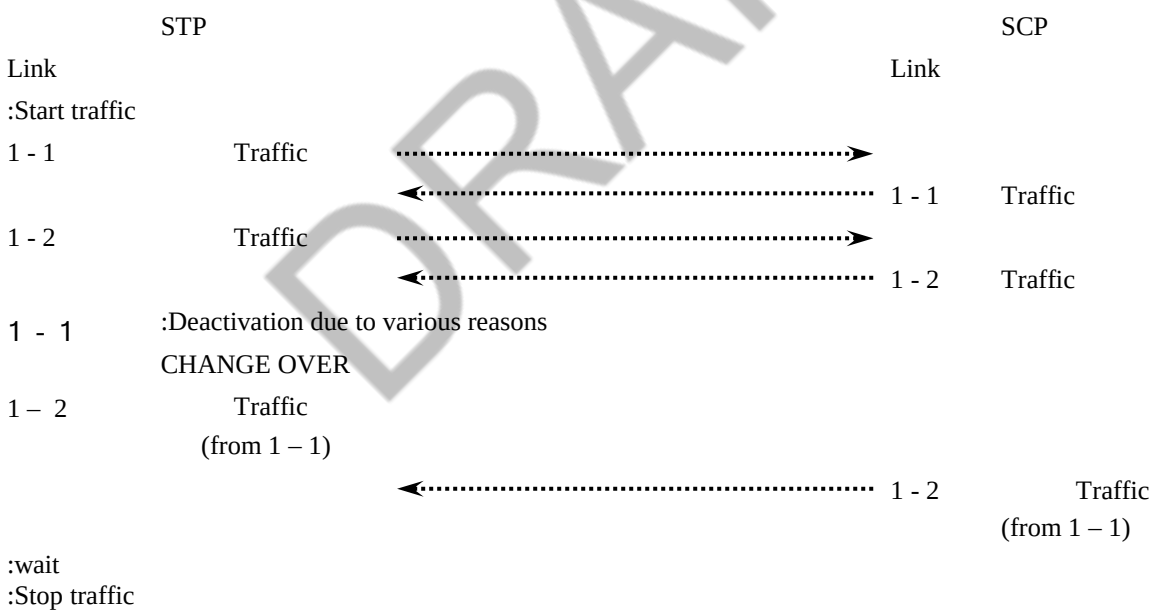
Expected Signal Unit Sequence 41

Expected Signal Unit Sequence 42



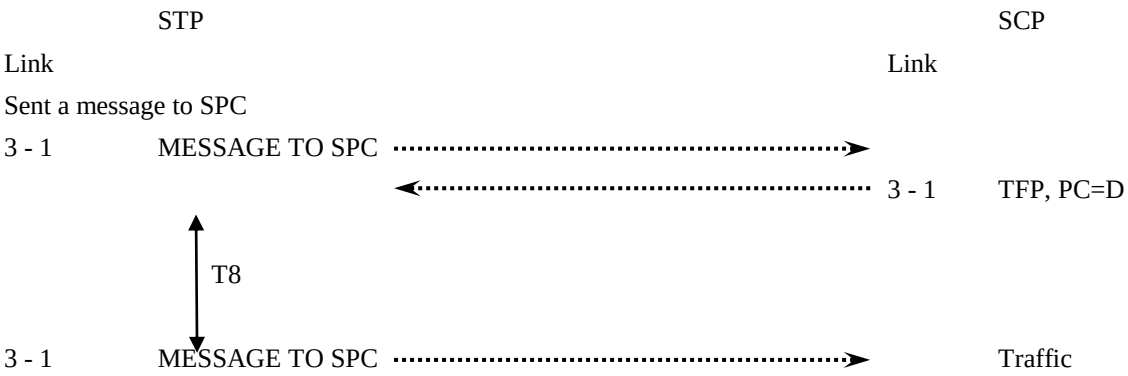
NOTE – This test will be performed if applicable (some systems may terminate the changeover procedure, then perform the changeback).

Expected Signal Unit Sequence 43

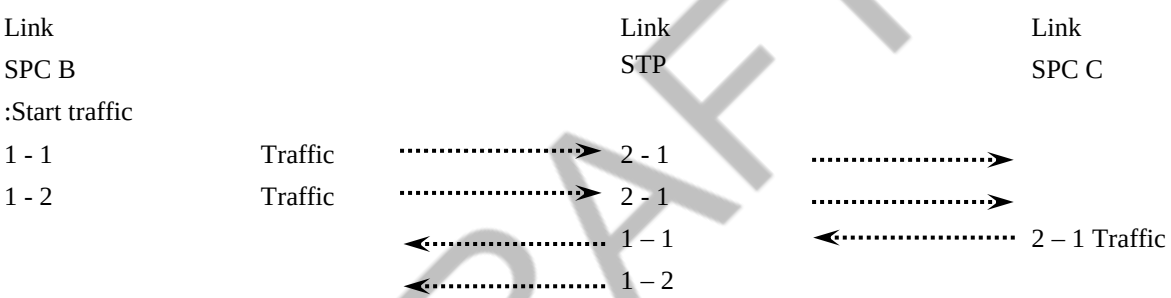


NOTE – This test will be performed if applicable (some systems may terminate the changeover procedure, then perform the changeback).

Expected Signal Unit Sequence 44



Expected Signal Unit Sequence 45



Expected Signal Unit Sequence 46

Signalling link 1 – 2 available

STP				SCP
Link			Link	
:Start traffic				
1 - 2	Traffic	⇢		
		⇠	1 - 2	Traffic
1 - 1	:Activate			
1 - 1	SLTM	⇢		
		⇠	1 - 1	SLTA
		⇠	1 - 1	SLTM
1 - 1	SLTA	⇢		
CHANGEBACK				
1 – 1, 2	TRAFFIC	⇢		
		⇠	1–1, 2	TRAFFIC
:wait				
:Stop traffic				

Expected Signal Unit Sequence 47

Two Signalling links available

STP				SCP
Link			Link	
:Start traffic				
1 - 1	Traffic	⇢		
		⇠	1 - 1	Traffic
1 - 2	Traffic	⇢		
		⇠	1 - 2	Traffic
		⇠	1 - 2	LIN, SLC1-X (non-existing SLC)
		⇠	1 - 2	LIA, SLC1-2 (non-existing OPC)
		⇠	1 - 2	LIN, SLC1-X (non-existing SLC)
		⇠	1 - 2	LIN, SLC1-1 (non-existing OPC)
		⇠	1 - 2	LID, SLC1-X (non-existing SLC)
		⇠	1 - 2	LID, SLC1-1 (non-existing OPC)

Expected Signal Unit Sequence 48

Signalling links 1 -1 available

STP				SCP
Link			Link	
:Start traffic				
1 - 1	Traffic	····➤		
		◄····	1 - 1	Traffic
		◄····	1 - 1	Traffic
		◄····	1 - 1	SLTM (invalid SLC)
1 - 1	Traffic	····➤		
		◄····	1 - 1	Traffic
:Wait				
:Stop traffic				

Expected Signal Unit Sequence 49

Signalling links 1 -1 available

STP				SCP
Link			Link	
:Start traffic				
1 - 1	Traffic	····➤		
		◄····	1 - 1	Traffic
		◄····	1 - 1	UPU (non-existing OPC)
		◄····	1 - 1	UPU (non-existing SI)
1 - 1	Traffic	····➤		
		◄····	1 - 1	Traffic
:Wait				
:Stop traffic				

Table – 1
Message Signalling Unit Format

Field	FLAG	BSN/ BIB	FSN/ FIB	Length Indicator	Service Info. octet	Signaling Info. field	Check sum
No. of bits	1	1	1	1	1	8 - 272	1

- Bit 1 - 4 → Type of Information in Signaling Information Field
- Bit 5 - 6 → Whether Message is intended for National or International Network
- Bit 7 - 8 → To identify Message Priority

Signaling Information Field

- The first portion of this field is routing label
- Routing Label Identifies Message Originator, Intended destination & Signaling Link Selected.
- Routing Label is of 7 Octets
  - Destination Point Code – 3 Octets
  - Originating Point Code – 3 Octets
  - Signaling Link Selection – 1 Octet

Table – 2

DCBA	Signal Codes	DCBA	Signal Codes
H0		H1	
0 0 0 1	Changeover and changeback	0 0 0 1	Changeover order
		0 0 1 0	Changeover acknowledgment
		0 0 1 1	Extended changeover order
		0 1 0 0	Extended changeover acknowledgment
		0 1 0 1	Changeback declaration
		0 1 1 0	Changeback acknowledgment
0 0 1 0	Emergency changeover	0 0 0 1	Emergency changeover order
		0 0 1 0	Emergency changeover acknowledgment
0 0 1 1	TFC and RSCM	0 0 1 0	Transfer-controlled
		0 0 0 1	Signaling-route-set-congestion-test
0 1 0 0	TFP, TFA, and TFR	0 0 0 1	Transfer-prohibited
		0 0 1 0	Transfer-cluster-prohibited
		0 1 0 1	Transfer-allowed
		0 1 1 0	Transfer-cluster-allowed
		0 0 1 1	Transfer-restricted
		0 1 0 0	Transfer-cluster-restricted
0 1 0 1	Signaling-route-set-test	0 0 0 1	Signaling-route-set-test for prohibited destination
		0 0 1 0	Signaling-route-set-test for restricted destination
		0 0 1 1	Signaling-route-set-test for prohibited cluster
		0 1 0 0	Signaling-route-set-test for restricted cluster
0 1 1 0	Management inhibiting	0 0 0 1	Link inhibit
		0 0 1 0	Link uninhibit
		0 0 1 1	Link inhibit acknowledgment
		0 1 0 0	Link uninhibit acknowledgment
		0 1 0 1	Link inhibit denied
		0 1 1 0	Link force uninhibit
		0 1 1 1	Link local inhibit test
		1 0 0 0	Link remote inhibit test
0 1 1 1	Traffic restart	0 0 0 1	Traffic restart allowed
		0 0 1 0	Traffic restart waiting
1 0 0 0	Signaling-data-link-connection	0 0 0 1	Signaling-data-link-connection-order
		0 0 1 0	Connection-successful
		0 0 1 1	Connection-not-successful
		0 1 0 0	Connection-not-possible
1 0 1 0	MTP user flow	0 0 0 1	User part unavailable

	control		

Table- 3

Timer	Range(*)
T1	500 (800) to 1200 ms
T2	700 (1400) to 2000 ms
T3	500 (800) to 1200 ms
T4	500 (800) to 1200 ms
T5	500 (800) to 1200 ms
T6	500 (800) to 1200 ms
T8	800 to 1200 ms
T10	30 to 60 s
T12	800 to 1500 ms
T13	800 to 1500 ms
T14	2 to 3 s
T15	2 to 3 s
T16	1.4 to 2s
T17	800 to 1500 ms
T18	Refer clause 9.2 of ITU-T Recommendation Q.704
T19	67 to 69 s
T20	59 to 61 s
T21	63 to 65 s
T22	3 to 6 m
T23	3 to 6 m

TABLE- 4
Signalling Message Transfer Delay

Percent of connections	Delay (ms)	
	Message type	
	Processing simple	Processing intensive
50%	300	440
95%	410	620

J. SUMMARY OF TEST RESULTS

GR/IR No._____

TSTP No._____

Equipment name & Model No._____

Clause No.	*Compliance* *(Complied /Not Complied / Submitted/Not Submitted / Not Applicable)*	*Remarks /* ***Test Report Annexure No.***

[Add as per requirement]

Date:

Place: ***Signature & Name of TEC testing Officer /***

**** Signature of Applicant / Authorized Signatory***

**** Section J as given above is also to be submitted by the Applicant/ Authorised signatory as part of in-house test results along with Form-A. The Authorised signatory shall be the same as the one for Form 'A'.***

END OF THE DOCUMENT