Interface Requirements for CCS-7

No. TEC/IR/CCS-SIG/01.JAN-09

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HISTORY SHEET

S. No.	Name of the document	No.	Remarks
1.	National CCS-7 Standards for MTP and ISUP	S/CCS-02/03.JAN 2000	Issue 3 of National Standards for CCS-7 Signalling Subsequent Amendments of S/CCS-02/03.JAN 2000 have been included as given below: • Amendment 1 to CCS-02/03 • Amendment 2 to CCS-02/03 • Addendum 1 to CCS-02/03
2.	Interface Requirements for CCS7	TEC/IR/CCS-SIG/01.JAN-09	New IR for CCS 7

References

A.1 Telecom. Engineering Centre Documents

S/CCS-02/03.JAN 2000	National CCS7 Standards for MTP and ISUP
GR/LLT-01/05.MAR2003	Large Size Digital Local Cum Tandem Exchanges
G/TAX-01/03.FEB2000 with Amendment1 (15-11-2002)	Large Size Digital Trunk Automatic Exchanges

A.2 ETSI document

ES 201 296 V1.3.1 (2003-04)	Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP); Signalling Aspects of charging

A.3 ITU-T Recommendations

I.530 (03/93)	Network interworking between an ISDN and a public switched telephone network (PSTN)
Q.701(03/93)	Functional description of the message transfer part (MTP) of Signalling System No. 7
Q.702(11/88)	Signalling data link
Q.703(07/96)	Signalling link
Q.704(07/96)	Signalling network functions and messages
Q.705(03/93)	Signalling network structure
Q.706(03/93)	Message transfer part signalling performance
Q.707(11/88)	Testing and maintenance
Q.736.1(10/95)	International Telecommunication Charge Card (ITCC)
Q.736.3(10/95)	Reverse charging (REV)
Q.737.1(06/97)	User-to-user signalling (UUS)
Q.752 (06/97)	Monitoring and measurements for Signalling System No. 7 networks
Q.761(12/99)	Signalling System No. 7 - ISDN User Part functional description
Q.761(1999) Amendment-1 (07/01)	Specifications of Signalling System No. 7 - ISDN user part functional description
Q.761(1999) Amendment-2 (12/02)	Support for the International Emergency Preference Scheme
Q.762(12/99)	Signalling System No. 7 - ISDN User Part general functions of messages and signals
Q.762 Addendum-1 (06/00)	Addendum-1

Q.762(1999) Amendment-1 (12/02)	Support for the International Emergency Preference Scheme
Q.763(12/99)	Signalling System No. 7 - ISDN User Part formats and codes
Q.763(1999) Corrigendum-1 (07/01)	Signalling System No. 7 - ISDN user part formats and codes
Q.763(1999) Amendment-2 (12/02)	Support for the International Emergency Preference Scheme
Q.764(12/99)	Signalling System No. 7 - ISDN User Part signalling procedures
Q.764(1999) Amendment-1 (07/01)	Amendment-1
Q.764(1999) Amendment-2 (12/02)	Support for the International Emergency Preference Scheme
Q.765(06/00)	Signalling system No. 7 - Application transport mechanism
Q.850 Addendum-1 (06/00)	Addendum-1
Q.850(1998) Amendment-1 (07/01)	Usage of cause and location in the Digital Subscriber Signalling System No. 1 (DSS1) and the Signalling System No. 7 ISDN user part (ISUP)

CHAPTER 1

INTRODUCTION

1.1 This document specifies the Interface Requirements for Common Channel Signalling No.7 (CCS7) on Message Transfer Part (MTP), Monitoring and measurements for CCS7 and ISDN User Part (ISUP)..

1.2 The Interface Requirements for CCS7 standards for MTP and ISUP are based on ITU-T Recommendations Q.701 to Q.707 and Q.761 to Q.766 respectively. The monitoring and measurements for CCS7 are based on ITU-T Recommendation Q.752.

1.3 The System Under Test (SUT) shall be connected to the POI on CCS 7 complying to the TEC standards on CCS 7 No. S/CCS 7 JAN 2000 with its all Amendments and Addendums.

CHAPTER 2

MESSAGE TRANSFER PART (MTP)

The Message Transfer Part (MTP) provides the function, that enables the User Part significant information passed to MTP, to be transferred across the CCS7 network to the required destination. In this chapter, the National options on the functional description of MTP, function of Signalling data link, Signalling network functions and messages have been specified.

2.1   FUNCTIONAL DESCRIPTION OF MTP

The functional description of MTP as given in ITU-T Recommendation Q.701 (03/93) shall be applicable. However, the following facilities shall not be used:

2.1.1   Inter-working of Yellow, Red and Blue book MTP implementation

2.1.2 SIF Compatibility mechanism (Refer clause 7.2.6 of ITU-T Recommendation Q.701).

2.2   SIGNALLING DATA LINK

A signalling data link is a bi-directional transmission path for signalling, comprising two data channels operating together in opposite directions at the same data rate. It constitutes the lowest functional level (level 1) in the Signalling System No. 7 functional hierarchy. The signalling data link provided for CCS7 shall be as per ITU-T Recommendation Q.702 (11/88).

2.2.1   All the facilities, except those mentioned in clause 2.2.2 of this document, shall be provided as per ITU-T Recommendation Q.702 (1988), including the following for National use:

(a) Standard bit rate of 64 kbps shall be used for signalling data link (Refer clause 2.1.1 of ITU-T Recommendation Q.702).

(b) Signalling Data link shall be derived from the 2048-kbits/s digital path (Refer clause 5.1 of ITU-T Recommendation Q.702)

(c) Interface at point C shall follow G.703 (04/91) ITU-T Recommendation for electrical characteristics and G.704 (04/91) for functional characteristics in particular the frame structure. (Refer figure 2 and clause 4 of ITU-T Recommendation Q.702).

2.2.2   The following facilities shall not be provided:

(a) For signalling, bit rates lower than 64 kbps shall not be used (Refer clauses 2.1.2, 2.1.3 and 2.2 of ITU-T Recommendation Q.702).

(b) Interface specifications at points A and B are not applicable. (Refer figure 2 and clause 4 of ITU-T Recommendation Q.702)

(c) Signalling data link derived from 8448-kbps stream shall not be used (Refer clause 5.2 of ITU-T Recommendation Q.702).

(d) Signalling data link derived from 1544-kbps shall not be used (Refer clause 5.3 of ITU-T Recommendation Q.702).

(e) Signalling data link established over data circuits shall not be used (Refer clause 5.5 of ITU-T Recommendation Q.702).

(f) Analogue signalling data links shall not be used (Refer clause-6 of ITU-T Recommendation Q.702).

2.3 SIGNALLING LINK

The functions and procedures relating to transfer of signalling messages over a data link shall be as per ITU-T Recommendation Q.703 *(07/96).* This provides the layer 2 functions for the CCS7 protocol stack.

2.3.1 Following facilities as per ITU-T Recommendation Q.703 (*07/96*) shall be provided for National use:

(a) The switch 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.

(b) Both Basic and Preventive Cyclic Retransmission (PCR) method of error correction shall be provided. (Refer clauses 5 and 6 of ITU-T Recommendation Q.703).

2.3.2 All the level 2 timers shall be provided as per ITU-T Recommendation Q.703 (1996), including those given in Table-1 of this document, for National use (Refer clause 12.3 of ITU-T Recommendation Q.703).

Table-1: Level 2 timers

Timer	Name and purpose	Range	Nominal Value
T1 T1 (64)	**Timer "alignment ready"** Bit rate of 64 kbps	40-50 s	45 s

T2
     T2 low
     T2 high
	Timer "not aligned"
	
	Only for automatic allocation of signalling data links and terminals
		5-150 s
		5-50 s
		70-150 s
			60 s

T3	**Timer "aligned"**	**1-2 s**	**1.5 s**

T4
 	
     T4n (64)
 	
     T4e (64)
	Proving period of timer (Pn) = 2^{16} or 2^{12} octet transmission time
	Normal proving period at 64 kbps (corresponding to $P_n = 2^{16}$)
	Emergency proving period at 64 kbps (corresponding to $P_e = 2^{12}$)
		7.5-9.5 s
		
		400-600 ms
			8.2 s
			
			500 ms

T5	**Timer "sending SIB"**	**80-120 ms**	**100 ms**
T6 T6 (64)	**Timer "remote congestion"** Bit rate of 64 kbps	3-6 s	5 s
T7 T7 (64)	**Timer "excessive delay of acknowledgment"** Bit rate of 64 kbps	0.5-2 s	1 s

P_e Emergency proving period
P_n Normal proving period
s   seconds
ms   milliseconds

Note 1: Timer T1 is calculated as follows: As per clause 10.3.4, of ITU-T Recommendation Q.703, proving can be tried M (=5) times. If normal alignment is assumed each time, the time taken for each proving period is T4n (= 8.2 s). Total time taken for 5 trial is 41 s (5X8.2). As per clause 12.2.1.2 of ITU-T Recommendation Q.704, timer T17 (= 1 s) is given between each proving period. So T1 = 41 + T17 X 4 = 45 s.

2.4   **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 (07/96). This provides the layer 3 functions for the CCS7 protocol stack.

2.4.1   All the facilities, except those mentioned in clauses **Error! Reference source not found.** and 2.4.2 of this document, shall be provided as per ITU-T Recommendation Q.704 (07/96), including the following for National use:

(a) Standard Routing label shall be used (Refer from clause 2.2.1 to clause 2.2.5 of ITU-T Recommendation Q.704).

(b) The following cases of load sharing shall be applicable (Refer clause 2.3.2 of ITU-T Recommendation Q.704):

    (i) Load sharing between signalling links belonging to the same link set.

    (ii) Load sharing between signalling links not belonging to same link set.

    (iii) Additionally load sharing should be possible between 32 signalling links either within the same linkset or different linkset.

(c) If UPU message is received, then the actions recommended in clause 11.2.7 of ITU-T Recommendation Q.704 shall be taken.

(d) **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.

(e) **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**.**

(f) **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.

(g) **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.

(h) MTP restart procedure as defined in clause 9 of ITU-T Recommendation Q.704, shall be used.

(i) Signalling route set congestion (International network) as defined in clause 11.2.3 of ITU-T Recommendation Q.704 shall be applicable.

(j) Basic Signalling link management procedure as defined in clause 12.2 of ITU-T Recommendation Q.704 shall be used.

(k) **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.

(l) Transfer controlled (Congestion priorities) message as defined in clause 13.7 of ITU-T Recommendation Q.704, shall be applicable.

(m) Signalling-route-set-congestion test as defined in clause 13.9 of ITU-T Recommendation Q.704, shall be applicable.

2.4.2 The following facilities shall not be provided:

(a) Signalling message handling: The procedure to prevent the unauthorised use of the message transfer capability of node as given in clause 2.1.7 of ITU-T Recommendation Q.704 shall not be used. However the measurements as per Table 6 of ITU-T Recommendation Q.752 shall be feasible.

(b) The routing label shall not be modified for national use (Refer clause 2.2.6 of ITU-T Recommendation Q.704).

(c) 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.

(d) Local processor outage shall not be applied to the affected link (Refer clause 3.3.5.1 of Q.704)

(e) 'Signalling route restricted' as given in clauses 3.4.3 and 3.5.3 of ITU-T Recommendation Q.704, shall not be used.

(f) Procedures dealing with multiple congestion thresholds, N (1 <= N <= 3) as given in clauses 3.8.2.1 and 3.8.2.2 of ITU-T Recommendation Q.704, shall not be used.

(g) Multiple congestion states, without priority, as given in clauses 3.8.2.3 and 3.8.4 of ITU-T Recommendation Q.704 shall not be used.

(h) Multiple congestion level status of signalling route sets as given clause no. 3.8.4 of ITU-T Recommendation Q.704 shall not be used.

(i) 'Signalling route restricted' as defined in clauses 4.1.2 and 4.7 of ITU-T Recommendation Q.704 shall not be used.

(j) 'Transfer-restricted' procedure as defined in clause 6.2.3 of ITU-T Recommendation Q.704 shall not be used.

(k) The clause 6.2.4 of ITU-T Recommendation Q.704, regarding "Restricted destination" shall not be applicable.

(l) 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.

(m) "Transfer restricted" facility as defined in clause 13.4 of ITU-T Recommendation Q.704 shall not be used.

(n) "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.

(o) The service indicator as defined in clause 14.2.1 of ITU-T Recommendation Q.704 shall not be used to perform message routing.

(p) 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.

Formats and codes

(a) The level 3 messages, formats and codes, except those mentioned in sub-clauses **Error! Reference source not found.** and (b) below, shall be provided as per ITU-T Recommendation Q.704 (07/96).

(b) The following messages shall not be provided:

RSR - Signalling-route-set-test signal for restricted destination

TFR - Transfer-restricted signal

Timers and timer values (Refer clause 16.8 of ITU-T Recommendation Q.704)

(a) All the Level 3 timers, except those mentioned in sub-clauses **Error! Reference source not found.** and (b) below, shall be provided as per ITU-T Recommendation Q.704 (07/96*),* including those given in Table-2 of this document, for National use.

(b) The Level 3 timers given in Table-33 of this document shall not be provided.

Switch shall support routing of CCS7 (SS7) messages on basis of Signalling Point Code as well as following network indicator defined in ITU-T recommendation Q.704 Clause 14.

Bits D C

    0 0   International Network

    0 1   Spare (For international   use only)

    1 0   Indian Telecom Network

    1 1   Indian Telecom Network

Table-2: Level 3 Timers for National use

Timer	Purpose of timer	Range (*)
T1	Delay to avoid message mis-sequencing on Changeover	500 (800) to 1200 ms
T2	Waiting for Changeover acknowledgment	700 (1400) to 2000 ms
T3	Time controlled diversion-delay to avoid mis-sequencing on Changeback	500 (800) to 1200 ms
T4	Waiting for Changeback acknowledgment (first attempt)	500 (800) to 1200 ms
T5	Waiting for Changeback acknowledgment (second attempt).	500 (800) to 1200 ms
T6	Delay to avoid message mis-sequencing on Controlled rerouting.	500 (800) to 1200 ms
T8	Transfer prohibited inhibition timer (transient solution).	800 to 1200 ms
T10	Waiting to repeat Signalling route set test message	30 to 60 s
T12	Waiting for Uninhibit acknowledgment	800 to 1500 ms
T13	Waiting for forced Uninhibit	800 to 1500 ms
T14	Waiting for Inhibition acknowledgment	2 to 3 s
T17	Delay to avoid oscillation of initial alignment failure and link restart.	800 to 1500 ms
T22	Local Inhibit test timer (provisional value)	3 to 6 m
T23	Remote Inhibit test timer (provisional value)	3 to 6 m

(*) Note: The values, in brackets, are the minimum values for use when routes with long propagation delays are used e.g. routes including satellite sections.

m   minutes
s   seconds
ms   milliseconds

Table-3: Level 3 Timers NOT used

Timer	Purpose of timer
T9	Not used
T11	Transfer restricted timer
T24	Stabilising timer after removal of local processor outage, used in LPO latching to RPO

2.5 FACILITIES TO BE PROVIDED IN THE SWITCH FOR MTP

The following facilities shall be provided in the switch for proper interworking with the connected switches in the network:

2.5.1 It shall be possible to assign the Signalling data link to any timeslot of the PCM except timeslot 0.

2.5.2 It shall be possible to assign multiple Signalling data links on the same PCM.

2.5.3 The switch shall provide report for failure of any signalling data link.

2.5.4 The switch shall provide audible and visual alarm for failure of signalling link set and signalling route.

2.5.5 **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 switch may therefore have both the methods working simultaneously on different signalling link sets. The method of assignment may be by MML or by office data change.

2.5.6 **Values of N 1 and N 2** (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.

2.5.7 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.

2.5.8 If automatic allocation of Signalling links 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 Recommendation Q.704.

CHAPTER 3

MONITORING AND MEASUREMENTS

To estimate the future performance, utilisation and availability of CCS7 network resources, the monitoring and measurements of these resources are carried out. The monitoring and measurements for MTP and ISUP shall be as per ITU-T Recommendation Q.752 (07/97). All measurements mentioned as "obligatory" shall be provided.

CHAPTER 4

ISDN USER PART (ISUP)

The Integrated Services Digital Network (ISDN) User Part (ISUP) is the CCS7 protocol which provides the signalling function required to support Basic bearer services and supplementary services for voice and non-voice applications in an Integrated Services Digital Network. This chapter specifies the functional description of ISUP, messages & parameter used by ISUP, formats & codes of ISUP messages and parameters, ISUP signalling procedures, facilities to be provided in the switch for ISUP and the application transport mechanism.

4.1   **FUNCTIONAL DESCRIPTION OF ISUP**

ISUP shall be as per the functional description given in ITU-T Recommendation Q.761 (12/99 & Amendment 1 dated 07/2001).

4.1.1 All the facilities, except those mentioned in clauses 4.1.2 of this document, shall be provided as per ITU-T Recommendation Q.761 (09/97), including the following for National use:

(a) General description given in clause-1 of ITU-T Recommendation Q.761 shall be applicable.

(b) Introduction to ISDN User Part (ISUP) signalling procedures given in clause 2 of ITU-T Recommendation Q.761 shall be applicable.

(c) ISUP capabilities relating to Basic call shall be as per Table-4 of this document.

(d) The Future enhancements and Compatibility procedure as defined in clause-6 of ITU-T Recommendation Q.761 shall be applicable.

4.1.2 The following capabilities of ISUP as defined in clause-3 of ITU-T Recommendation Q.761 shall be provided:

(a) Support of Number Portability (NP

Table- 4: ISUP capabilities relating to Basic call - to be provided

Speech/3.1 kHz audio	64 kbps unrestricted
En bloc address signalling	Overlap address signalling
Transit Network selection	Continuity check test using CCR
Simple segmentation	Tones and announcements
Access delivery information	Transportation of User teleservice information
Suspend and resume	Automatic repeat attempt
Blocking and unblocking of circuits and circuit groups	Dual seizure
Transmission alarm handling for digital inter-exchange circuits	Reset of circuits and circuit groups Hop counter procedure

Receipt of unreasonable signalling information	Compatibility procedure
ISDN User Part signalling congestion control	Automatic congestion control
Interaction between ISUP and INAP	MTP pause and resume
Over length messages	Continuity check per call basis and statistical method

Table-6: ISUP capabilities relating to Basic call – NOT used

Multi rate connection type, i.e. 2 X 64, 384, 1536 and 1920 kbps.	N x 64 kbps connection types
Forward Transfer	Signalling procedures for connection type allowing fallback capability
Circuit Group Query	Temporary trunk blocking
Unequipped circuit identification code	

4.2 MESSAGES AND PARAMETERS

The messages, parameters and the parameter information used by ISUP shall be as per ITU-T Recommendation Q.762 {12/1999 with Addendum 1(06/2000)}.

4.2.1 All the facilities, Signalling messages, parameters and Parameter information except those mentioned in clauses 4.2.2 and 4.2.3 of this document, shall be provided as per ITU-T Recommendation Q.762 {12/1999 with Addendum-1 (06/2000)} including the following for National use:

(a) The general description as given in the clause 1 of ITU-T Recommendation shall be applicable.
(b) The ISUP Signalling messages listed in Table-7 of this document, shall be provided as per Clause 2 of ITU-T Recommendation Q.762.
(c) The ISUP Signalling parameters listed in Table-8 of this document, shall be provided as per Clause 3 of ITU-T Recommendation Q.762.
(d) The ISUP Parameter information listed in Table-9 of this document, shall be provided as per Clause 4 of ITU-T Recommendation Q.762.

4.2.2 The following Signalling messages, parameters and Parameter information shall   not be provided:
(a) The ISUP signalling messages listed in Table-10 of this document are NOT used.
(b) The ISUP Signalling parameters listed in Table-11 of this document, are NOT   used .

(c) The ISUP Parameter information listed in Table-12 of this document, are NOT used.

Table-7:ISUP Signalling messages – to be provided

Address Complete Message (ACM)	Answer message (ANM)
Application Transport message (APM)	Blocking message (BLO)
Blocking acknowledgement (BLA)	Call Progress message (CPG)
Charge information message (CRG)	Circuit Group Blocking message (CGB)
Circuit Group Blocking Acknowledgement message (CGBA)	Circuit Group Reset message (GRS)
Circuit Group Reset Acknowledgement message (GRA)	Circuit Group Unblocking message (CGU)
Circuit Group Unblocking Acknowledgement message (CGUA)	Confusion message (CFN)
Connect message (CON)	Continuity message (COT)
Continuity Check Request message (CCR)	Identification Request message (IDR)
Identification Response message (IRS)	Information message (INF)
Information Request message (INR)	Initial Address message (IAM)
Pre-release Information message (PRI)	Release message (REL)
Release Complete message (RLC)	Reset Circuit message (RSC)
Resume message (RES)	Segmentation Message (SGM)
Subsequent Address Message (SAM)	Suspend message (SUS)
Unblocking message (UBL)	Unblocking Acknowledgement Message (UBA)

Table-8: ISUP Signalling parameters – to be provided

Access delivery information	Access transport
Application transport parameter	Automatic congestion level
Backward call indicators	Call diversion information
Call diversion treatment indicators	Call offering treatment indicators
Call reference	Called IN number
Called party number	Calling party number
Calling party's category	Cause indicators
Circuit group supervision message type	Circuit group supervision message type
Circuit state indicator	Connected number
Forward call indicators	Continuity indicators
Correlation id	Display information
End of optional parameters	Event information
Information indicators	Information request indicators
MCID response indicator	MCID request indicator
Nature of connection indicators	Message compatibility information
Optional forward call indicators	Optional backward call indicators
Original called IN number	Original called number
Redirecting number	Parameter compatibility information
Redirection number	Redirection information
SCF ID	Redirection number restriction
Suspend/resume indicators	Subsequent number
Transmission medium requirement	Transit network selection
User teleservice information	User service information
User-to-user information	User-to-user indicators
Echo control information	Hop counter

Table-9: ISUP Parameter information – to be provided

Access delivery indicator	Address presentation restricted indicator
Address signal	Call identity
Called party's category indicator	Called party's status indicator
Calling party address request indicator	Calling party address response indicator
Calling party's category request indicator	Calling party's category response indicator
Cause value	Charge indicator
Circuit identification code	Coding standard
Connected line identity request indicator	Continuity check indicator
Diagnostic	Discard message indicator
Discard parameter indicator	Event indicator
End-to-end method indicator	Extension indicator
Event presentation restricted indicator	Holding indicator
Filler	Inband information indicator
Hold provided indicator	Instruction indicator
Internal network number	Interworking indicator
ISDN user part indicator	ISDN access indicator
Nature of address indicator	ISDN user part preference indicator
Network identification	Location
Number incomplete indicator	National/international call indicator
Odd/even indicator	Network identification plan
Protocol control indicator	Nth upgraded parameter name
Range	Numbering plan indicator
Offset	Redirecting reason
Release call indicator	Satellite indicator
SCCP method indicator	Screening indicator
Simple segmentation indicator	Send notification indicator
Status	Solicited information indicator
Type	Transit at intermediate exchange indicator

Type of network identification	Incoming echo control device information indicator
Echo control device indicator	Incoming echo control device request indicator

Table-10: ISUP Signalling messages – NOT used

Circuit group query message (CQM)	Circuit group query response message (CQR)
Forward Transfer message (FOT)	Loop back Acknowledgement message (LPA)
Loop Prevention message (LOP)	Overload (OLM)
Unequipped CIC (UCIC)	

Table-11: ISUP Signalling parameters – NOT used

Backward GVNS	Call history information
CCSS	Charged Party Identification
Circuit Assignment Map	Forward GVNS
Generic digits	Generic Notification
Generic Number	Generic reference
Loop Prevention Indicators	Remote operations
Network specific facilities	Transmission Medium Requirement Prime
Service Activation	User Service Information Prime
Transmission Medium Used	

Table-12: ISUP Parameter information – NOT used

CCSS call indicator	Charge information response

	indicator
Charge information request indicator	Component type
Component id tag	Credit
Component type tag	End-to-end information indicator
Encoding scheme	GVNS user group identification
Error code	Invoke id
Feature code	Linked ID
Length (of each component or of an information element)	Network specific facility indicator
More instruction indicators	Operation code
Notification indicator	Parameter tag
Number qualifier indicator	Protocol profile
Originating participating service provider identification	Set
Problem code	Terminating network routing number
Sequence	Terminating access indicator
Type of digits	

4.3 **FORMAT AND CODES**

The formats and codes of ISUP messages and the parameters required to support basic bearer services and the supplementary services shall be as per ITU-T Recommendation Q.763 (12/99), Q.763 (1999) Amendment-1 (03/01), Q.763 (1999) Corrigendum 1 (07/01) and Q.763 (1999) Amendment-2 (12/02).

4.3.1 All the facilities, except those mentioned in clause 4.3.2 of this document, shall be provided as per ITU-T Recommendation Q.763 (12/99), Q.763 (1999) Amendment-1 (03/01), Q.763 (1999) Corrigendum-1 (07/01) and Q.763 (1999) Amendment-2 (12/02), including the following for National use:

(a) ISDN User part shall support the Scope, References, Definitions, Routing label, Circuit identification code, message type codes, formatting principles and structure of ISUP messages as per clause-1 of ITU-T Recommendation Q.763.

(b) ISDN User part shall support the Parameters, formats and codes as defined in the clause-2 of ITU-T Recommendation Q.763.

(c) **Message type codes**: The message and parameter codes shall be as defined in Table-4 and 5 of ITU-T Recommendation Q.763. No reserved codes, except those specified in this document, shall be used for any purpose.

(d) In addition to the Calling party categories defined in clause 3.11 of ITU-T Recommendation Q.763, the categories listed in

(e) Table-13 of this document, shall also be applicable.

(f) Any unrecognised category shall be treated as "ordinary" category and call processed accordingly. In case of interworking with other signalling, the corresponding category information shall be translated. If corresponding category is not available, the category shall be set as "ordinary".

(g) The format of cause indicator field shall be as defined in clause 3.12 of ITU-T Recommendation Q.763. The codes to be used in the subfields of the cause indicators fields shall be as defined in ITU-T Recommendation Q.850.

    (i) The Extension Indicator shall be set to '1'.

    (ii) In 'Coding Standard' the binary values '01' to '11' shall be kept reserved.

    (iii) In 'Location' the binary values '0001', '0101', '0111' shall be kept reserved.

    (iv) All cause values shall be supported.

    (v) Diagnostics shall not be used

    (vi) Octets 3 to 3n shall not be used.

(h) The Transit network Selection parameter defined in the clause 3.53 of ITU-T Recommendation Q.763 shall be applicable .

(i) ISDN User Part messages shall support clause-4 of ITU-T Recommendation Q.763.

4.3.2 The following facilities shall not be provided:

(a) In the Signalling parameter 'Backward Call Indicator', defined in clause 3.5 of ITU-T Recommendation Q.763, binary value '10' for bits 'DC" are reserved and shall not be used.

(b) In the 'Circuit group supervision message type' parameter defined in clause 3.13 of ITU-T Recommendation Q.763, binary value '10' for bits 'BA" are reserved and shall not be used.

(c) In the 'Information Indicators' parameter defined in the clause 3.28 of ITU-T Recommendation Q.763, bit H is always set to 0.

(d) In the 'Transmission medium Requirement' parameter defined in clause 3.54 of ITU-T Recommendation Q.763, binary values '00000100' to '00000101' , '00000111' to '00001010' and '00010000' to '00101010' shall not be used

(e) In the 'User service information' defined in clause 3.57 of ITU-T Recommendation Q.763, the codes listed in Table-114 of this document, are reserved and shall not be provided.

Table-13: Additional Calling party categories for National use

Binary value	Application of the Category
00001001	National operator with trunk offer
11100000	Operator without trunk offer
11100001	CCB subscriber
11100010	Interception Operator
11100011	Subscriber with Home Meter
11100100	PABX
11100101	PABX with priority
11100110	Line test desk

Note: Calling Line Categories for "Mobile terminal in home PLMN" and "Mobile terminal in visited PLMN" shall be supported as per latest ITU-T Q.763 recommendations.

Table-14: Reserved codes in User Service Information

Binary value	Parameter information
01 to 11	Coding Standard
10001 and 11000	Information Transfer Capability
10001 to 10111 and 11000	Information Transfer rate
111	Structure
00010, 00100, 00101, 00110 and 00111	User information layer-1 protocol identification

4.4 SIGNALLING PROCEDURES

The ISUP signalling procedures for setting up and clearing down of national and international ISDN connections shall be as per ITU-T Recommendation Q.764 (12/99) with Q.764 (1999) Amendment-1(07/01) and Q.764 (1999) Support for the International Emergency Preference Scheme Amendment-2 (12/02).

4.4.1 All the facilities, except those mentioned in clauses 4.4.2 and 4.4.3 of this document, shall be provided as per ITU-T Recommendation Q.764(12/99) with Q.764 (1999) Amendment-1(07/01) and Q.764 (1999) Support for the International Emergency Preference Scheme Amendment-2 (12/02), including the following for National use

(a) The facilities listed in Table-15 of this document for 'Successful call setup' shall be provided as per clause 2.1 of ITU-T Recommendation Q.764.

(b) The facilities listed in Table-16 of this document for 'Unsuccessful call setup' shall be provided as per clause 2.2 of ITU-T Recommendation Q.764.

(c) The facilities listed in Table-17 of this document for 'Normal call release' shall be provided as per clause 2.3 of ITU-T Recommendation Q.764.

(d) All the facilities of the suspend and resume defined in the clause 2.4 of ITU-T Recommendation Q.764 (12/99) shall be provided.

(e) Through connection of the transmission path: Through connection of the transmission path in both forward and backward directions shall be completed immediately after Initial Address message has been sent. This is applicable to both originating as well as intermediate exchanges.

(f) The facilities listed in Table-18 of this document for 'Network features' shall be provided as per clause 2.8 of ITU-T Recommendation Q.764.

(g) The facilities listed in Table-19 of this document for 'Abnormal conditions' shall be provided as per clause 2.9 of ITU-T Recommendation Q.764.

(h) ISDN User Part signalling congestion control defined in the clause 2.10 of ITU-T Recommendation Q.764 (12/99) shall be provided.

(i) The Automatic congestion control defined in the clause 2.11 of ITU-T Recommendation Q.764 (12/99) shall be provided.

(j) The MTP Pause/Resume defined in the clause 2.14 of ITU-T Recommendation Q.764 (12/99) shall be provided.

(k) The Over length messages procedure defined in the clause 2.15 of ITU-T Recommendation Q.764 (12/99) shall be provided.

(l) ISDN USER PART TIMERS: All relevant timers shall be as per ANNEX A to ITU-T Recommendation Q.764. Timers T3 and T4 processing are not used.

(m) Number portability should be supported

Table-15: Facilities to be provided for Successful call setup

Facility	Clause of ITU-T Rec.Q.764
Forward address signalling – En bloc operation	2.1.1
Forward address signalling – Overlap operation	2.1.2
Calling party number	2.1.3
Address complete message or connect message	2.1.4
Call progress (Basic call)	2.1.5
Information messages	2.1.6
Answer message	2.1.7
The continuity test using CCR message	2.1.8
Charging: Charging Procedure is given in Chapter- 6 of this document.	2.1.9
The Transit Network Selection	2.1.11
Simple Segmentation	2.1.12

Table-16: Facilities to be provided for Unsuccessful call setup

Facility	Clause of ITU-T Rec.Q.764
Actions at exchange initiating a release message	2.2.1
Actions at intermediate exchange	2.2.2
Actions at the controlling exchange (i.e. the exchange controlling the call)	2.2.3
Tones and announcements	2.2.4
Address incomplete	2.2.5

Table-17: Facilities to be provided for Normal call release

Facility	Clause of ITU-T Rec.Q.764
Release initiated by a calling party	2.3.1
Release initiated by a called party	2.3.2
Release initiated by the network	2.3.3
Storage and release of initial address message information	2.3.4
Pre-release information transport	2.3.5

Table-18: Facilities to be provided for Network features

Facility	Clause of ITU-T Rec.Q.764
Automatic repeat attempt	2.8.1
Blocking and unblocking of circuits and circuit groups	2.8.2

Table-19: Facilities to be provided for Abnormal conditions

Facility	Clause of ITU-T Rec.Q.764
Dual seizure: Method-2 shall be used.	2.9.1
Transmission alarm handling for digital inter-exchange circuits.	2.9.2
Reset of circuits and circuit groups	2.9.3
Failure in the blocking/unblocking sequence	2.9.4
Receipt of unreasonable signalling information messages	2.9.5
Failure to receive a "release complete" message – Timer T1 and T5	2.9.6
Failure to receive a response to an information request message	2.9.7
Other failure conditions	2.9.8

4.5 SWITCHING FACILITIES REQUIRED IN ISUP

4.5.1 It shall be possible to assign enbloc or overlap signalling by MML to specified destination based on (part of) called number analysis.

4.5.2 It shall be possible to modify the ISUP timers, given in Annex-A to ITU-T Recommendation Q.764, using MML commands, within the specified ranges.

4.6 APPLICATION TRANSPORT MECHANISM

The application transport mechanism shall be implemented as per ITU-T Recommendation Q.765 (06/00). The Recommendation describes the addition to ISUP for the introduction of a transport mechanism for use by the application requiring a bearer in conjunction with the support of the application 'signalling information flow'.

CHAPTER 5

CHARGING PROCEDURE

5.1 SUT should be able to receive and accept the CRG message coming from connected exchange without leading to a call failure.

5.2 The national charging procedure for CCS7 shall be based on Charge band method. Though the system may adopt the CDR based billing yet the capability for charge band method shall be tested as per the following clauses:

5.3 **CHARGE BAND METHOD (CRG-CHB)**

5.3.1   (i) The CRG message shall contain the Charge band number information as per the format given in Table- 20

(ii) Valid charge indicator shall be as per Table-21

(iii) The instruction indicator subfield in message compatibility information parameter of CRG message is coded as per Table-22

5.3.2

(a) **Determination of Valid charge indicator**: The Valid charge indicator shall be determined on the following criteria:

(i) The "Valid charge indicator" shall be determined from the 'Charge indicator' field of the Backward Call Indicator parameter (BCI) which may be received in successive ISUP messages i.e. ACM, CPG, CON/ANM. The rule is that the Valid Charge indicator shall be equal to the last Significant received charge indicator.

(ii) A significant Charge indicator is coded either 'no charge' or 'charge'.

(iii) A non-significant Charge indicator is coded 'no indication'.

(iv) A received spare code shall be interpreted as a 'charge' code as recommended in Table-A2 of ITU-T Recommendation Q.763 (3/93) and therefore the Valid charge indicator shall be set to "charge".

(v) If successive non significant 'charge indicators' are only received during the call set-up, then the Valid Charge indicator shall be forced by default to 'charge'.

(b) The time at which ANM or CON message is received shall determine the start of charge. The charging shall end when calling subscriber disconnects or when the call is disconnected by Network.

(c) **Exceptional cases**: The originating exchange shall release the call immediately in all the following cases:

(i) CRG is not received before ANM or CON message (cause value 111).

(ii) The charge band number received is not in the charge band table (cause value 95).

(iii) When the originating or interworking exchange receives an incorrect CRG message (i.e. where included parameter(s) are not

in conformance with the one(s) expected), it shall be processed as per section 2.9.5.1 of ITU-T Recommendation Q.764.

(d) TAX shall send charge indicator of ACM/ANM/CON/CPG as "CHARGE" irrespective of charge indicator received in the message.

(e) In case of Tandem exchanges it shall be possible to send charge indicator of ACM/ANM/CON/CPG as charge or no charge based on trunk group irrespective of charge indicator of received message.

(f) In case of Local exchanges it shall be possible to charge or not to charge the call irrespective of charge indicator of received ACM/ANM/CON/CPG message based on trunk group.

(g) In case of announcement 'Answer' Message shall not be sent to originating exchange.

5.3.3 CCS7 to CCS7 Interworking: Intermediate exchange shall transparently transfer 'charge indicator' field of backward call indicator in the ACM/ANM/CON/CPG messages.

Table-20: FORMAT OF CRG-CHB

Parameter	Type	Length (Octets)	Code (HEX)
Message type	F	1	31
Charge band	O	3	
Parameter code			FF
Parameter length			01
Charge band number			
**Message compatibility information	O	3	38
End of optional Parameter	O	1	00

** Refer clause 3.33 of ITU-T Recommendation *Q.763 (12/99).* Refer table-22 of this document for coding of 'Instruction indicator' sub-field.

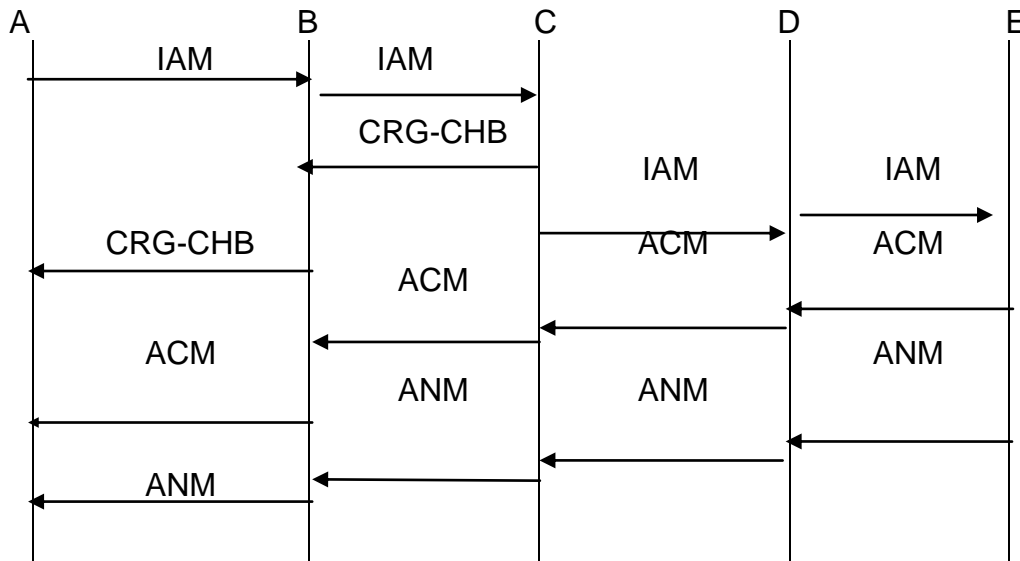**TYPE**
F – Fixed mandatory parameter
O- Optional parameter

Table-21: Charging decision based on Valid charge indicator

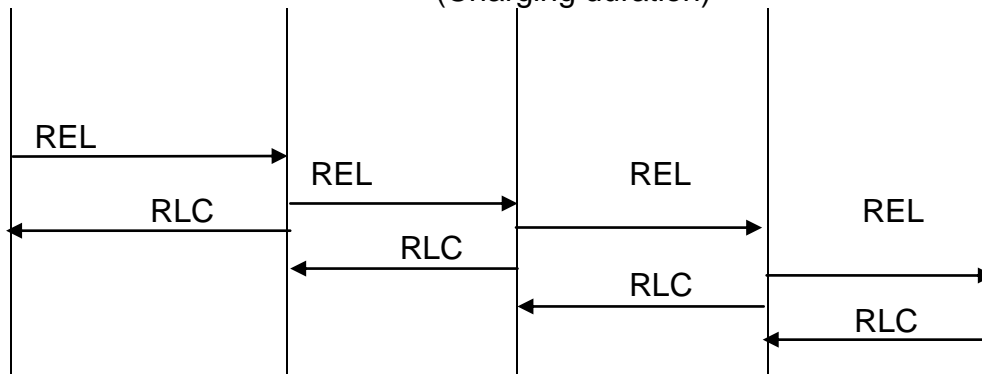| Case	Valid Charge Indicator	Decision in originating exchange based on called number analysis	Action to be taken in originating exchange after receipt of ANM/CON
1	Charge	Metered	Call put through with charge
2	No charge	Non metered	Call put through without charge
3	Charge	Non-metered	Call put through without charge
4	No charge	Metered	As per provisions of clause 5.3.2 (c), (d) and (e).

Table-22: Coding of instruction indicator subfield in message compatibility information parameter of CRG message

BIT number	Value in binary	Information given
A	0	Transit interpretation
B	1	Release call
C	0	Do not send Notification
D	0	Do not discard the message (pass on)
E	0	Release call
F	0	Spare
G	0	Spare
Extension indicator	1	Last octet

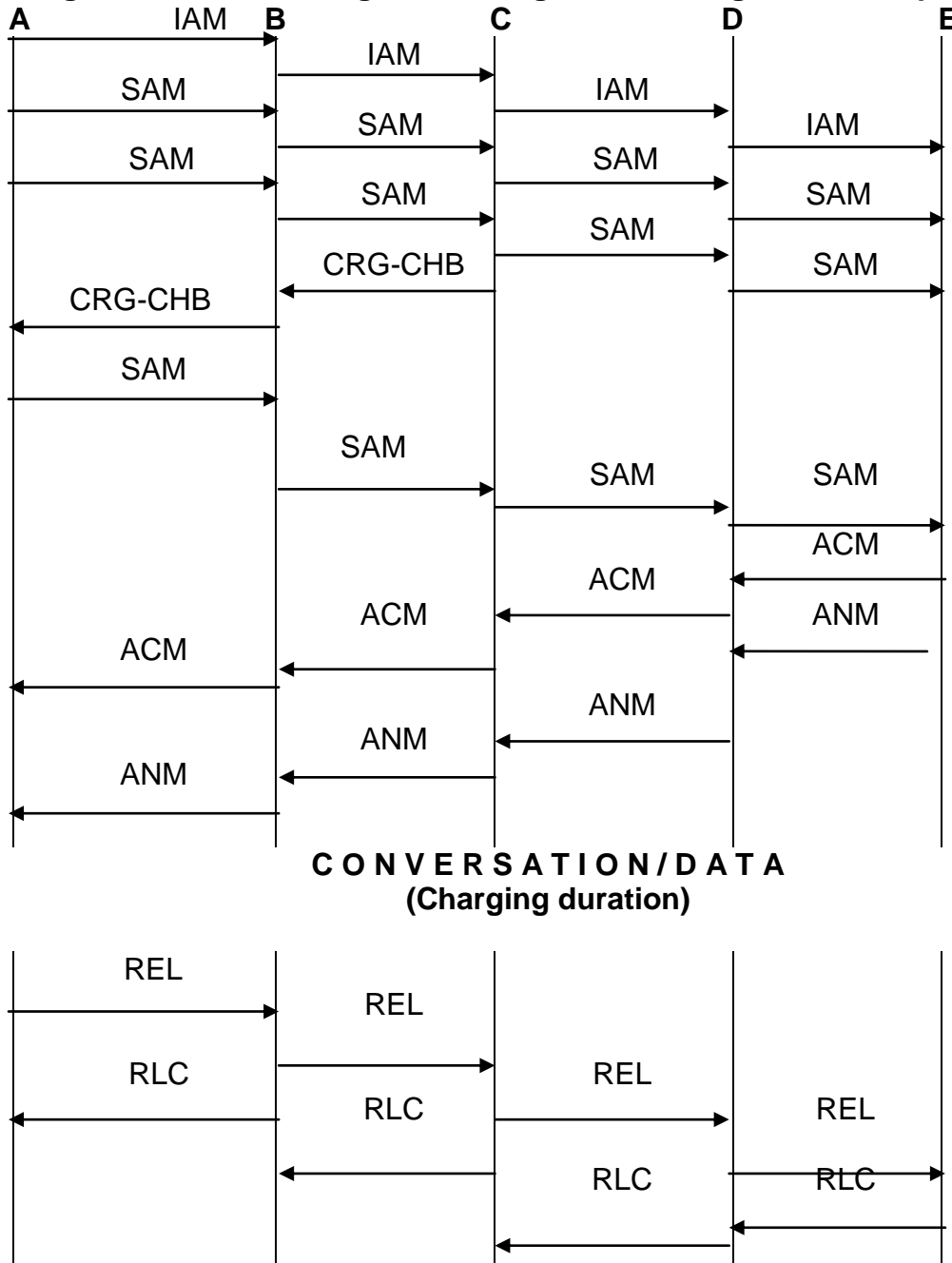**Figure-1: ISUP message flow using CRG message for Enbloc sending**

A - Originating exchange which handles the charging

B - Intermediate exchange (e.g. local tandem)

C - Intermediate exchange which determines the charging rate (e.g. TAX)

D - Intermediate exchange

E - Terminating exchange

Note : Instead of ACM and ANM, auto answering data terminals may send CON.

Figure-2: ISUP message flow using CRG message for Overlap sending

C O N V E R S A T I O N / D A T A
(Charging duration)

A - Originating exchange which handles the charging
B - Intermediate exchange (e.g. local tandem)
C - Intermediate exchange which determines the charging rate (e.g.
      TAX)
D - Intermediate exchange
E - Terminating exchange

Note : Instead of ACM and ANM, auto answering data terminals may send
CON.

Glossary

1. **ACM**
A CCS7 message sent in backward direction indicating that all the address signals required for routing the call to the called party have been received.

2. **ANM**
A CCS7 message sent in backward direction indicating that call has been answered.

3. **CHB**
Charge band parameter used in CRG message.

4. **CON**
A CCS7 message sent in backward direction indicating that all address signal required for routing the call to the called party have been received and the call has been answered.

5. **CPG**
A CCS7 message sent in either direction during set up or active phase of the call indicating that an event which of significance, should be relayed the originating or terminating access, has occurred.

6. **CRG**
A CCS7 message used for conveying charging information.

7. **CRG-CHB**
A CCS7 message used for conveying charging information with charge band parameter.

8. **Enbloc**
A method in which all digits of called party number are send in IAM message.

9. **IAM**
A CCS7 message used for sending a call parameters necessary for switching the call to distant switching node.

10. **ITU-T**
Telecommunication standardization sector of International Telecommunication Union (ITU).

11. **Kbits**
A unit of data volume, i.e. one thousands binary digits. For example, a particular channel may be said to handle 9.6 kilo bits per second.

12. **kbps**
Kilo bits per second.

13. **Linkset**
A set of signalling data links used for transmission of CCS7 messages.

14. **MSUs**
Number of CCS7 Messages used for telephone calls.

15. **Overlap**
A method in which some digits of called party number are sent in IAM message and remaining digits are sent in one or more SAM messages.

16. **REL**

A CCS7 message sent in either direction to indicate that the circuit is being released due to the reason(cause) supplied and is ready to be put into the idle state on receipt of the release complete message.

17. **RLC**

A CCS7 message sent in either direction in response to the receipt of release message, or if appropriate to reset a circuit message, when the circuit concerned has been brought into the idle condition.

18. **SAM**

A CCS7 message that may be sent in forward direction following initial addressmessage, to convey additional called party information.

19. **SIB**

Status Indication "B" (Busy) is sent from the receiving end of the link to the remote end after the congestion is detected at the receiving end.

20. **SIF**

User part of a CCS7 message is called SIF i.e. signalling information octets.

21. **SSP**

Service switching point i.e. a switch in Intelligent network used for accessing service control point (SCP) and for switching service user to service subscriber.

22. **STPs**

Nodes used for transfer of CCS7 message i.e Signalling Transfer Points.

23. **TAX**

Trunk Automatic Exchange i.e a switch used for switching of national and international calls.

24. **Un inhibit**.

To open for traffic.

25. **UPU (User Part Unavailable)**

When the distribution function detects that a received message cannot be delivered to the required user, a UPU message is returned to the originating end .