C-DOT CCS7

USER'S MANUAL

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THIS C–DOT SYSTEM PRACTICE REFERS TO THE C–DOT SIGNALLING SYSTEM #7 (ABBREVIATED AS C-DOT SS7 IN THE REST OF THIS PUBLICATION).

THE INFORMATION IN THIS SYSTEM PRACTICE IS FOR INFORMATION PURPOSES AND IS SUBJECT TO CHANGE WITHOUT NOTICE.

A COMMENT FORM HAS BEEN INCLUDED AT THE END OF THIS PUBLICATION FOR READER'S COMMENTS. IF THE FORM HAS BEEN USED, COMMENTS MAY BE ADDRESSED TO THE DIRECTOR (SYSTEMS), CENTRE FOR DEVELOPMENT OF TELEMATICS, 39, MAIN PUSA ROAD, NEW DELHI - 110 005

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Chapter 1.

Introduction

1.1. PURPOSE & SCOPE

The purpose of this document is to provide complete and detailed information on the implementation of ITU-T (formerly CCITT) Common Channel Signalling System No.7 (CCS7) in C-DOT DSS MAX switching systems. The architecture of the signalling unit, its MML interface, and operations and maintenance aspects are discussed in detail. This document would be useful for anyone interested in gathering detailed information about C-DOT CCS7 as well as to the exchange O&M personnel. For technical persons, involved in design or testing and validation of CCS7, this document will prove to be a good starting point in understanding the implementation of CCS7 in the switch.

1.2. ORGANISATION OF CONTENTS

There are twelve chapters in the document including the present one. In the following sections of this chapter, the advantages of common channel signalling systems over CAS systems, and the features and capabilities of CCS7 are briefly described. The international standards and other references followed in the design of CCS7 are also listed.

Chapter 2 presents a brief on the system architecture of C-DOT DSS MAX and the place of the CCS7 Signalling Unit Module (SUM) in the overall switch architecture. The overall architecture of SUM is also described here.

Chapter 3 is on the hardware and software architecture of the SUM and the packaging of its hardware components.

Chapter 4 deals with CCS7 (ISDN User Part) call processing in C-DOT DSS MAX. Here, the interaction between the hardware and software while handling different types of ISUP calls has been described.

In Chapters 5, 6 & 7 the man-machine interface for carrying out operations and maintenance functions is described.

Chapter 8 covers the SUM packaging and interconnection aspects.

Chapter 9, 10 & 11 are on the retrofit procedure installation and maintenance procedures.

Finally, in Chapter 12, engineering of the SUM resources is discussed.

1.3. OVERVIEW OF SIGNALLING SYSTEMS

One of the major factors influencing the development of signalling systems is the relationship between signalling and the control function of exchanges. Early telecommunication networks used analogue step-by-step exchanges. In such systems, the control and switch functions are co-located, and when a call is made, the signalling and traffic follow the same path within the exchange. This is known as Channel Associated Signalling (CAS). In this case, the signalling and traffic also follow the same path external to the exchange, i.e. on the transmission link.

The next stage through which the exchanges evolved is shown in Fig.1.1. In such exchange the control mechanism for setting-up and releasing calls is separated from the switch block. The technique allows much more flexibility in controlling calls and it also reduces costs. Again, CAS systems are typically associated with this type of exchange. Whereas signalling information is carried on the same path as its associated speech circuit external to the exchange, the two are separated within the exchange. This is shown in Fig. 1.1 in which the speech traffic circuits (denoted by solid lines) are routed by the switch block but the signalling information (denoted by dotted lines) is routed via the control function. Between Exchanges A and B, the signalling and traffic are carried over the same path. This approach was primarily designed to allow optimisation of functions within exchanges, but its effectiveness is constrained by the need to combine signalling and speech traffic external to the exchange.

With Common Channel Signalling (CCS) systems, the philosophy is to separate the signalling path from the speech path. The separation occurs both within the exchange and external to the exchange (Fig.1.2), thus allowing optimisation of the control processes, switch block and signalling systems. Fig.1.2 illustrates that, in a CCS environment, the switch block routs the speech paths as before, however, a separate path internal to the exchange routs the signalling (denoted by a dotted line). This approach allows maximum flexibility in optimising exchange and signalling development. The approach gains maximum benefit when adopted in parallel with the introduction of digital exchanges and digital transmission systems. CCS system being particularly efficient in these circumstances.

1.4. ADVANTAGES OF COMMON CHANNEL SIGNALLING

Common Channel Signalling is being adopted throughout the world in national and international networks for numerous reasons. The main reasons are:

a) The rapidly changing control techniques of exchanges

b) The limitations of CAS systems

c) The evolutionary potential of CCS systems

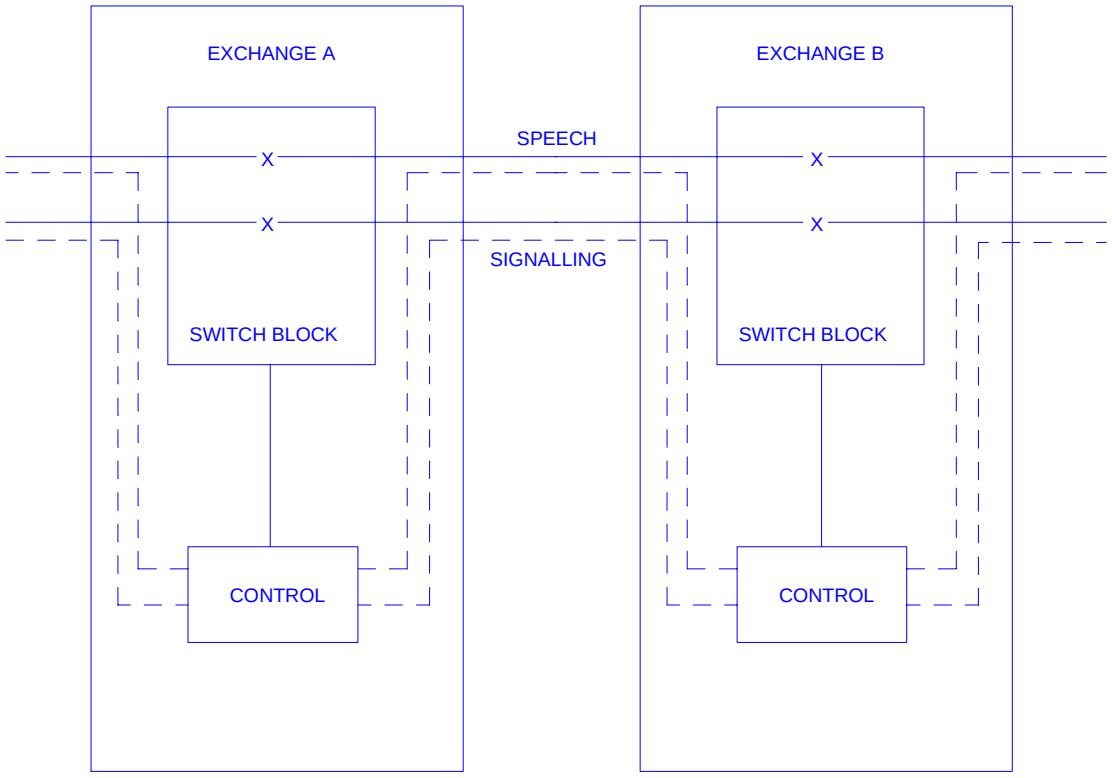

FIG. 1.1
CAS SIGNALLING WITH SEPARATE CONTROL AND SWITCH BLOCKS

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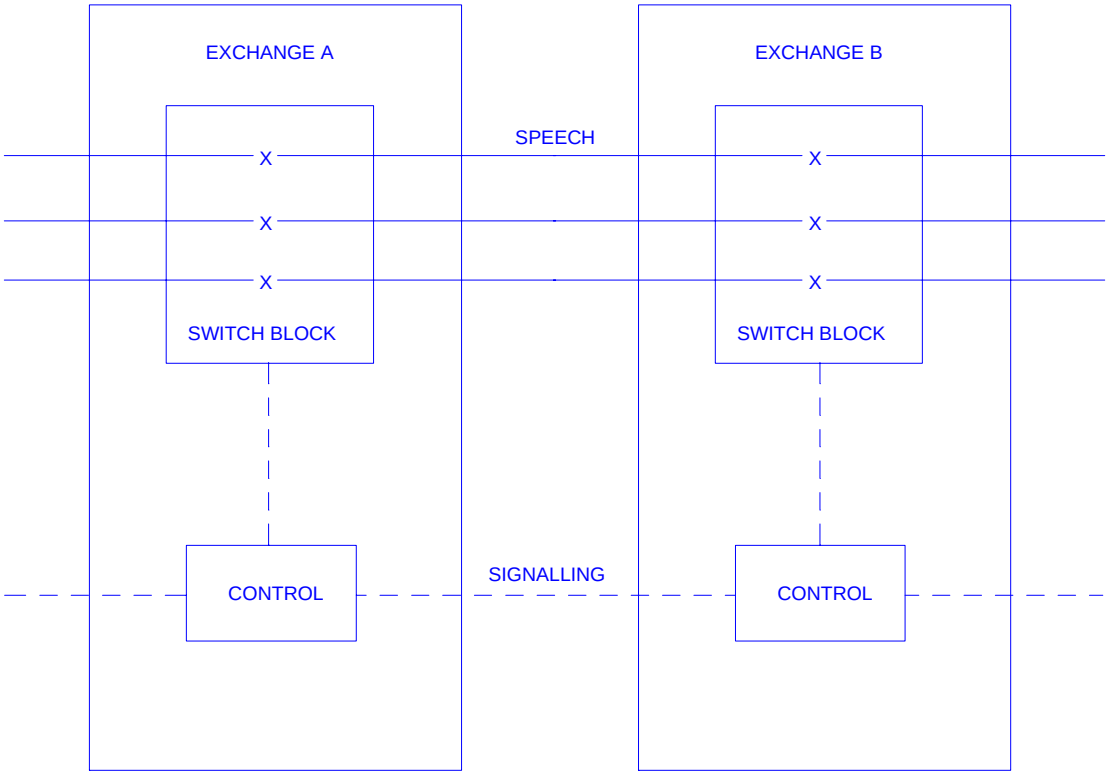

FIG. 1.2
COMMON CHANNEL SIGNALLING

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One result of the evolutionary process of exchanges described above is to change the relationship between signalling and call control. In the early exchange systems, exchanges could communicate, but in a limited and inflexible manner, thus limiting the flexibility of call control. In a CCS environment, the objective is to allow uninhibited communication between exchange control functions, or processors, thus tremendously broadening the scope and flexibility of information transfer.

Further advantages result from the evolutionary process of CCS and call control. The drive to provide an unrestricted communication capability between exchange processors eliminates per-circuit signalling termination costs. These costs are inevitable in per-circuit CAS systems, but for funelling all signalling information into a single common-channel, only one signalling termination cost is incurred for each transmission link. There are cost penalties for CCS systems; e.g. the messages received by an exchange have to be analysed, resulting in a processing overhead. However, these cost penalties are more than covered by the advantages of increased scope of inter-processor communication and more efficient processor activity.

The separation of CCS from traffic circuits, and the direct inter-connection of exchange processors, are the early steps in establishing a cohesive CCS network to allow unimpeded signalling transfer between customers and nodes and between nodes in the network. The concept of a cohesive CCS network opens up the opportunity for the implementation of a wide range of network management, administrative, operation and maintenance functions. A major example of such a function is the quasi-associated mode of operation. This mode of operation provides a great deal of flexibility in network security, reduces the cost of CCS on small traffic routes and extends the data-transfer capabilities for non-circuit-related signalling.

CAS systems possess limited information-transfer capability due to:

i) The restricted number of conditions that can be applied (e.g. the limited variations that can be applied to a D.C. loop or the limited number of frequency combinations that can be implemented in a voice frequency system)

ii) The limited number of opportunities to transfer signals (e.g. it is not possible to transmit voice-frequency signals during the conversation phase of a call without inconveniencing the customers or taking special measures).

Neither of these restrictions applies to CCS. The flexible message-based approach allows a vast range of information to be defined and the information can be sent during any stage of a call. Hence, the repertoire of CCS is far greater than channel-associated versions and messages can be transferred at any stage of a call without affecting the calling and called subscribers.

CCS systems transfer signals very quickly, i.e. at 64 Kbps. This speedy signalling also permits the inclusion of far more information without an increase in post-dialling delay.

Techniques used in modern CCS system can further improve the flexibility provided to customers. 'User-to-user' signalling and end-to-end signalling techniques are used whereby messages can be transferred from one customer to another without undergoing a full analysis at each exchange in the network. Whilst forms of end-to-end signalling are possible using CAS systems, the technique can be more efficiently implemented with CCS systems.

One of the problems that prompted the development of CCS systems was 'speech clipping' in the international network. In some CAS systems, it is necessary to split the speech path during call set-up to avoid tones being heard by the calling customer. This results in a slow return of the answer signal and, if the called customer starts speaking immediately after answer, then the first part of the statement by the called customer is lost. As the first statement is usually the identity of the called customer, this causes a great deal of confusion and inconvenience. CCS systems avoid the problem by transferring the answer signal quickly.

As a result of the processing ability of CCS systems, a high degree of reliability can be designed into the signalling network. Error detection and correction techniques can be applied which ensure reliable transfer of uncorrupted information. In the case of an intermediate exchange failure, re-routing can take place within the signalling network, enabling signalling transfer to be continued. While these features introduce extra requirements, the common channel approach to signalling allows a high degree of reliability to be implemented economically.

A major restriction of CAS is the lack of flexibility, e.g. the ability to add new features is limited. One factor that led to the development of CCS was the increasing need to add new features and respond to new network requirements. Responses to new requirements in CCS can be far more rapid and comprehensive than for channel associated versions.

CCS systems are not just designed to meet current needs. They are designed to be as flexible as possible in meeting future requirements. One way of achieving the objective is to define modern CCS systems in a structured way, specifying the signalling system in a number of tiers. The result is flexible signalling system that reacts quickly to evolving requirements and future services can be incorporated in a flexible and comprehensive manner. Changes to existing services can be implemented more quickly and at lower cost than with CAS systems.

1.5. OVERVIEW OF SIGNALLING SYSTEM NO.7

Signalling System No.7 (CCS7) is a message based signalling system between Stored Program Controlled (SPC) switches. Where the intermediate nodes may be used as Signal Transfer Points (STPs), CCS7 network can be used for transmitting call related messages, as well as slow speed data packets between ISDN users. The Signalling Connection Control Part (SCCP) enables it to act like a packet network. Thus it is an important pre-requisite to Integrated Service Digital Network (ISDN)

and Intelligent Network (IN) features. Enhanced service for the public telephone network can also be provided using this message based signalling system.

Some of the salient features of CCS7 are:

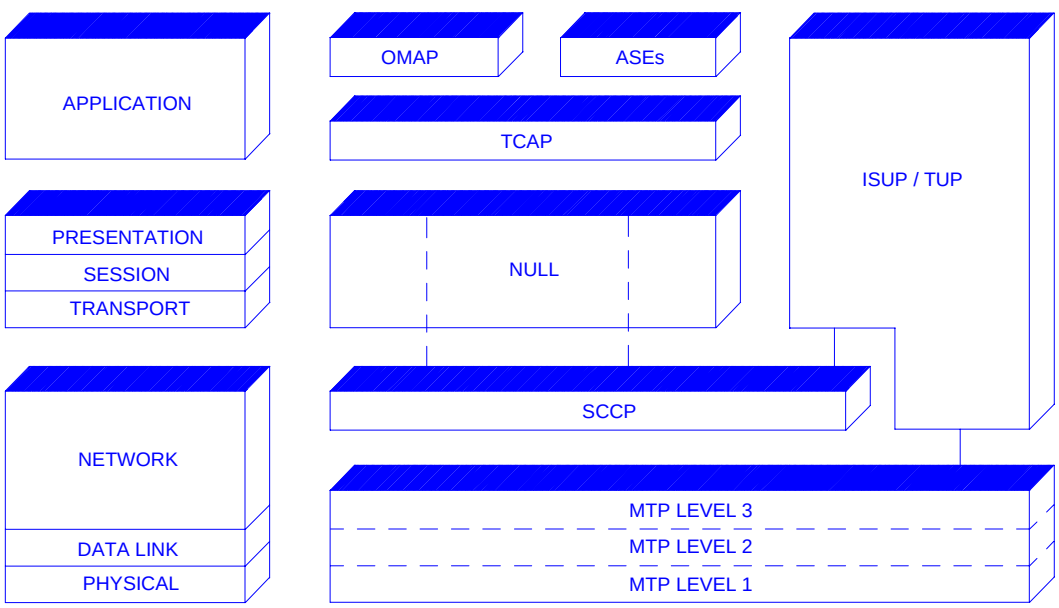
- Fast, reliable and economical
- Bit-oriented protocol
- Labelled messages
- Associated and quasi-associated mode of working
- Error correction is supported at link level (level 2) by transmission and sequence control.
- Message routing is supported by signalling message handler at level 3
- Redundancy and load sharing is possible on signalling links. Changeback on link restoration is possible
- Redundancy and load sharing is possible on signalling routes, alongwith diversion on route failure.

1.5.1. CCS7 Protocol Stack

The CCS7 protocol stack comprises of four layers. With reference to the OSI 7-layer model, the correspondence between the layers is depicted in Fig.1.3. The functions defined for each layer or level are briefly described in the following paras.

Level 1

Any node with the capability of handling CCS7 is termed a ‘signalling point’. The direct interconnection of two signalling points with CCS7 uses one or more 'signalling link(s)'. Level 1 of the 4-level structure (shown in Fig.1.3) defines the physical, electrical and functional characteristics of the signalling link. Defining such characteristics within level 1 means that the rest of the signalling system (level 2 to 4) can be independent of the transmission medium adopted. By keeping the interface between levels 1 and 2 constant, any changes within level 1 do not affect the higher levels. In a digital environment, usually the physical link is a 64 Kbps channel. This is typically within a digital transmission system using pulse-code modulation (PCM). However, other types of link (including analogue) can be used without affecting levels 2 to 4.



ASE = APPLICATION SERVICE ELEMENT
ISUP = ISDN USER PART
MTP = MESSAGE TRANSFER PART
OMAP = OPERATIONS MAINTENANCE AND ADMINISTRATION PART
SCCP = SIGNALING CONNECTION PART
TCAP = TRANSACTION CAPABILITIES APPLICATION PART
TUP = TELEPHONE USER PART

FIG. 1.3
CCS7 PROTOCOL ARCHITECTURE

\DESIGN\CCS7-UM\SS7-PA

Level 2

Level 2 defines the functions that are relevant to an individual signalling link, including error control and link monitoring. Thus, level 2 is responsible for the reliable transfer of signalling information between two directly connected signalling points. If errors occur during transmission of the signalling information, it is the responsibility of level 2 to invoke procedures to correct the errors. Such characteristics can be optimised without affecting the rest of the signalling system, provided that the interfaces to levels 1 and 3 remain constant.

Level 3

The functions that are common to more than one signalling link, i.e. signalling network functions, are defined in level 3 : these include ‘message handling’ functions and 'signalling network management' functions. When a message is transferred between two exchanges, there are usually several routes that the message can take including via a signal-transfer point. The message-handling functions are responsible for the routing of the messages through the signalling network to the correct exchange. Signalling network management functions control the configuration of the signalling network. These functions include network reconfigurations in response to status changes in the network. For example, if an exchange within the signalling network fails, the level 3 of CCS7 can re-route messages and avoid the exchange that has failed.

Message Transfer Part (MTP)

Levels 1 to 3 constitute a transfer mechanism that is responsible for transferring information in messages from one signalling point to another. The combination of level 1 to 3 is known as the message transfer part (MTP). The MTP controls a number of signalling message links and network management functions to ensure correct delivery of messages. This means that the messages are delivered to the appropriate exchange in an uncorrupted form and in the sequence that they were sent, even under failure conditions in the network.

Level 4

Level 4 comprises the ‘user parts’. The meaning of the messages transferred by the MTP and the sequence of actions for a particular application (e.g. telephony) is defined by the `user parts'. A key feature is that many different user parts may use the standardised MTP. Hence, if new requirements arise, that had not been foreseen previously, the relevant user part can be enhanced (or a new user part derived) without modifying the transfer mechanism or affecting other user parts. Three user parts have been defined, the Telephone User Part (TUP), the ISDN User Part (ISUP) and the Data User Part (DUP). Along with SCCP, which provides end-to-end signalling capability, MTP constitutes the Network Services Part (NSP) which provides the Network Layer functionalities of the OSI model. The user parts of NSP

are Operations and Maintenance Application Part (OMAP) and Mobile Application Part (MAP).

Signalling Connection Control Part (SCCP)

The Signalling Connection Control Part (SCCP) has the functions of the network as well as the transport layers of the CCS7 protocol stack. Together with the MTP, it provides true OSI transport layer capabilities. Unlike MTP which provides only datagram service, SCCP provides connection-oriented and connection-less services as well.

Thus, while MTP is sufficient for circuit switched applications like TUP and ISUP, for non-circuit related applications, such as database querying, the enhanced addressing capability of SCCP is required. SCCP has a unique scheme of addressing and routing based on Global Titles. SCCP utilizes the services of MTP to route its payload from one node to other.

In addition to routing transaction related messages submitted by the Transaction Capabilities Application Part (TCAP), SCCP also segments and sequences large TCAP messages to fit into the MTP packet size. At the distant node it is the responsibility of the peer SCCP to re-assemble the segmented message.

Transaction Capabilities Application Part (TCAP)

TCAP is an application part in the CCS7 stack and is responsible for establishing dialogue with remote databases. It carries the data of higher layers like INAP and MAP and invokes remote operations. An operation at remote end requires a series of queries and responses as part of a TCAP dialogue.

Management of a dialogue requires:

- Establishing a dialogue
- Continuing the dialogue
- Terminating the dialogue
- Maintaining the integrity of each dialogue in case of multiple dialogue scenario by assigning unique transaction ids to each dialogue.
- Invoking remote operation and managing the operation

TCAP layer is a compound layer in the sense that it is composed of two sub-layers, namely, Transaction Sublayer (TSL) and Component Sublayer (CSL).

Transaction sublayer is responsible for establishing, managing and maintaining the integrity of the dialogue whereas Component sublayer is responsible for packing the upper layer message into a component and assigning an invoke ID to the component.

When CCS7 is specified as a signalling system, level 4 specifies a number of call-control functions. Indeed, the circuit-related mode of CCS7 is so closely

associated with controlling the set-up and release of physical circuits that it is essential that some aspects of call-control are defined within the user part specification in order to optimise the procedures that are adopted.

1.5.2. Application of the Level Structure

The application of the level structure is illustrated in Fig.1.4. Exchanges A and B are directly connected by speech circuits (denoted by the solid lines connecting the respective switch blocks). A signalling link is also available between Exchanges A and B (denoted by the dotted line). It is shown that level 4 (the user part) is closely associated with the control function of the exchange.

If the control function of exchange A needs to communicate with the control function of Exchange B (e.g. to initiate the set-up of a speech circuit between the exchanges), the control function in Exchange A requests the level 4 functions to formulate an appropriate message. Level 4 then requests the message-transfer part (level 1 to 3) to transport the message to exchange B. Level 3 analyses the request and determines the means of routing the message to exchange B. The message is then transported via levels 2 and 1.

Upon receipt of the message by the MTP of exchange B, levels 1 and 2 deliver the message to level 3. Level 3 at exchange B recognises that the message has arrived at the correct exchange and distributes the message to the appropriate user part at level 4. Level 4 in exchange B then interacts with the control function to determine the appropriate action and response. If problems arise in the transmission process between exchanges A and B, causing message corruption, the level 2 functions are responsible for detecting the corruption and retransmitting the information. If the signalling link between exchanges A and B is not available (e.g. link has failed), the level 3 functions are responsible for re-routing the information through the signalling network to exchange B.

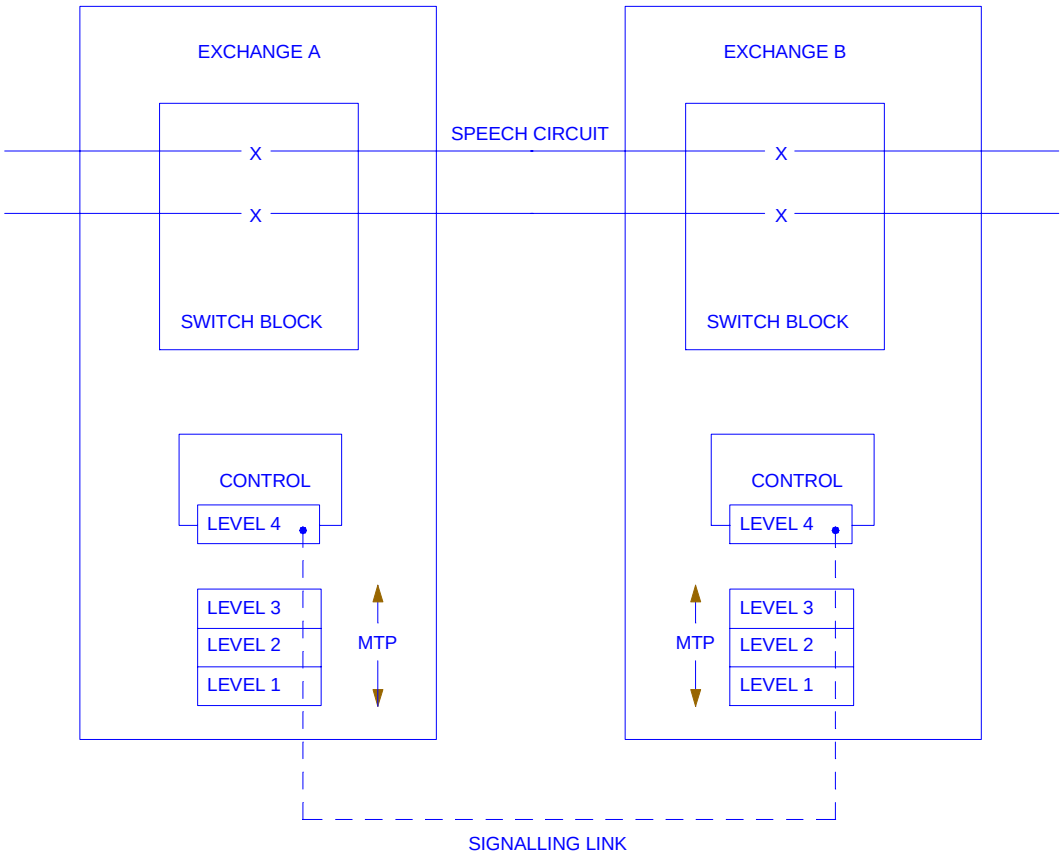


FIG. 1.4
APPLICATION OF THE LEVEL STRUCTURE

\DESIGN\CCS7-UM\CCS7-LS

1.5.2.1. PROTOCOL SPECIFICATIONS

To ensure compatibility between various telephony systems, ITU-T (formerly CCITT) has specified rules and procedures to be followed by telephony systems. Common Channel Signalling System No. 7 specified by ITU-T (CCS7) consists of the international specifications for CCS (Common Channel Signalling) implementation. The model specific for CCS7 corresponds to the OSI (Open System Interconnections) model of ISO (International Standards Organisation).

The relevant ITU-T specifications are :

- The Message Transfer Part (MTP), specified in recommendations Q.701 to Q.709
- The Signalling Connection Control Part (SCCP), specified in recommendations Q.711 to Q.714
- The Transaction Capabilities Application Part (TCAP), specified in recommendations Q.771 to Q.775
- The Telephone User Part (TUP), specified in recommendations Q.721 to Q.725
- The ISDN User Part (ISUP), specified in recommendations Q.761 to Q.766
- The Data User Part (DUP), specified in recommendation Q.741
- Monitoring and Measurement, specified in recommendations Q.791 and Q.752
- The Operation and Maintenance Application Part (OMAP), specified in recommendation Q.795

For detailed specifications, Blue Books [1998] of ITU-T on CCS7 (and subsequent White Book enhancements) can be referred.

There are certain areas on which ITU-T has left the specification to be framed by the individual countries. Department of Telecommunications (DOT), the nodal regulating agency of telephony in India, has specified the implementation of CCS7 in Indian telephone network. It consists of the specifications which are applicable in the national network and specific recommendations for areas left open by ITU-T, as well as certain basic services applicable in the Indian context. Some of these are :

- National Common Channel Signalling Plan (23-330/91-TEC, September 1992)
- National CCS7 Specifications for Local/Tandem Exchanges (G/CCS – 01/02, SEP 96)
- National CCS7 Specifications for Transit Exchanges (G/CCS – 02/02, SEP 96)
- National STP Standards (SP STP 001, September 1994)
- National SCCP Standards for Large Digital Switching Systems (G/CCS – 03/01, JUN 94)

In the implementation of CCS7 in C-DOT DSS MAX, the relevant portions of above mentioned specifications have been used.

Chapter 2.

CCS7 Capability in C-DOT DSS MAX

2.1. OVERVIEW OF C-DOT DSS MAX ARCHITECTURE

C-DOT DSS MAX family of exchanges employ T-S-T switching architecture and can be configured by using the following four basic modules (Figure 2.1):

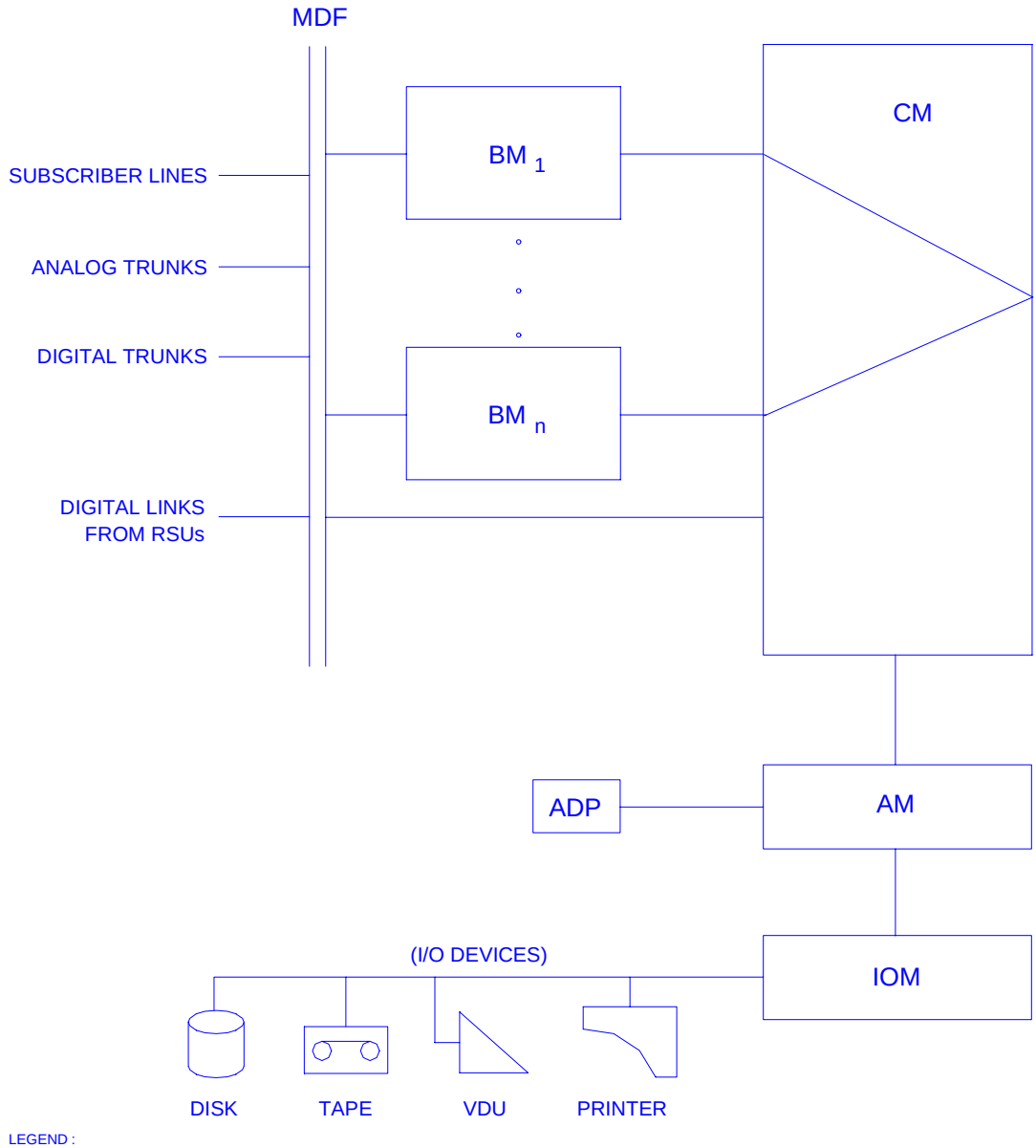
a. Base Module
b. Central Module
c. Administrative Module
d. Input Output Module

The Base Module (BM) is the basic growth unit of the system. It interfaces the external world to the switch. The interfaces may be subscriber lines, analog and digital trunks, CCB and PBX lines, and digital links from remote modules. Each Base Module can interface upto 2024 terminations. The number of Base Modules directly corresponds to the exchange size. It carries out majority of call processing functions and, in a small-exchange application, also carries out operation and maintenance functions with the help of the Input Output Module.

In Single Base Module (SBM) exchange configuration, the Base Module acts as an independent switching system and provides connection to upto 1500 lines and 100 trunks. In such configuration, the Base Module directly interfaces with the Input Output Module for bulk data storage and operations and maintenance functions. Clock and synchronisation is provided by a source within the Base Module. It is a very useful application for small urban and rural environments.

With suitable modifications in hardware and software, a Base Module can be remotely located to form a part of a Remote Switch Unit (RSU) configuration.

Central Module (CM) consists of a message switch and a space switch to provide inter-module communication and perform voice and data switching between Base Modules. It provides control-message communication between any two Base Modules, and between Base Modules and Administrative Module for operation and maintenance functions.



LEGEND :

BM -	BASE MODULE
CM -	CENTRAL MODULE
AM -	ADMINISTRATIVE MODULE
IOM -	INPUT OUTPUT MODULE
ADP -	ALARM DISPLAY PANEL
MDF -	MAIN DISTRIBUTION FRAME
RSU -	REMOTE SWITCH UNIT
n -	≤ 32

FIG. 2.1
C-DOT DSS MAX BASIC ARCHITECTURE

\DESIGN\CCS7-UM\CCS7-SA

The duplicated Network Synchronisation Controller (NSC) in the CM provides clock and synchronisation to processing complexes in the switch. It has digital phase locked (PLL) circuitry for locking to the network reference clock. In free-run made, it supplies its highly accurate (level 2) clock to the switch.

Administrative Module (AM) performs system-level resource allocation and processing function on a centralised basis. It performs all the memory and time intensive call processing support functions and also administration and maintenance functions. It communicates with the Base Modules via the Central Module. It supports the Input Output Module for providing man- machine interface. It also supports an Alarm Display Panel (ADP) for the audio-visual indication of faults in the system. In SBM configuration, ADP directly communicates with the Base Processor.

Input Output Module (IOM) is a powerful duplex computer system that interfaces various secondary storage devices like disk drives, cartridge tape drive and floppy drive. It supports printers and upto 32 video display units that are used for man-machine communication interface. All the bulk data processing and storage is done in this module.

Thus, a C-DOT DSS MAX exchange, depending upon its size and application, will consist of Base Modules (maximum 32 in case of MAX-XL), Central Module, Administrative Module, Input Output Module and Alarm Display Panel. The Base Modules can be remotely located or co-located depending on the requirement.

For more details on the hardware and software architecture, please refer to the document - "C-DOT DSS MAX-XL General Description".

2.2. CCS7 SIGNALLING UNIT MODULE

The ITU-T Signalling System No. 7 (CCS7) capability in C-DOT DSS MAX exchange is provided in the form of the Signalling Unit Module (SUM). It is a standalone equipment frame that can be used and retrofitted in any exchange configuration. Only one such unit is required in an exchange.

The place of SUM in the switch architecture is similar to that of a Terminal Unit (TU). SUM is equipped in one of the co-located Base Modules in a Terminal Unit frame position.

Although SUM is a module by itself and contains global resources, it has been deliberately placed at the front-end in order to make it independent of the switch configuration. The BM containing the SUM is then called the "home" BM. Figure 2.2 depicts the placement of SUM in C-DOT DSS MAX.

SUM contains a 68010 or 68040 based generic CPU complex and CCS7 signalling handler terminals. The number of signalling terminals depends upon the signalling network connectivity and the amount of signalling traffic to be carried.

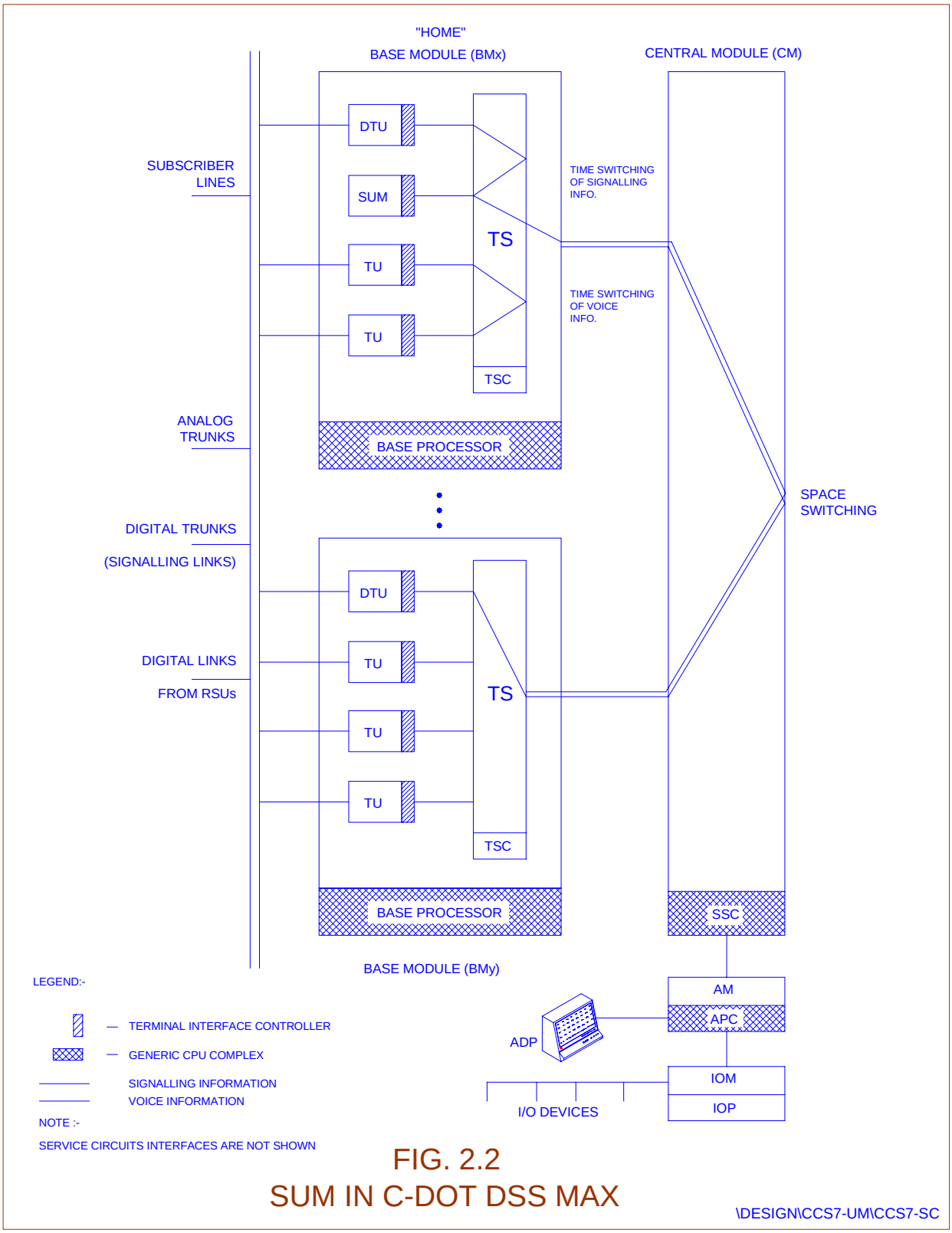


FIG. 2.2
SUM IN C-DOT DSS MAX

\DESIGN\CCS7-UM\CCS7-SC

The CCS7 protocol stack has been implemented according to ITU-T Recommendations and Indian National Standards. Message Transfer Part (MTP), ISDN User Part (ISUP), Signalling Connection Controller Part (SCCP) and Transanction Capabilities Application Part (TCAP) are available for PSTN, ISDN and Intelligent Network applications. Monitoring and measurements as per ITU-T Rec. Q.752 have been implemented. In future, Mobile Application Part (MAP) and Operations & Maintenance Application Part (OMAP) will be available.

Chapter 3.

SUM Architecture

3.1. SYSTEM ARCHITECTURE

CCS7 capability in C-DOT DSS MAX exchanges is implemented in the form of the CCS7 Signalling Unit Module (SUM).

The SUM hardware is packaged into a standard equipment frame. The equipage of the frame is similar to that of a terminal unit. In a Base Module rack, the SUM frame can be placed in any Terminal Unit (TU) frame position, i.e. principal frame or concentration frame position. In case it is equipped in the principal frame position, it interfaces with the Time Switch via a Terminal Unit Controller (TUC) on a 128-channel PCM link operating at 8 Mbps. See Fig. 3.1.

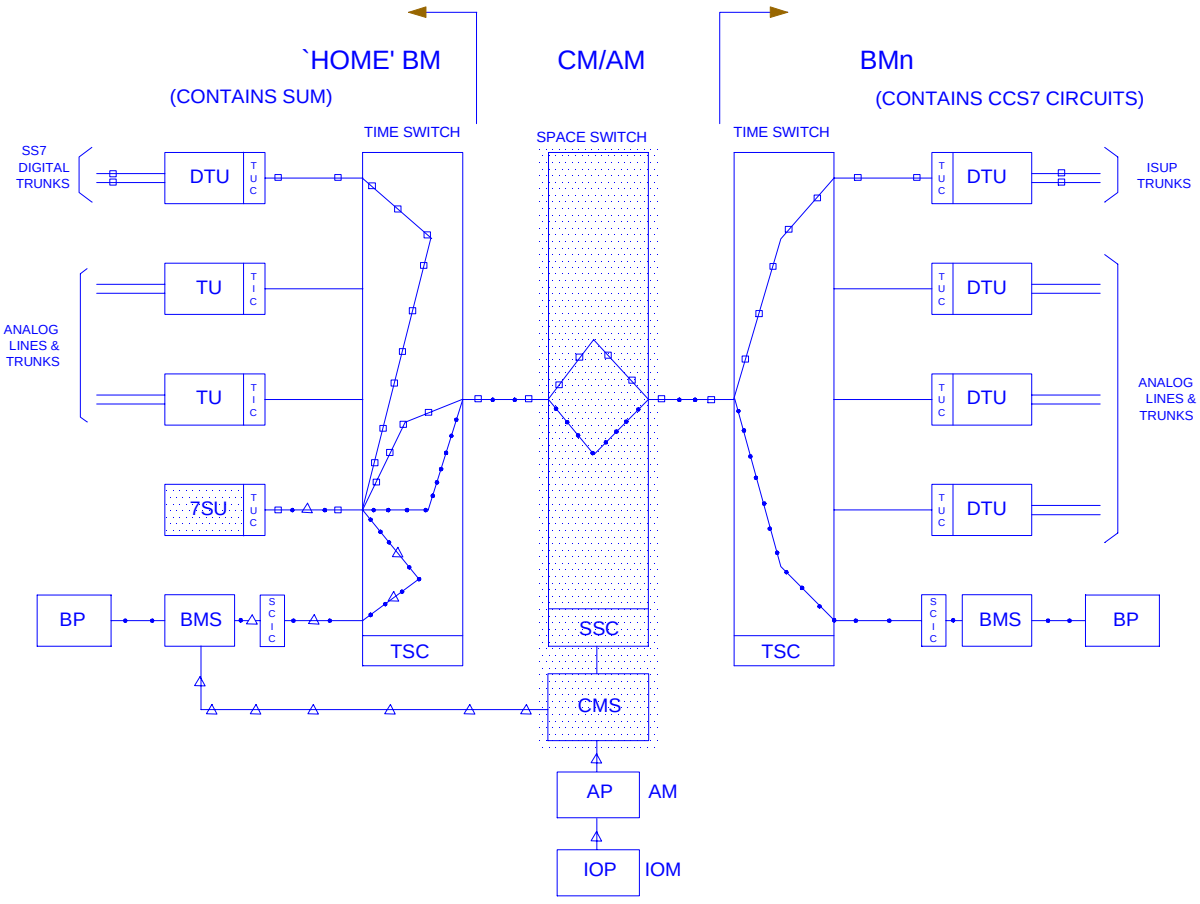
However, the SUM can not be equipped with a V5 Unit (VU) in one concentration chain, i.e. if VU is equipped as the principal TU then SU can not be concentrated behind it and vice-versa. Also, SUM can not be equipped in a remote BM (RBM).

Similar to a TU, the SUM has terminal cards i.e. Signalling Handler Module Cards (SHM). Each SHM card supports upto 8 Protocol Handler (PHC) terminals.

The PHC terminals can be configured as CCS7 protocol terminals, or as C.85 protocol (C-DOT proprietary protocol, a variation of X.25 protocol) terminals for internal control message communication. Two PHC terminals are configured as C.85 terminal at the time of SUM initialisation in order to enable code and data downloading from the Input Output Module. The number of C.85 terminals is however variable and depends upon the switch configuration.

The communication with the Base Processor of the home BM and between PHC terminals is handled by the SUM CPU (SU7) complex which is also the central control of the SUM.

The protocol software is distributed over SHM, SU7 and BPC cards. Table 3-1 depicts the software distribution over various processors.



LEGEND :-

- CODE/DATA DOWNLOADING PATH
- NAILED-UP #7 SIGNALLING LINKS
- NAILED-UP INTERNAL MESSAGE (C.85) LINKS

ABBREVIATIONS :-

AM	-	ADMINISTRATIVE MODULE
AP	-	ADMINISTRATIVE PROCESSOR CONTROLLER
BM	-	BASE MODULE
BMS	-	BASE MESSAGE SWITCH
BP	-	BASE PROCESSOR
CM	-	CENTRAL MODULE
CMS	-	CENTRAL MESSAGE SWITCH
DTU	-	DIGITAL TERMINAL UNIT
IOM		INPUT OUTPUT MODULE
IOP	-	INPUT OUTPUT PROCESSOR
SCIC	-	SERVICE CIRCUITS INTERFACE CONTROLLER
SSC	-	SPACE SWITCH CONTROLLER
SUM	-	SIGNALLING UNIT MODULE
TIC	-	TERMINAL INTERFACE CONTROLLER
TSC	-	TIME SWITCH CONTROLLER
TU	-	TERMINAL UNIT
TUC	-	TERMINAL UNIT CONTROLLER

FIGURE 3.1
CCS7 SIGNALLING UNIT MODULE ARCHITECTURE

\DESIGN\CCS7-UM\CCS7-CSU

3.2. HARDWARE ARCHITECTURE (FIGURE 3.2)

SUM hardware has been implemented by using two basic types of cards : a backend duplicated CPU and front-end Signalling Handler Module Cards (SHM). The CPU (called SU7) cards operate in active/standby mode and interface all the SHM cards (in n+x redundancy) and off-board memory (BME) as devices on the processor bus.

Each SHM card consists of two processing complexes each with two 68302 processors with inbuilt HDLC controller timer, shared RAM for buffering messages, EPROM for storing code and static RAM for storing data. The combination of the microprocessor, HDLC controller and shared RAM constitutes a signalling terminal. The SHM card provides 8 channels to be used as signalling terminals or I-channels and another four channels for diagnostic purposes. Outputs of four SHM cards are multiplexed to offer a 2.048 Mbps stream towards the TUC. Figure 3.2 depicts the hardware architecture of SUM.

Messages received from the HDLC or messages to be transmitted to the HDLC are deposited in shared RAM that can be accessed by both the PHC processors as well as the SU7. The SU7 address and data bus extends to the PHCs to access shared RAM containing messages. Care is taken in the PHC to avoid contention between the processors in PHC and CPU accessing the memory. Messages are presented to the SU7 in FIFO queues corresponding to each channel.

Each PHC terminal is soft configurable to handle CCS7 or C.85 protocols and are switchable to any data link.

The SU7 card, which is the central control of the SUM, is duplicated and the copies are attached to the same address and data bus accessing the shared RAM on SHM cards. At any instant only one SU7 copy is active and other lies in hot standby mode, i.e. on failure of one copy the other copy takes over immediately. Since the messages are stored in the shared RAM on the PHCs, messages are not lost and message handling can proceed unaffected in the event of CPU copy switchover.

3.3. SOFTWARE ARCHITECTURE

The SUM software is distributed over different processors in SUM and the switch. While layer 2 protocol functions are completely carried out by the software resident in the PHC, layer 3 protocol functions are distributed over SU7 and the Base Processor of the home BM. Call processing functionality (the ISUP) is resident on the Base Processor. This is depicted in Table 3-1 also. The software subsystems are described briefly in the following paragraphs.

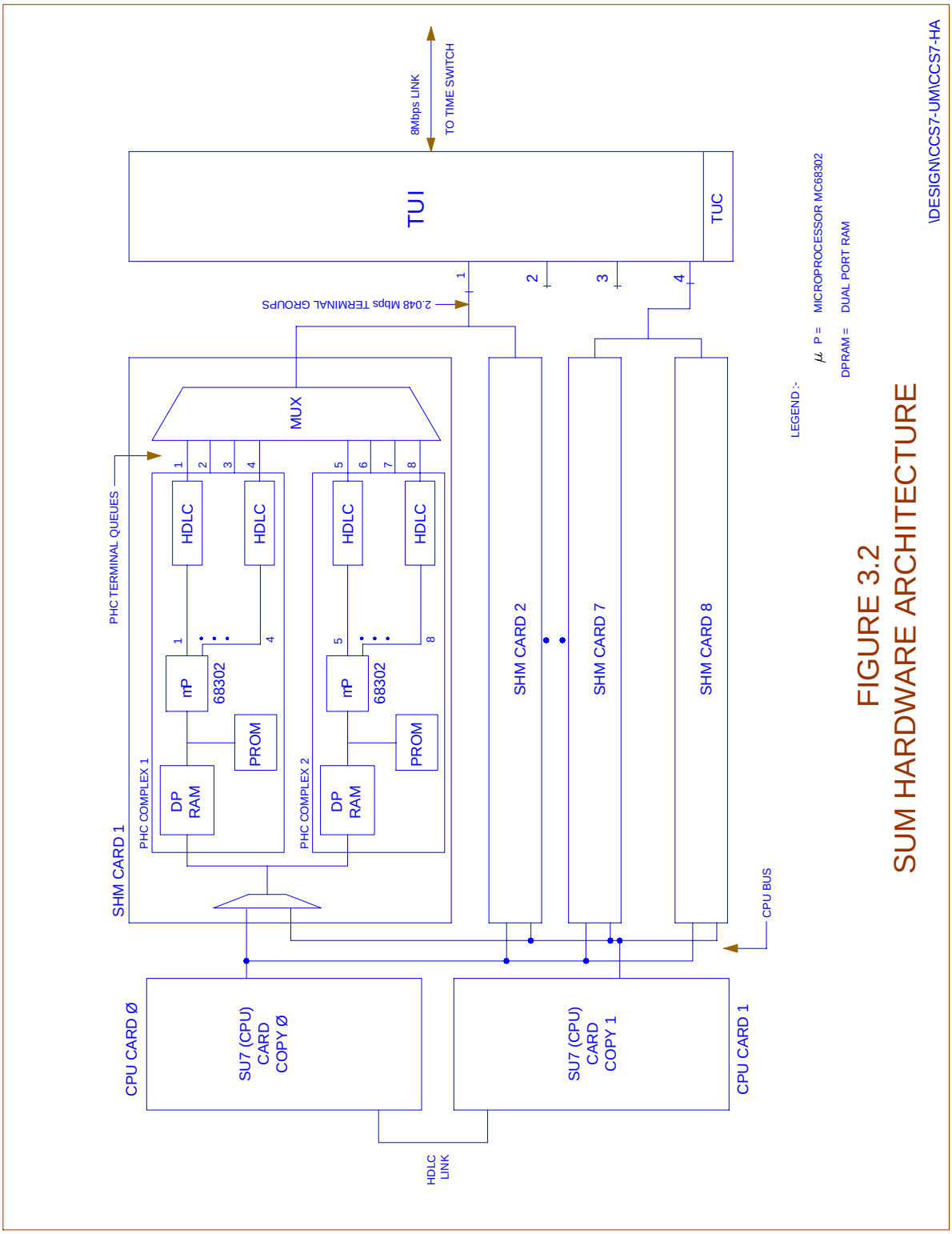


FIGURE 3.2
SUM HARDWARE ARCHITECTURE

Table 3-1 CCS7 Software Distribution

Functionality/Subsystem	Hrdware Unit
Level 2	SHM
Level 3	SHM, SU7
ISUP	SU7, Base Processor
Call Processing	Base Processor
Maintenance	Base Processor, SU7, SHM
Administration	Base Processor, Administrative Processor, SU7, SHM

Signalling Message Handler

The message handler is responsible for discrimination of incoming messages, their distribution to the user parts or routing to other signalling network nodes. The internal message communication between PHCs, SU7 and home BPC is also handled by SMH.

See Fig. 3.3 for the place of SMH in the software architecture of SUM. SMH is resident on PHC as well as SU7.

Signalling Network Manager (SNM)

The Signalling Network Manager constitutes a major part of the level 3 software resident on the SU7. It is responsible for managing the overall organisation of signalling paths in the network and takes corrective action in case of failure, restoration or addition of new links, routes or nodes.

The tasks of signalling network manager are distributed amongst a number of eternal processes. They maintain and use a common database, containing informations (both static and dynamic) about the status of links, routes, and nodes, the network configuration and the connections within the home node. The message handler for routing of signalling messages uses this information.

The signalling network management processes communicate with one another using messages, and also with the external world via the message handler. The 'external world' comprises the following:

- *Neighbouring nodes in the network* - they exchange messages about reconfiguration of links, blocking the traffic, etc.
- *Local management (maintenance and administration subsystem)* - for exchanging blocking/unblocking, inhibition/uninhibition requests and responses, and the messages to change path connections within the exchange.

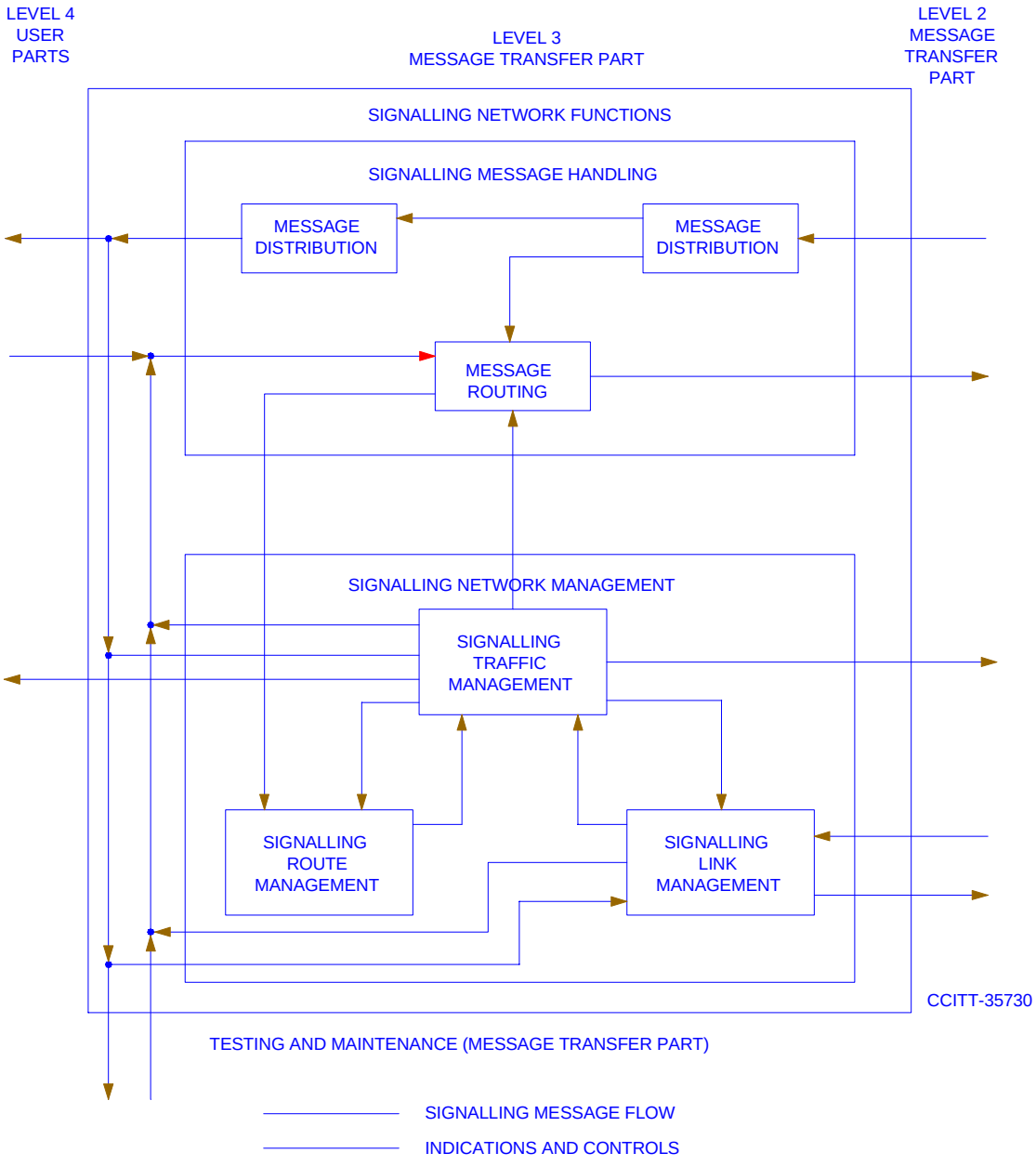


FIG. 3.3
SMH & SNM FUNCTIONS

\DESIGN\CCS7-UM\CCS7-SM

- *Level 2* – for exchanging messages about signalling terminals' status and other protocols.
- *Message handler itself* - for exchanging messages for co-ordination of the various activities.

Operating Systems

The operating system in the SU7 is the proprietary C-DOT DSS Operating System (CDOS) which provides communication primitives, memory management and timing services for the user processes. The OS in PHC is the customised TINIX operating system.

Related software in other processors include :

User Parts

The Telephone User Part (TUP) and ISUP are implemented as part of the call processing subsystem, which is distributed over different Base Processors. Based on the 'half call' concept, call related characteristics can be categorised either as incoming or outgoing. As for any other signalling scheme, for CCS7 also, the two types of characteristics are handled by two terminal processes (TPs) :

- Incoming Terminal Process (ITP7 for TUP, and, ICUP for ISUP)
- Outgoing Terminal Process (OTP7 for TUP, and, OGUP for ISUP).

The basic feature of the C-DOT DSS architecture is its capability to interwork with different signalling schemes. On one end there may be one signalling scheme in the network while on the other end signalling type may be altogether different. CMR process facilitates the interworking of different signalling schemes. For CCS7, problem of interworking arises when on one side of the network there is CCS7 and the other end is some other. Signalling process translates the message received from the CCS7 TP and communicates the event to other TP in a form that is understandable to it. Also, communication received from the non-CCS7 TP is communicated to CCS7 TP in the format relevant to it.

Maintenance Subsystem

Maintenance subsystem is spread over SU7 and the central processors of the home BM and the CM. Together these take care of the overall configuration management, maintenance of SUM and the nailed-up paths, and the management of datalinks to be used for setting up signalling links.

The ITU-T Recommendations for MTP level 3 assumes some management functions, which are implementation dependent. In this implementation, these functions are distributed in BM and AM and form part of CCS7 subsystem. These functions can be broadly categorised as :

- Operator interface for activation/deactivation, blocking/unblocking, inhibiting/ uninhibiting of signalling links and linksets.
- Data link allocating/deallocation functions
- Switching functions to provide the switched access to data links
- Initialisation of the SUM, which includes initial hardware diagnostics, downloading of code, data and other files, initialisation of database and creation of other processes in the SU7.
- Detection and recovery from hardware and software faults
- Management of terminals and maintenance of PHCs and I-channels
- Monitoring the health of SUM (including PHCs) and configuration management
- Diagnostics – automatic and on demand
- Overload and congestion control
- Running audits on the database periodically and on demand

Administration System

The administration subsystem coordinates the following activities :

- Execution of the administration related man-machine command (for addition, deletion and modification of the status of various resources), and the maintenance related man machine commands for testing and configuration management.
- Generation of alarms and reports for the operator
- Generation of CCS7 related traffic reports

Database Subsystem

The data related to the CCS7 resources (signalling links and terminals, linksets, routes, route sets, point codes and other network specific data), system parameters and network configuration data utilised by CPU processes is kept in the CPU memory and maintained by its own database routines. Routines are available for insertion, deletion, selection, updation and modification of data.

A part of this data is maintained in a different format in the central database in BP, and AP as well, which is accessed by concerned processes using the standard database routines. These data are downloaded and modified through man-machine commands.

Chapter 4.

Call Processing

4.1. INTRODUCTION

Building upon the discussion on the SUM architecture in the last chapter, in this chapter, the hardware - software interactions are illustrated with the help of ISUP call handling procedures.

In C-DOT DSS MAX ISUP call handling is different from non-ISUP call handling. This is so because of the SUM hardware and software which now have to participate in call handling. Apart from this the general philosophy of call processing remains the same.

In the following sections, the processes of handling an ISUP incoming- terminating call and an ISUP transit call is described. Originating - outgoing call flow is essentially similar to the incoming - terminating call flow described below.

4.2. ISUP CALL MESSAGE SEQUENCE

The signalling message sequence during the handling of a successful and unsuccessful ISUP call is depicted in Fig. 4.1 and 4.2. The discussion in subsequent sections is based upon this information.

4.3. ISUP TERMINATING CALL

Setup Phase

When an ISUP call originates on an ISUP trunk, the Status Control Process (SCP) checks the busy/free status of the trunk circuit (i.e., CIC).

If the circuit is free, an incoming trunk terminal process – ICUP (Incoming ISDN User Part) – is created for handling the ISUP protocol. Once this process is created the SCP forwards the Initial Address Message (IAM) received from preceding exchange to it. ICUP extracts the called party number from IAM and performs preliminary digit analysis (i.e. whether the call is terminating in the same exchange or it has to be transited etc.). When the call is terminating in the exchange, it collects all the digits of the called party and goes for routing of the call in order to determine the destination of the call. For the transit case, refer to the next section.

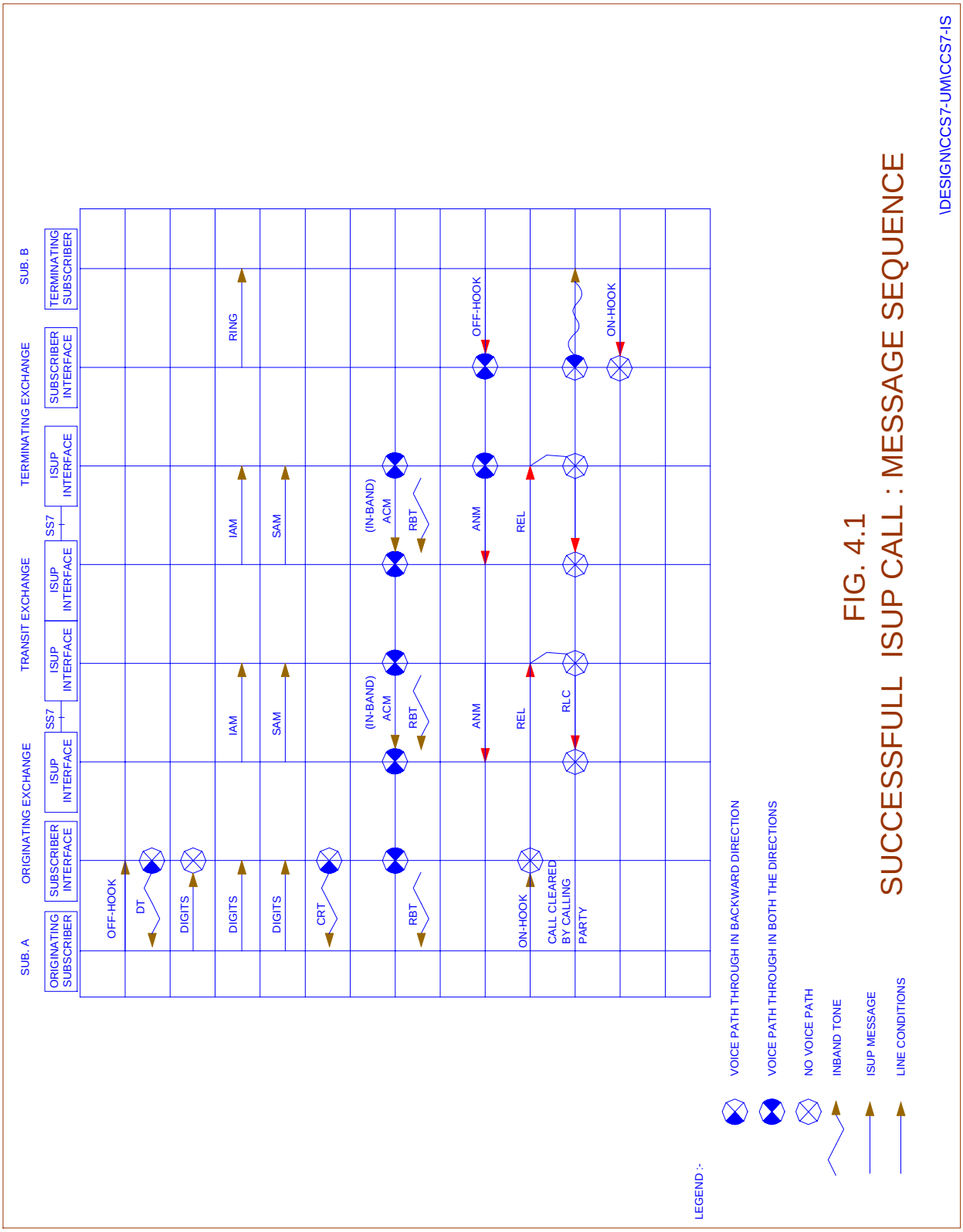


FIG. 4.1

SUCCESSFULL ISUP CALL : MESSAGE SEQUENCE

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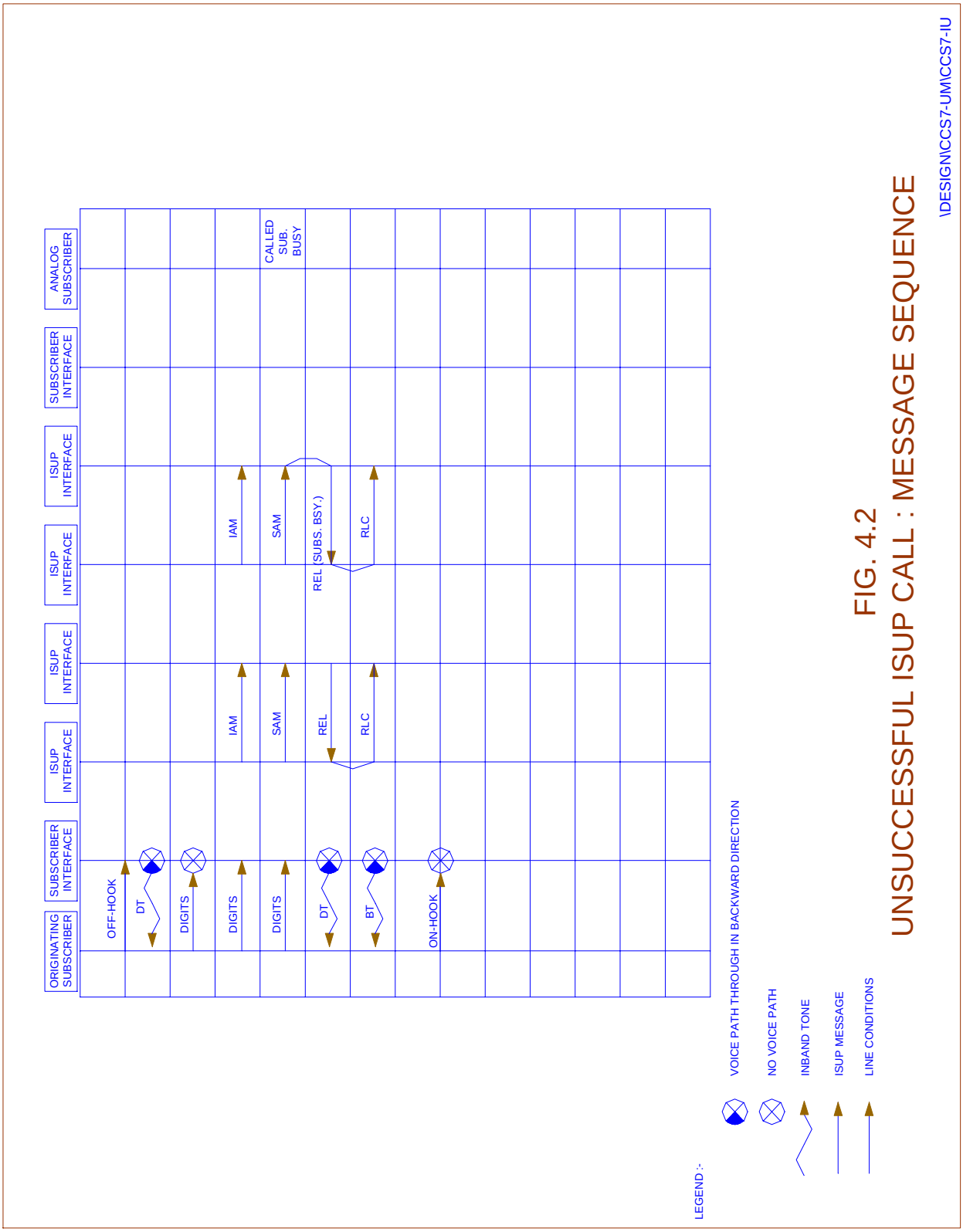

FIG. 4.2

UNSUCCESSFUL ISUP CALL : MESSAGE SEQUENCE

\DESIGN\CCS7-UM\CCS7-IU

Ringing Phase

In the terminating exchange, it is then checked whether the called party is free or busy. If the called party is free, then ring is fed to the called subscriber. Path is switched in the backward chain towards the calling party by sending an Address Complete Message (ACM) to the preceding exchange. After switching the path, Ring Back Tone (RBT) is fed to the calling subscriber.

The charging information is extracted for the call based on the incoming trunk group category and the call party category and passed to ICUP. If in the charging information it is indicated that this exchange has to do the charging, ICUP generates the Charge (CRG) message and sends it to the preceding exchange, prior to sending the ACM, so that the charging of the call can be done at the originating exchange upon receipt of answer.

Conversation Phase

When the called subscriber answers the call, Answer Message (ANM) is sent to the preceding exchange to notify the called party's condition to the calling subscriber.

Release Phase

If the calling party releases the call, ICUP receives Release (REL) message from the preceding exchange. It records the case of failure and replies with Release Complete (RLC) message to the preceding exchange. The call details are then sent to the relevant administration processes for post-processing.

4.4. ISUP TRANSIT CALL

Setup Phase

When a call originates on an ISUP trunk, SCP checks the free/busy status of the trunk circuit (i.e., CIC).

If the circuit is free, then an incoming trunk terminal process, ICUP (Incoming ISDN user part), is created for catering to ISUP protocol at the incoming end. Once this process is created SCP forwards the Initial Address Message (IAM) received from preceding exchange to it. ICUP extracts the called party number from IAM and performs preliminary digit analysis (to determine whether the call is terminating in the same exchange or is outgoing from the exchange etc.). When the called party is outgoing from this exchange, then called party digits are used for determining the trunk group on which the call is to be routed. It is then checked whether free trunk circuits are available in the trunk group. After a free circuit is selected on the outgoing route, in outgoing trunk, terminal process OGUP (Outgoing ISDN User Part) is created for catering to ISUP protocol at the outgoing end and the IAM received from the preceding exchange is forwarded to the succeeding exchange on the signalling link and ACM timer is started.

Ringing Phase

For an outgoing call, charging information is defined on the route for the incoming trunk group category and this information is passed to ICUP.

When ACM is received from the succeeding exchange, voice path is switched and, if the charge data indicates that this exchange has to do the charging, the CRG message is generated and sent to the preceding exchange followed by ACM.

Conversation Phase

When the called subscriber answers the call, ANM received from the succeeding exchange is forwarded to the preceding exchange to notify the called party's condition to the calling subscriber.

Release Phase

If the calling party releases the call, then ICUP receives REL from the preceding exchange. The cause of failure is recorded and RLC is sent to the preceding exchange. To the succeeding exchange, the REL message received is forwarded. On getting RLC the call details are sent to the relevant administration process for post-processing.

Chapter 5.

Command Directory

5.1. INTRODUCTION

Commands are the tools that can be used to observe, record, manipulate and display exchange data. For the purpose of incorporating requirements specific to CCS7 implementation, administration and maintenance, commands have been added to the existing MML command set of C-DOT DSS MAX. CCS7 administration commands are grouped under two classes in the CRP Administration commands menu.

Class 31 Number 7 Update Commands

Class 32 Number 7 Display Commands

Similarly, CCS7 maintenance commands are also grouped under the following two classes in the CRP Maintenance commands menu.

Class 12 Number 7 Maintenance Update Commands

Class 13 Number 7 Maintenance Display Commands

Additionally, ISUP charging related update and display commands are available in classes 40 & 41 respectively.

5.2. COMMANDS DIRECTORY

Command directory serves the function of a central reference point for all the commands. By looking at the various entries in the directory the operating personnel get an idea of the function performed by a command, its mnemonic and the position defined parameters required for its execution.

The directory is divided into four parts corresponding to the four CCS7 command classes and two addition classes, which contain ISUP charging related commands.

Please note that through all the commands and their parameters have been described in Chapter 5 & 6, all the commands may not be available in a particular software release.

5.3. COMMAND FLOW

Irrespective of the command, all the commands when executed follow a similar pattern of man-machine interaction. Command flow is the interaction between the operating personnel (*man*) and the software, more specifically, the Command Recognition Process (CRP) (*machine*).

As an illustration, the command flow for Create Circuit Group Set (CRE-CGS) command is given in the following paras.

1. At the CRP prompt (>), either give the command CRE-CGS or the menu path for this command, i.e. 1 (Administration Main Menu), 31 (Number 7 Update Commands 8) (Create Circuit Group Set). The path will be specified by typing MENU 1 31 8.

   Yet another method would be to traverse the menus and choose the appropriate option. In any case, let us assume that the command has been correctly issued.

2. 'Security Checks' are performed by CRP, i.e. whether the operator has the authority to issue this command. This authority is granted to an operator while adding a new operator via ADD-OPR command.

3. Parameter Entry Form is displayed if security check has been passed. The form contains:

   - The command mnemonic, command name and all the position-defined parameters required for executing the command.
   - Non-essential parameters, i.e. to which a default value is attached, are shown enclosed in square brackets ([ ]) while essential parameters are without brackets. For example, in this case, all the parameters except SIG-NW and USR-PART are essential (mandatory) parameter.

4. User enters parameter values as desired. Error messages will be displayed for illegal entries.

   Online 'Help' is available for each parameter and can be accessed by typing 'h' and 'CR' (Carriage Return) while the cursor is at the desired parameter.

5. Option to Repeat/Terminate/Execute (R/T/E) the command with the given input parameters will now be displayed.

   - User enters the "Execute" i.e. "E" option. The system will respond by displaying the message: Executing ....

   Now, the Command Execution Process (CEP) validates the parameters entered.

   If CEP detects any error, the command is rejected and CRP displays an error message. The error message contains error number, error statement, entity

id and error dictionary reference. Let us assume that parameter validation was successful.

6. Since the command has been executed successfully, CRP will display output results in the form of "Output Forms" which may occupy one or more VDU screen and/or printer pages. The results will be sent to VDU, printer, or both depending upon the option already chosen by the operator via CHG-OUT-DEV command.

Class 31: Number 7 Administration Update Commands

S.No.	Command Mnemonic	Command Name	Position Defined Parameters
1.	CRE-SRS	Create a Signalling Relation	SRS-NUM, DPC, HI-RTBL, [LO-RTBL], [SSN-LST]
2.	MOD-SRS-CHAR	Modify a Signalling Route Set	SRS-NUM, [HI-RTBL], [LO-RTBL], [SSN-LST].
3.	DEL-SRS	Delete Signalling Route Set	SRS-NUM
4.	CRE-SPC	Create Signal Point Code for Exchange	[SIG-NW], SPC-LST
5.	DEL-SPC	Delete SPC For This Exchange	[SIG-NW], SPC-LST
6.	CRE-LS	Create a Link Set	LS-NUM, LSB-NUM, [MNAC-LN], [MXAV-LN], [MNAV-LN], EC-OPTN, [MXMS-RB], [MXOC-RB], PC-LST, LOG-LNK, [DAT-LNK]
7.	DEL-LS	Delete Link Set	LS-NUM
8.	CRE-CGS	Create Circuit Group Set For This Exchange	CGS-NUM, CGS-NAME,SELF-PC, DEST-PC, [SIG-NW], [USR-PART]
9.	DEL-CGS	Delete Circuit Group Set	[CGS-NUM], [CGS-NAME]
10.	CRE-LSB	Create Link Set Bundle For This Exchange	LSB-NUM, [CGS-NUM], [CGS-NAME], LM-MTHD, MX-MSGSZ, [STP-USER], [DEST-PCS]
11.	DEL-LSB	Delete Link Set Bundle	LSB-NUM
12.	MOD-LSB-CHAR	Modify Link Set Bundle Characteristics	LSB-NUM, [STP-USER], [DEST-PCS]
13.	ADD-DEL-LNK	Add or Delete Link	LS-NUM, OPR-TYP, [LOG-LNK], [DAT-LNK]
14.	MOD-LS-CHAR	Modify Link Set Characteristics	LS-NUM, [MNAC-LNK], [MXAV-LN], [MNAV-LN], [PC-LST]
15.	CRE-GT	Create Global Title	GT, PC, [SIG-NW], SSN, [NEW-NAI],

S.No.	Command Mnemonic	Command Name	Position Defined Parameters
		Translation	[NEW-ADR], [RTIND]
16.	MOD-GT-CHAR	Modify a Global Title	GT, PC, [SIG-NW], SSN, [NEW-NAI], [RTIND]
17.	DEL-GT	Delete Global Title Translation	GT

CCS7 COMMANDS DIRECTORY (Contd.)

CLASS 32: Number 7 Administration Display Commands

S.No.	Command Mnemonic	Command Name	Position Defined Parameters
1.	DISPL-SRS	Display Signalling Route Set Information	SRS-NUM
2.	DISPL-SPC	Display Signal Point Code	No parameters required
3	DISPL-LS	Display Link Set	LS-NUM
4.	DISPL-CGS	Display Circuit Group Set	[GS-NUM], [CGS-NAME]
5.	DISPL-LSB	Display Link Set Bundle	LSB-NUM
6.	DISPL-CGS-NUM-NAME	Display Circuit Group Set Number to Name Mapping	[GS-NUM], [CGS-NAME]
7.	DISPL-GT	Display Global Title Translation	GT

CLASS 12: Number 7 Maintenance Update Command

S.No.	Command Mnemonic	Command Name	Position Defined Parameters
1.	TST-SGNL-LNK	Test Signal Link	LSB-NUM, LOG-LNK
2.	MOD-LS-STS	Modify Link Set Status	LS-NUM, ACTION
3.	MOD-LNK-STS	Modify Link Status	LSB-NUM, LOG-LNK, ACTION
4.	MOD-BLK7-STS	Modify Block 7 Status	BLK-TYP, TEN

CLASS 13: Number 7 Maintenance Display Commands

S.No.	Command Mnemonic	Command Name	Position Defined Parameters
1.	DISPL-LS-STS	Display Link Set Status	[LS-NUM]
2.	DISPL-NET-STS	Display Network Status	[NET-ID], [PC-NUM]
3.	DISPL-BLK7-STS	Display Block 7 Status	TEN

CLASS 30: Charge Calendar Management Update

S.No.	Command Mnemonic	Command Name	Position Defined Parameters
1.	MOD-CHB-CRG	Modify Charge Band - Charge Rate Number Association	OPR-TYP, CRG-BND, [CRG-RTN]

CLASS 41: Charge Calendar Management Display

S.No.	Command Mnemonic	Command Name	Position Defined Parameters
1.	DISPL-CHB-CRG	Display Charge Band - Charge Rate Association	[CRG-BND]

Chapter 6.

Parameters Description

6.1. INTRODUCTION

On issuing a command with valid mnemonic and syntax, the system responds by displaying a parameter entry form in which the parameters required for execution of that command are to be specified by the operator. Parameters are variables that identify and contain a piece of necessary information to execute a command. Although online 'help' is available on the parameter entry form, it is very important for the operating personnel to understand the correct application of each parameter.

Some of the parameters are used in more than one command. In the parameter description to follow, such parameters are discussed only once alongwith necessary qualifying remarks. Parameter description for each parameter is covered under the following subheads:

PARAMETER NAME	:	Name of the parameter
MNEMONIC	:	Address code in the form of a pronounceable word
TYPE	:	ASCII, numeric or logical, i.e. type of data acceptable
POSSIBLE VALUES	:	A set of values and/or range acceptable
DEFAULT VALUE	:	The value automatically assigned by the system if the operator does not assign any value i.e. just presses the <Return> key
REMARKS	:	Some more information regarding special attributes of the parameter and their usage

6.2. PARAMETERS DESCRIPTION

On the proceeding pages, all the parameters used by CCS7 administration and maintenance commands are described in the format described above in section 3.1.

6.2.1. ACTION

PARAMETER NAME	:	Action
MNEMONIC	:	ACTION
TYPE	:	10 ASCII
POSSIBLE VALUES	:	1. Activate 2. Deactivate 3. Block 4. Unblock 5. Inhibit 6. Uninhibit
DEFAULT VALUE	:	None. Essential Parameter.
REMARKS	:	In MOD-LNK-STS command, this parameter is used to specify the action to be done on the link.

6.2.2. BLK-TYP (Block Type)

PARAMETER NAME	:	Block Type
MNEMONIC	:	BLK-TYP
TYPE	:	7 ASCII
POSSIBLE VALUES	:	1. Block 2. Unblock 3. Reset Range or set not allowed.
DEFAULT VALUE	:	None. Essential Parameter.
REMARKS	:	Type of blocking action to be done on the #7 CICs. Reset option is used to send Reset Circuit (RSC) message for one or more CICs. It is a useful option that is used specially when the distant node is not honoring Group Reset (GRS) message from the local node.

6.2.3. CGS-NAME (Circuit Group Set Name)

PARAMETER NAME	:	Circuit Group Set Name
MNEMONIC	:	CGS-NAME
TYPE	:	10 ASCII
POSSIBLE VALUES	:	Any ASCII string of maximum length 10. Range or set not allowed.
DEFAULT VALUE	:	Non. Essential parameter.
REMARKS	:	CGS name is used to give an easily remembered identity to the CGS in addition to the CGS-NUM. For example, CGS between Delhi and Calcutta may be named as 'DEL-CAL'.

6.2.4. CGS-NUM (Circuit Group Set Number)

PARAMETER NAME	:	Circuit Group Set Number
MNEMONIC	:	CGS-NUM
TYPE	:	2 Numeric
POSSIBLE VALUES	:	1 to 64. Range or set not allowed.
DEFAULT VALUE	:	None. Essential parameter
REMARKS	:	The identification of trunk group/s which are served by common signalling links. CGS represents the identity of voice circuits in the CCS7 network and does the association between the voice and signalling networks.

6.2.5. CRG-BND (Charge Band)

PARAMETER NAME	:	Charge Band
MNEMONIC	:	CRG-BND
TYPE	:	3 Numeric
POSSIBLE VALUES	:	0 to 255
DEFAULT VALUE	:	'None', when it is an essential parameter., and, 'All' when it is not essential.
REMARKS	:	Charge Band is associated with a charge rate number according to which CCS7 calls will be charged. Charge band will be used for charging only if such charging method is defined in the CCS7 trunk group.

6.2.6. DAT-LNK (Data Link)

PARAMETER NAME	:	Data Link
MNEMONIC	:	DAT-LNK
TYPE	:	Numeric string with 5 subfields separated by '-'. Format is B-R-F-S-C. The description of fields is same as for TEN given in section 3.2.8. But here PCM number (D) is not used.
POSSIBLE VALUES	:	1-1-1-1-1 to 32-3-6-26-32. Set allowed.
DEFAULT VALUE	:	None. Essential parameter.
REMARKS	:	Signalling data link identifies the channel on the digital transmission medium, which is to be used as the signalling data link. The data link chosen should be the same by both the ends of the link.

6.2.7. DEST-PC/DEST-PCS (Destination Point Code/s)

PARAMETER NAME	:	Destination Point Code/s.
MNEMONIC	:	DEST-PC, DEST-PCS
TYPE	:	5 Numeric.
POSSIBLE VALUES	:	0 to 2^{14}-1. i.e., 0 to 16383. Range not allowed
DEFAULT VALUE	:	No default value in some commands. Else 65534, i.e. none defined.
REMARKS	:	The destination point code for a CGS. In case of LSB, since multiple nodes can be reached via one LSB (consider the entire route between two non-adjacent point codes), more than one point codes can be defined.

6.2.8. DPC (Destination Point Code)

PARAMETER NAME	:	Destination Point Code
MNEMONIC	:	DPC
TYPE	:	5 Numeric
POSSIBLE VALUES	:	0 to 2^{14}-1, i.e. 0 to 16383. Range or set not allowed.
DEFAULT VALUE	:	None. Essential Parameter.
REMARKS	:	The point code of the destination of the outgoing message is called DPC.

6.2.9. EC-OPT (Error Correction Option)

PARAMETER NAME	:	Error Correction Option
MNEMONIC	:	EC-OPT
TYPE	:	5 ASCII
POSSIBLE VALUES	:	1. BASIC 2. PCR. Range or set not allowed.
DEFAULT VALUE	:	None. Essential parameter.
REMARKS	:	Defines the error correction method for a link set. Basic option is used to terrestrial link whereas PCR (Preventive Cycle Retransmission) is used for long delay routes, e.g. satellite routes.

6.2.10. GT (Global Title)

PARAMETER NAME	:	Global Title

MNEMONIC	:	GT		
TYPE	:	ASCII or Numeric (4 fields)		
POSSIBLE VALUES	:	(Subfield 1) T Type	:	None, TYPE1, TYPE254, TYPE253
		(Subfield 2) NUMPLAN:		NONE, UNKNOWN, ISDN, SPARE2, DATA-TELEX, MAR-MOBILE, LAND-MOBILE, ISDN-MOBILE.
		(Subfield 3) NAI	:	NONE, SUBS, RESN, MSN, IN
		(Subfield 4) ADR	:	Numeric range 9999 9999 9999 9999 9999
DEFAULT VALUE	:	None		
REMARKS	:	Global title is used for SCCP addressing. GT specifies the Translation Type i.e. T TYPE, the Numbering Plan being used after translation - NUM-PLAN, and the Nature of address indicator. ADR (adress) indicates the remote DPC address to which the SCCP messages will be routed if routing indicator is DPC + SSN.		

6.2.11. HI-RTBL (High (Priority) Route Table)

PARAMETER NAME	:	High (Priority) Route Table
MNEMONIC	:	HI-RTBL
TYPE	:	2 Numeric
POSSIBLE VALUES	:	1 to 64. Set allowed.
DEFAULT VALUE	:	None. Essential parameter.
REMARKS	:	In a signalling routset, the set of high priority routes.

6.2.12. LM-METHOD (Link Management Method)

PARAMETER NAME	:	Link Management Method
MNEMONIC	:	LM-METHOD
TYPE	:	9 ASCII string
POSSIBLE VALUES	:	1. LM-BASIC 2. LM-SECOND 3. LM-THIRD
DEFAULT VALUE	:	None. Essential Parameter.
REMARKS	:	Generally LM-BASIC method is used.

6.2.13. LO-RTBL (Low Priority Route Table)

PARAMETER NAME	:	Low (Priority) Route Table
MNEMONIC	:	LO-RTBL
TYPE	:	2 Numeric
POSSIBLE VALUES	:	1 to 64. Set allowed.
DEFAULT VALUE	:	None. Essential Parameter.
REMARKS	:	In a signalling route set, the set of low priority routes. These routes will be selected if the high priority routes are unavailable.

6.2.14. LOG-LNK (Logical Link)

PARAMETER NAME	:	Logical Link
MNEMONIC	:	LOG-LNK
TYPE	:	2 Numeric
POSSIBLE VALUES	:	0 to 15. Range or set not allowed.
DEFAULT VALUE	:	None. Essential Parameter..
REMARKS	:	It is the logical identity of the link in the linkset.

6.2.15. LS-NUM (Link Set Number)

PARAMETER NAME	:	Link Set Number
MNEMONIC	:	LS-NUM
TYPE	:	2 Numeric
POSSIBLE VALUES	:	1 to 64. Range or set not allowed.
DEFAULT VALUE	:	None. Essential parameter.
REMARKS	:	Link set is a set of signalling links of the same CGS. Link set number is used to identify a signalling link set in a link set bundle. Link set is a set of signalling links between adjacent nodes. The links within the set are logically numbered. The error correction option, i.e. Basic or PCR, is same of all links in link set.

6.2.16. LSB-NUM (Link Set Bundle Number)

PARAMETER NAME	:	Link set Bundle Number
MNEMONIC	:	LSB-NUM
TYPE	:	2 Numeric
POSSIBLE VALUES	:	1 to 64. Range of set not allowed.
DEFAULT VALUE	:	None
REMARKS	:	LSB, also called combined link set, is a set of all signalling link sets between two adjacent signalling points. The link sets in a LSB have the same link management method, maximum message size and list of STP users and destination point codes. LSB has only a logical significance.

6.2.17. MNAC-LN (Minimum Active Links)

PARAMETER NAME	:	Minimum Active Links
MNEMONIC	:	MNAC-LN
TYPE	:	2 Numeric
POSSIBLE VALUES	:	1 to 16. Range or set not allowed.
DEFAULT VALUE	:	1
REMARKS	:	It is the minimum active links threshold in a link set. If the number of active links falls below this value, the maintenance system is alerted via a threshold cross report. The system will try to activate more links in order to reach this threshold.

6.2.18. MNAV-LN (Minimum Available Links)

PARAMETER NAME	:	Minimum Available Links
MNEMONIC	:	MNAV-LN
TYPE	:	2 Numeric
POSSIBLE VALUES	:	1 to 16. Range or set not allowed.
DEFAULT VALUE	:	1
REMARKS	:	It is the minimum number of links available for carrying traffic in a link set.

6.2.19. MX-MSG-SZ (Maximum Message Size)

PARAMETER NAME	:	Maximum Message Size
MNEMONIC	:	MX-MSG-SZ
TYPE	:	7 ASCII
POSSIBLE VALUES	:	1. DATA62 2. DATA272 3. DYNAMIC
DEFAULT VALUE	:	None. Essential parameter.
REMARKS	:	Defines the maximum signalling information field (SIF) size to be handled. Generally in ISUP implementation, DATA272 i.e., 272 octets SIF size is used. SIF contains routing label and actual signalling information.

6.2.20. MX-OC-RB (Maximum Octets in Retransmission Buffer)

PARAMETER NAME	:	Maximum Octets in Retransmission Buffer
MNEMONIC	:	MX-OC-RB
TYPE	:	5 Numeric.
POSSIBLE VALUES	:	1 to 65535. Range or set not allowed.
DEFAULT VALUE	:	None. Essential parameter.
REMARKS	:	Defines the maximum number of message octets to be retained in the retransmission buffer. MXMS-RB and MXOC-RB are used in tandem to control the levels of retransmission buffers.

6.2.21. MXAV-LN (Maximum Available Links)

PARAMETER NAME	:	Maximum Available Links
MNEMONIC	:	MXAV-LN
TYPE	:	2 Numeric
POSSIBLE VALUES	:	1 to 16. Range or set not allowed.
DEFAULT VALUE	:	0 (zero)
REMARKS	:	It is the maximum number of links available for carrying traffic in a link set.

6.2.22. MXMS-RB (Maximum MSU in Retransmission)

PARAMETER NAME	:	Maximum MSUs (Message Signalling Unit) in Retransmission Buffers
MNEMONIC	:	MXMS-RB
TYPE	:	5 Numeric
POSSIBLE VALUES	:	1 to 65535. Range or set not allowed.
DEFAULT VALUE	:	127.
REMARKS	:	Defines the maximum of MSUs to be retained in retransmission buffers. If acknowledgement is not received within a specific period or a negative acknowledgement is received, appropriate number of MSU are retransmitted from the buffer.

6.2.23. NEW-ADR (New Address)

PARAMETER NAME	:	New Address digits after GT translation
MNEMONIC	:	New-ADR
TYPE	:	Numeric
POSSIBLE VALUES	:	Range 9999 9999 9999 9999 9999
DEFAULT VALUE	:	NONE
REMARKS	:	This specifies the new address after GT translation. This will be used only if the old GT address is to be converted to a new address

6.2.24. NET-ID (Network Identification)

PARAMETER NAME	:	Network Identification
MNEMONIC	:	NET-ID
TYPE	:	7 ASCII
POSSIBLE VALUES	:	1. NW-NAT (National network) 2. NW-INAT (International network)
DEFAULT VALUE	:	NW-NAT
REMARKS	:	It identifies the national or international network within which the connectivity status of the local mode is to be interrogated.

6.2.25. NEW-NAI (New Nature of Address Indicator)

PARAMETER NAME	:	New NAI after GT translation
MNEMONIC	:	New-NAI
TYPE	:	ASCII or Numeric
POSSIBLE VALUES	:	NONE, SUBS, RESN, MSN, IN
DEFAULT VALUE	:	NONE
REMARKS	:	This specifies the new NAI after GT translation.

6.2.26. NUM-FLAG (Number of Flags between signalling units)

PARAMETER NAME	:	Number of flags between signalling units.
MNEMONIC	:	NUM-FLAG
TYPE	:	Number (0 to 15)
DEFAULT VALUE	:	0
REMARKS	:	This field is used to increase or decrease the number of flags between two signalling units of CCS7 message.

6.2.27. OPR-TYP (Operation Type)

PARAMETER NAME	:	Operation Type
MNEMONIC	:	OPR-TYP
TYPE	:	3 ASCII
POSSIBLE VALUES	:	1. ADD 2. DEL
DEFAULT VALUE	:	None. Essential Parameter.
REMARKS	:	In ADD-DEL-LNK command, the operation type. Choose ADD if a link is to be added to a linkset and DEL if is to be deleted.

6.2.28. PC- LST (Point Codes List)

PARAMETER NAME	:	Point Codes List
MNEMONIC	:	PC-LST
TYPE	:	5 Numeric
POSSIBLE VALUES	:	0 to 16383. Set allowed.
DEFAULT VALUE	:	None. Essential parameter.
REMARKS	:	It is the list of point codes for which signalling messages are carried by a signalling link set.

6.2.29. PC-NUM (Point Code Numbers)

PARAMETER NAME	:	Point Code Numbers
MNEMONIC	:	PC-NUM
TYPE	:	5 Numeric
POSSIBLE VALUES	:	0 to 16383. Set allowed.
DEFAULT VALUE	:	None. Essential parameter.
REMARKS	:	Used for specifying the set of point codes in a given type of network (NAT or INAT whose connectivity status to this node is to be interrogated.

6.2.30. RTIND (Routing Indicator)

PARAMETER NAME	:	Routing Indicator
MNEMONIC	:	RTIND
TYPE	:	ASCII or Numeric
POSSIBLE VALUES	:	1. DPCSSN
		2. GT
DEFAULT VALUE	:	DPCSSN
REMARKS	:	This parameter specifies the routing mechanism to be used by INAP or SCCP messages. If Routing indicator is GT then GT translation will be used. If DPCSSN is used then the routing will be done on the DPC & SSN specified in the GT.

6.2.31. SELF-PC (Self Point Code)

PARAMETER NAME	:	Self Point Code
MNEMONIC	:	SELF-PC
TYPE	:	5 Numeric
POSSIBLE VALUES	:	0 to 2^{14}-1 i.e. 0 to 16383. Range or set not allowed.
DEFAULT VALUE	:	None. Essential parameter.
REMARKS	:	Refers to the particular point code of the node which is used for defining a particular signalling relation.

6.2.32. SIG-NW (Signalling Network Identification)

PARAMETER NAME	:	Signalling Network Identification
MNEMONIC	:	SIG-NW
TYPE	:	13 ASCII
POSSIBLE VALUES	:	1. NW-INAT, 2. NW-INAT-SPARE 3. NW-NAT 4. NW-NAT-SPARE Range or set not allowed
DEFAULT VALUE	:	NW-NAT
REMARKS	:	It is a 2 bit code that indicates the signalling network to which the node belongs. The network could be national (NAT) or international (INAT). Spare codes are provided to accommodate multiple national or international network. By this approach, the number of signalling point codes can be increased in a network.

6.2.33. SPC-LST (Self Point Code List)

PARAMETER NAME	:	Self Point Code List
MNEMONIC	:	SPC-LST
TYPE	:	5 Numeric
POSSIBLE VALUES	:	0 to 2^{14}-1 i.e. 0 to 16383. Set allowed
DEFAULT VALUE	:	None. Essential parameter.
REMARKS	:	The list of point codes assigned to an exchange which is node in the CCS7 signalling network. Similar to exchange code in the voice network.

6.2.34. SRS-NUM (Signalling Route Set Number)

PARAMETER NAME	:	Signalling Route Set Number
MNEMONIC	:	SRS-NUM
TYPE	:	2 Numeric
POSSIBLE VALUES	:	1 to 64. Range or set not allowed.
DEFAULT VALUE	:	None. Essential parameter.
REMARKS	:	SRS is the set of signalling routes defined between two nodes.

6.2.35. SSN-LST (Subsystem Number List)

PARAMETER NAME	:	Subsystem Number List
MNEMONIC	:	SSN-LST
TYPE	:	ASCII or Numeric
DEFAULT VALUES	:	NONE-65535-NONE-NONE
REMARKS	:	This parameter is used for identifying subsystems. It has the following 4 fields:

Subfield 1: User parts, Possible values NONE, SCMG (SCCP Management), INAP (Intelligent Network Application part), ISUP (ISDN user part).

Subfield 2: Backup DPC. Used only when SCP are mated. It is used to specify the backup DPC number.

Subfield 3: Backup DPCs Nature of network

Subfield 4: Backup SSN id.

6.2.36. STP-USER (Signalling Transfer Point Users)

PARAMETER NAME	:	STP Users
MNEMONIC	:	STP-USER
TYPE	:	5 Numeric.
POSSIBLE VALUES	:	0 to 2^{14}-1, i.e. 0 to 16383. Set allowed.
DEFAULT VALUE	:	65535, i.e., no user has been defined.
REMARKS	:	It is the set of signalling transfer points (STPs) which are served by a LSB.

6.2.37. T1-L2-H2/T3-N4-E4/T5-T6-T7 (Level 2 Timers)

PARAMETER NAME	:	Level 2 Timers
MNEMONIC	:	T1-L2-H2 T3-N4-E4 T5-T6-T7
TYPE	:	Numeric
POSSIBLE VALUES	:	T1 - 400 to 500, L2 - 50 to 500, H2 - 700 to 1500 T3 - 10 to 15, N4 - 75 to 95, E4 - 4 to 6 T5 - 80 to 120, T6 - 30 to 60, T7 - 5 to 20
DEFAULT VALUE	:	T1-L2-H2 450-450-800 T3-N4-E4 13-82-5 T5-T6-T7 10-50 15
REMARKS	:	Level 2 timers are adjusted if required, by these parameters.

6.2.38. TEN -NO7 (Number 7 Terminal Equipment Number)

PARAMETER NAME	:	No. 7 Terminal Equipment Number
MNEMONIC	:	TEN-No7
TYPE	:	Numeric string with six subfields, separator character '-'. Type is B-R-F-S-P-C. B = BM-No. 2 numeric, range 1 to 32 R = Rack-No. 1 numeric, range 1 to 3 F = Frame-No. 1 numeric, range 1 to 6 S = Slot-No. 2 numeric, range 1 to 26 P = PCM-No. 3 numeric, range 1 to 128 C = Circuit-No. 2 numeric, range 1 to 32
POSSIBLE VALUES	:	1-1-1-1-1-1 to 32-3-6-26-128-32. Range and set of values allowed.
DEFAULT VALUE	:	NONE, i.e. no TEN is specified.
REMARKS	:	The TEN specifies the physical identity of the circuit number in a CCS7 trunk group. These can be upto 128 circuits in a CCS7 trunk group. There is one-to one correspondence between CCS7 trunk group TENs and Circuit Identification Codes of the CGS. In CRE-TGP command, this parameter is relevant only when signalling defined is CCS7 i.e. LIN-SIG = DIG-CCS and REG-SIG=CCITT-R7.

6.2.39. USR-PART (User Part)

PARAMETER NAME	:	User Part
MNEMONIC	:	USR-PART
TYPE	:	11 ASCII
POSSIBLE VALUES	:	1. NO-USR-PART (No user part defined.) 2. ISUP (ISDN User Part)
DEFAULT VALUE	:	ISUP
REMARKS	:	It identifies the user part of MTP. Presently only ISUP is used.

Chapter 7.

Operator Command Sheets

7.1. INTRODUCTION

Operator command sheets are given in order to help the operating personnel in familiarising themselves with the interactions that take place while issuing various CCS7 administration and maintenance commands. At best, they purport to be a WYSIWYG, that is *what you see is what you get*, representation of these interactions. The operating personnel can get an idea about the functions that are performed by a CCS7 administration/maintenance command, the parameter that are required for its execution, the precautions to be observed and various probable error messages that he or she may encounter and what they mean. Although 'help' is available online, it will always be a help to pre-familiarise oneself before attempting any command.

Typically the course of interaction is as follows.

1. Operator issues command at the CRP prompt.
2. The system responds with a "parameter entry form" and prompts the operator to fill in the required values for respective parameters.
3. When all the valid parameter values are filled in, the system then asks the operator to choose whether he/she wants to:

   Repeat (R), Terminate (T) or Execute (E) the command with the given parameters.

   If the operator chooses to:

   Repeat(R) - If the command is executed successfully, the action returns to the "parameter entry form" and once again step 2 is gone through. But if the command is rejected, on pressing the 'CR' (Carriage Return) the system returns to the CRP prompt.

   Terminate (T) - The command is abandoned and system returns to the CRP prompt. It also displays the message "Command Terminated".

Execute (E)	-	The system displays a temporary message "Executing .....", indicating that it is processing the command. After execution, the system displays the message "Command Executed" and is ready for the issue of next command if the operator so desires. For the commands whose execution entails certain output information from the system, the result of execution is displayed in the form of "Output Forms" which may cover one or more screens. In case any execution error 18 detected by the system, it will respond with an "Error Report". An error report contains the code of the error encountered and a short description of the error.

Some general comments about the process of execution of #7 administration/Maintenance commands

- Help is available on the parameter entry form for every parameter. Typing <h> and <CR> (Carriage Return) will display the 'help' available for that parameter. The parameter value can then be chosen by selecting the appropriate parameter mnemonic or simple keying in the serial number of the mnemonic in the online help.
- Non-essential i.e. optional parameters are enclosed in square brackets ([ ]) whereas essential i.e. mandatory parameters are not. The system will assume DEFAULT VALUE values of the non-essential parameters if no value is entered by the operator i.e. just <CR> is pressed.
- DEFAULT VALUES of the non-essential parameters are already displayed on the parameter entry form.
- An error message is displayed in case an illegal value is entered for any parameter. The operator may seek on-line help in such a situation.
- Output forms and parameter entry form for each command have a predefined structure.
- Modify commands are not accepted by the system when the IOP is not in inservice level.

On the following pages, general information, parameter entry form and output forms for each CCS7 command are given. The description of the parameters required for all the commands have already been given in Chapter 3.

7.2. CCS7 ADMINISTRATION COMMANDS: UPDATE CLASS

7.2.1. Create Signalling Relation

ADMINISTRATION COMMAND :		Create Signalling Relation
MNEMONIC : CRE-SRS	CLASS : Update	MENU POSITION : 1 31 1
GENERAL INFORMATION		

COMMAND : Create a Signalling Relation

MNEMONIC : CRE-SRS

FUNCTION : To create a route set describing the signalling relation between OPC (i.e. self PC) and a DPC.

PARAMETERS REQUIRED : SRS-NUM, DPC, HI-RTBL and [LO-RTBL], [SSN-LST]

REMARKS : A SRS is a collection of signalling routes between two nodes. These can be direct routes or indirect routes.

Direct Routes run directly between the two nodes whereas indirect routes run via one or more signal transfer points (STPs).

In HI-RTBL link set number, which can carry signalling message towards the specified DPC, is to be given.
LO-RTBL will have the link set number, which is going towards STP if any.

SSN-LST specifies the sub system numbers associated with this SRS. Sub systems can be INAP, along with SCMG or ISUP.

Note: *SSN-LST is presently available only in 1-5-x-x releases.*

CRE-SRS : PARAMETER ENTRY FORM

CRE-SRS	CREATE A SIGNALLING RELATION	
SRS-NUM	:	9
DPC	:	1104
HI-RTBL	:	9
[LO-RTBL]	:	
[SSN-LST]*	:	INAP & SCMG

CRE -SRS : OUTPUT FORM

CREATE SIGNALLING ROUTESET REPORT

Signalling Route Set Number	=	9
Self Point Code	=	9998
Destination Point Code	=	1104
Signalling Network	=	NW-NAT
High Priority Route Table	=	9
Low Priority Route Table	=	
Subsystem number list *	=	SCMG-65535-NONE-NONE
		INAP-65535-NONE-NONE
Global Titles Associated*	=	TYPE1-ISDN-SUBS-998

***Note:** These parameters are available in 1-5-x-x release only.*

7.2.2. Modify a Signalling Routeset

ADMINISTRATION COMMAND :		Modify a Signalling Routeset
MNEMONIC : MOD-SRS-CHAR	CLASS : Update	MENU POSITION : 1 31 2
GENERAL INFORMATION		

COMMAND : Modify a Signalling Route Set

MNEMONIC : MOD-SRS-CHAR

FUNCTION : To modify the characteristics of a signalling route set.

PARAMETERS REQUIRED : SRS-NUM, [HI-RTBL], [LO-RTBL], [SSN-LST]*

REMARKS : This command is used to change the signalling route priorities.

Note: *SSN-LST is presently available only in 1-5-x-x releases.*

MOD-SRS-CHAR : PARAMETER ENTRY FORM

MOD-SRS-CHAR MODIFY A SIGNALLING ROUTE SET

SRS-NUM	:	9
[HI-RTBL]	:	1
[LO-RTBL]	:	6
[SSN-LST]*	:	NONE-65535-NONE-NONE

MOD-SRS-CHAR : OUTPUT FORM

MODIFY SIGNALLING ROUTESET REPORT

Signalling Route Set Number	=	9
High Priority Route Table	=	1
Low Priority Route Table	=	6
Subsystem Number List*	=	NONE-65535-NONE-NONE

Note: *SSN-LST is presently available only in 1-5-x-x releases.*

7.2.3. Delete Signalling Route Set

ADMINISTRATION COMMAND :	Delete Signalling Route Set	
MNEMONIC : DEL-SRS	CLASS : Update	MENU POSITION : 1 31 3
GENERAL INFORMATION		

COMMAND : Delete a Signalling Route Set.

MNEMONIC : DEL-SRS

FUNCTION : To delete an existing signalling route set.

PARAMETERS REQUIRED : SRS-NUM

REMARKS : The SRS should exist. Before deleting a link set, first the SRS associated with it should be deleted.

DEL-SRS : PARAMETER ENTRY FORM

DEL-SRS DELETE SIGNALLING ROUTE SET

SRS-NUM : 9

DEL-SRS : OUTPUT FORM

DELETE SIGNALLING ROUTESET REPORT

Signalling Route Set Number = 9

7.2.4. Create Self Point Code for Exchange

ADMINISTRATION COMMAND :		Create Self Point Code for Exchange
MNEMONIC : CRE-SPC	CLASS : Display	MENU POSITION : 1 31 4
GENERAL INFORMATION		

COMMAND : Create Self Point Code for Exchange

MNEMONIC : CRE-SPC

FUNCTION : To create a self point code for exchange in a signalling network.

PARAMETERS REQUIRED : [SIG-NW], SPC-LST

REMARKS : SPC is the point code assigned to an exchange which is a node in the CCS7 network, analogous to exchange code of the voice network.

CRE-SPC : PARAMETER ENTRY FORM

CRE-SPC CREATE SIGNAL POINT CODE FOR EXCHANGE

[SIG-NW] : NW-NAT
SPC-LST : 1104

CRE-SPC : OUTPUT FORM

CREATE SIGNAL POINT CODES REPORT

Signalling Network = NW-NAT
Self Point Code = 1104

7.2.5. Delete SPC for this Exchange

ADMINISTRATION COMMAND : Delete SPC for this Exchange		
MNEMONIC : DEL-SPC	CLASS : Display	MENU POSITION : 1 31 5
GENERAL INFORMATION		

COMMAND : Delete SPC for this Exchange

MNEMONIC : DEL-SPC

FUNCTION : To delete one or more signal point codes of this exchange.

PARAMETERS REQUIRED : [SIG-NW], SPC-LST

REMARKS : This command can be executed when no CGS are associated with the concerned SPC. This means that the point code to be deleted should not be in use for a signalling relation.

DEL-SPC : PARAMETER ENTRY FORM

DEL-SPC DELETE SPC FOR THIS EXCHANGE

[SIG-NW] : NW-NAT
SPC-LST : 1104

DEL-SPC : OUTPUT FORM

DELETE SIGNALLING POINT CODES REPORT

Signalling Network = NW-NAT
Self Point Code = 1104

7.2.6. Create a Link Set

ADMINISTRATION COMMAND : Create a Link Set		
MNEMONIC : CRE-LS	CLASS : Update	MENU POSITION : 1 31 6
GENERAL INFORMATION		

COMMAND : Create a Link Set

MNEMONIC : CRE-LS

FUNCTION : This command creates a link set between two exchanges. The links in the LS should have the same error correction option, i.e. basic or PCR.

PARAMETERS REQUIRED : LS-NUM, LSB-NUM, [MNAC-LN], [T1-L2-H2]* {T3-*N4-E4}, {T5-T6-T7}*

[MXAV-LN], [MNAV-LN], EC-OPTN, [MXMS-RB],

[MXOC-RB], PC-LST, LOG-LNK, [DAT-LNK], [NUM-FLAG]*

REMARKS : The link set bundle (LSB) of which this LS will be a part should already exist.

The point code should not be in the PC served list of another LS.

***Note:** These parameters are available in 1-5-x-x & 2-1-x-x releases only.*

CRE-LS : PARAMETER ENTRY FORM

CRE-LS		CREATE A LINK SET
LS-NUM	:	9
LSB-NUM	:	9
[MNAC-LN]	:	1
[MXAV-LN]	:	0
[MNAV]	:	1
[MXMS-RB]	:	127
[NUM-FLAG]*	:	0
MXOC-RB]	:	4095
[T1-L2-H2]*	:	450-450-800
[T3-N4-E4]*	:	13-82-5
[T5-T6-T7]*	:	10-50-15
EC-OPTN	:	BASIC
PC-LST	:	9998
LOG-LNK	:	0 & 1
[DAT-LNK]	:	1-1-2-21-16
		1-1-2-21-17

***Note:** These parameters are available in 1-5-x-x & 2-1-x-x releases only.*

CRE -LS : OUTPUT FORM

REPORT FOR CRE-LS

Link Set Number	=	9
Link Set Bundle Number	=	9
Maximum Active Links	=	1
Minimum Active Links	=	1
Maximum Available Links	=	1
Minimum Available Links	=	1
Error Correction Option	=	BASIC
Max. MSU Rtb	=	127
Max. Octet Rtb	=	4095
*Flags Between MSUS	=	0
*Timers : T1-TL2-TH2	=	450-450-800
*Timers : T3-TN4-TE4	=	13-82-5
*Timers : T5-T6-T7	=	10-50-15
PCs Served	=	9998
Logical Links	=	0
		1
Data Links (TEN)	=	1-1-2-21-16
		1-1-2-21-17

7.2.7. Delete Linkset

ADMINISTRATION COMMAND :	Delete Linkset	
MNEMONIC : DEL-LS	CLASS :Update	MENU POSITION : 1 31 7
GENERAL INFORMATION		

COMMAND : Delete Linkset

MNEMONIC : DEL-LS

FUNCTION : To delete an existing linkset.

PARAMETERS REQUIRED : LS-NUM

REMARKS : Upon deletion of an existing LS, the data links hitherto assigned to it become free to be used with some other linkset or to be used as voice circuits.

There should be no signalling route set for the point code served by the LS.

DEL-LS : PARAMETER ENTRY FORM

DEL-LS DELETE LINK SET

LS-NUM : 1

DEL-LS : OUTPUT FORM

REPORT FOR DEL-LS

Link Set Number = 1

7.2.8. Create a Circuit Group Set

ADMINISTRATION COMMAND :		Create a Circuit Group Set
MNEMONIC : CRE-CGS	CLASS : Update	MENU POSITION : 1 31 8
GENERAL INFORMATION		

COMMAND : Create a Circuit Group Set

MNEMONIC : CRE-CGS

FUNCTION : To create a circuit group set consisting of physical circuits between two nodes.

PARAMETERS REQUIRED : CGS-NUM, CGS-NAME, SELF-PC, DEST-PC, [SIG-NW], [USR-PART]

REMARKS : Circuit group set consists of physical circuits between two nodes in the CCS7 network. These circuits are referred to by Circuit Identification Codes (CICs). A CGS may contain circuits of more than one trunk group. The CICs in such a case are sequentially numbered. CGS is a part of both trunk group and link set bundle. It provides with signalling links an association of voice trunk link sets.

CRE-CGS : PARAMETER ENTRY FORM

CRE-CGS CREATE CIRCUIT GROUP SET FOR THIS EXCHANGE

CGS-NUM	:	2
CGS-NAME	:	CGS2
SELF-PC	:	1104
DEST-PC	:	9998
[SIG-NW]	:	NW-NAT
[USR-PART]	:	ISUP

CRE-CGS : OUTPUT FORM

CREATE CIRCUIT GROUP SET REPORT

Circuit Group Set Number	=	2
Circuit Group Set Name	=	CGS2
Self Point Code	=	1104
Destination Point Code	=	9998
Signalling Network	=	NW-NAT
User Part Type	=	ISUP

7.2.9. Delete a Circuit Group Set

ADMINISTRATION COMMAND :	Delete a Circuit Group Set	
MNEMONIC : DEL-CGS	CLASS :Update	MENU POSITION : 1 31 9
GENERAL INFORMATION		

COMMAND : Delete a Circuit Group Set

MNEMONIC : DEL-CGS

FUNCTION : To delete an existing circuit group set.

PARAMETERS REQUIRED : [CGS-NUM], [CGS-NAME]

REMARKS : The deletion is possible only if no linkset bundle is associated to that CGS. The user can specify either the CGS number or name.

DEL-CGS : PARAMETER ENTRY FORM

DEL-CGS DELETE CIRCUIT GROUP SET

[CGS-NUM] : 1
[CGS-NAME] : NONE

CRE-CGS : OUTPUT FORM

REPORT FOR DEL-CGS

Circuit Group Set Number = 1
Circuit Group Set Name =

7.2.10. Create a Linkset Bundle for this Exchange

ADMINISTRATION COMMAND :	Create a Linkset Bundle for this Exchange	
MNEMONIC : CRE-LSB	CLASS : Update	MENU POSITION : 1 31 10
GENERAL INFORMATION		

COMMAND : Create a Linkset Bundle

MNEMONIC : CRE-LSB

FUNCTION : This command creates a linkset bundle for a CGS.

PARAMETERS REQUIRED : LSB-NUM, [CGS-NUM], [CGS-NAME], LM-MTHD, [STP-USER], [DEST-PCS]

REMARKS : Creation of linkset bundle associates one or more linksets with that LSB. Care must be taken that a CGS must exist between the OPC and DPC between which the LSB is required.

In the 'SECOND' link management, the allocation of signalling terminals (level2 functionality) is automatic and that of signalling datalinks is manual.

CRE-LSB : PARAMETER ENTRY FORM

CRE-LSB CREATE LINK SET BUNDLE FOR THIS EXCHANGE

LSB-NUM	:	2
[CGS-NUM]	:	2
[CGS-NAME]	:	CGS2
LM-MTHD	:	LM-SECOND
MX-MSGSZ	:	DATA272
[STP-USER]	:	65535
[DEST-PCS]	:	9998

CRE -LSB : OUTPUT FORM

CREATE LINK SET BUNDLE REPORT

Link Set Bundle Number	=	2
Circuit Group Set Number	=	2
Circuit Group Set Name	=	CGS2
Self Point Code	=	1104
Destination Point Code	=	9998
Signalling Network	=	NW-NAT
Link Management Method	=	SECOND
Maximum Message Size	=	DATA272
STP User	=	
DEST-PCs	=	9998

7.2.11. Delete Linkset Bundle

ADMINISTRATION COMMAND : Delete Linkset Bundle		
MNEMONIC : DEL-LSB	CLASS : Update	MENU POSITION : 1 31 11
GENERAL INFORMATION		

COMMAND	:	Delete a Linkset Bundle
MNEMONIC	:	DEL-LSB
FUNCTION	:	To delete a particular link set bundle
PARAMETERS REQUIRED	:	LSB-NUM
REMARKS	:	At the time of command execution, no linkset should be associated with this link set bundle. Also, the LSB should not be serving any SRS.

DEL-LSB : PARAMETER ENTRY FORM

DEL-LSB DELETE LINK SET BUNDLE

LSB-NUM : 1

DEL-LSB : OUTPUT FORM

DELETE LINK SET BUNDLE REPORT

Link Set Bundle Number = 1

7.2.12. Modify Linkset Bundle Characteristics

ADMINISTRATION COMMAND :		Modify Linkset Bundle Characteristics.
MNEMONIC : MOD-LSB-CHAR	CLASS : Update	MENU POSITION : 1 31 12
GENERAL INFORMATION		

COMMAND : Modify linkset bundle characteristics

MNEMONIC : MOD-LSB-CHAR

FUNCTION : To modify the list of STP users and/or DPCs for a LSB

PARAMETERS REQUIRED : LSB-NUM, [STP-USER], [DEST-PCS]

REMARKS : By using this command only user changeable LSB parameters can be modified in a STP configuration.

MOD-LSB-CHAR : PARAMETER ENTRY FORM

MOD-LSB-CHAR MODIFY LINK SET BUNDLE CHARACTERISTICS

LSB-NUM	:	1
[STP-USER]	:	9994
[DEST-PCS]	:	9998 & 9994

MOD-LSB-CHAR : OUTPUT FORM

MODIFY LINK SET BUNDLE REPORT

Link Set Bundle Number	=	1
STP Users	=	9994
DEST-PCs	=	9998 & 9994

7.2.13. Add or Delete Link

ADMINISTRATION COMMAND : Add or Delete Link		
MNEMONIC : ADD-DEL-LNK	CLASS : Update	MENU POSITION : 1 31 13
GENERAL INFORMATION		

COMMAND : Add or Delete Link

MNEMONIC : ADD-DEL-LNK

FUNCTION : The command is used to add or delete one or more links of a linkset between two exchanges.

PARAMETERS REQUIRED : LS-NUM, OPR-TYP, [LOG-LNK], [DAT-LNK]

REMARKS : The TENs of links to be added or deleted should be out of service. Use FRC-TRM-OOS command. After 'ADD' operation the newly created links (TEN) should be forced inservice. Also add one to MNAC-LN, MXAV-LN, MNAV-LN parameter in linkset by MOD-LS-CHAR command.

ADD-DEL-LNK : PARAMETER ENTRY FORM

ADD-DEL-LNK		ADD OR DELETE LINK
LS-NUM	:	1
OPR-TYP	:	DEL
[LOG-LNK]	:	0
[DAT-LNK]	:	1-1-2-17-18

ADD-DEL-LNK : OUTPUT FORM

REPORT FOR ADD-DEL-LNK

Link Set Number	=	1
Operator Type	=	DEL
Data Links (TEN)	=	1-1-2-17-18
Logical Link Id	=	0

7.2.14. Modify Linkset Characteristics

ADMINISTRATION COMMAND :	Modify Linkset Characteristics	
MNEMONIC : MOD-LS-CHAR	CLASS : Update	MENU POSITION : 1 31 14
GENERAL INFORMATION		

COMMAND : Modify Linkset Characteristics

MNEMONIC : MOD-LS-CHAR

FUNCTION : To modify the link thresholds or DPC of an existing linkset.

PARAMETERS REQUIRED : LS-NUM, [MNAC-LN], [MXAV-LN], [MNAV-LN], [PC-LST]. [T1-L2-H2]* [T3-N4-E4]* [T5-T6-T7]*

REMARKS : While modifying care must be taken that MXAV-LN should be greater than or equal to MNAV-LN. For more information on the threshold parameters, please refer to Chapter 3.

***Note:** These parameters are available in 1-5-x-x and 2-1-x-x releases only.*

MOD-LS-CHAR : PARAMETER ENTRY FORM

MOD-LS-CHAR MODIFY LINK SET CHARACTERISTICS

LS-NUM	:	1
[MNAC-LN]	:	1
[MXAV-LN]	:	1
[MNAV-LN]	:	1
*[NUM-FLAG]	:	0
*[T1-L2-H2]	:	450-450-800
*[T3-N4-E4]	:	13-82-5
*[T5-T6-T7]	:	10-50-15
[PC-LST]	:	9998

MOD-LS-CHAR : OUTPUT FORM

REPORT FOR MOD-LS-CHAR

Link Set Number	=	1
Link Set Bundle Number	=	1
Minimum Active Links	=	1
Maximum Available Links	=	1
Minimum Available Links	=	1
*FLAG BETWEEN MSUs	=	0
*TIMERS : T1-TL2-TH2	=	450-450-800
*TIMERS : T3-TN4-TE4	=	13-82-5
*TIMERS : T5-T6-T7	=	10-50-15
PCs Served	=	9998

7.2.15. Modify Charge Band-Charge Rate Number Association

ADMINISTRATION COMMAND :		Modify Charge Band-Charge Rate Number Association
MNEMONIC : MOD-CHB-CRG	CLASS : Update	MENU POSITION : 1 30 8
GENERAL INFORMATION		

COMMAND : Modify (Create/delete/modify) Charge Band to Charge Rate Number association

MNEMONIC : MOD-CHB-CRG

FUNCTION : To Modify a Charge Band to Charge Rate Number Association

PARAMETERS REQUIRED : OPR-TYP, CRG-BND, [CRG-RTN]

REMARKS : If CCS7 TGP has charging method as ISUP-CRG-CHB then CCS7 calls will be charged according to the charge band coming from distant end. For each charge Band being used there should be an association of the band with charge rate number. This command is used to create a new charge Band (CRE-CHB), associate/disassosiate charge rate number with it (ASSCT/DASSCT-CRN), modify an existing charge band or delete an existing charge band (DEL-CHB). Multiple Charge Rate Numbers can be associated with a single charge Band. But all these Rate numbers should have all the characteristics same except initial charge. Initial charge can be different.

MOD-CHB-CRG : PARAMETER ENTRY FORM

MOD-CHB-CRG		MODIFY CHARGED BAND - CHARGE RATE NUMBER ASSOCIATION
OPR-TYP	:	CRE-CHB
CRG-BND	:	5
[CRG-RTN]	:	40

MOD-CHB-CRG : OUTPUT FORM

OPERATION TYPE = CRE

CHARGE BAND NUMBER	CHARGE RATE NUMBER
5	40

7.2.16. Create Global Title Translation

Note: *This command is available only in release 1-5-x-x.*

ADMINISTRATION COMMAND :	Create Global Title Translation	
MNEMONIC : CRE-GT	CLASS : Update	MENU POSITION : 1 31 15
GENERAL INFORMATION		

COMMAND : Create Global Title Translation

MNEMONIC : CRE-GT

FUNCTION : To Create a Global title translation for SCCP message routing.

PARAMETERS REQUIRED : GT, PC, [SIG-NW], SSN, [NEW-ADR], [NEW-NAI], [RTIND]

REMARKS : This command is used to create a Global Title translation for SCCP message routing. Global title specifies whether the routing of message is based on DPC & SSN of the destination or on GT itself. If GT is used the new NAI or new Address may be specified.

CRE-GT : PARAMETER ENTRY FORM

CRE-GT CREATE GLOBAL TITLE TRANSLATION

GT	:	Type1-ISDN-SUBS-1111
PC	:	9998
[SIG-NW]	:	NW-NAT
SSN	:	INAP
[NEW-NAI]	:	NONE
[NEW-ADR]	:	NONE
[RTIND]	:	DPCSSN

CRE-GT : OUTPUT FORM

CREATE GLOBAL TITLE REPORT

GLOBAL TITLE (TTYP-NUMPL-NAI-ADR)	=	TYPE1-ISDN-SUBS-1111
POINT CODE	=	9998
SIGNALLING NETWORK	=	NW-NAT
SUBSYSTEM NUMBER	=	INAP
NEW ADDRESS		=
NEW NATURE OF ADDRESS INDICATOR	=	NONE
ROUTING INDICATOR	=	DPCSSN

7.2.17. Modify a Global Title

Note: *This command is available only in release 1-5-x-x.*

ADMINISTRATION COMMAND :		Modify a Global Title
MNEMONIC : MOD-GT-CHAR	CLASS : Update	MENU POSITION : 1 31 17
GENERAL INFORMATION		

COMMAND	:	Modify an existing Global Title
MNEMONIC	:	MOD-GT-CHAR
FUNCTION	:	In an existing GT, Point code, Nature of network, SSN etc. can be modified.
PARAMETERS REQUIRED	:	GT, [PC], [SIG-NW], [SSN], [NEW-ADR], [NEW-NAI], [RTIND]
REMARKS	:	GT can be modified by the command.

MOD-GT-CHAR : PARAMETER ENTRY FORM

MOD-GT-CHAR		MODIFY A GLOBAL TITLE
GT	:	Type1-ISDN-SUBS-1111
PC	:	9998
[SIG-NW]	:	NW-NAT
SSN	:	ISUP
[NEW-ADR]	:	NONE
[NEW-NAI]	:	NONE
[RTIND]	:	DPCSSN

MOD-GT-CHAR : OUTPUT FORM

Modify Global Title

Global Title (TTYP-NUMPL-NAI-ADR)	=	TYPE1-ISDN-SUBS-1111
Point Code	=	9998
Subsystem Number	=	ISUP
New Address	=	
New Nature of Address Indicator	=	NONE
Routing Indicator	=	DPCSSN

7.2.18. Delete a Global Title Translation

Note: *This command is available only in 1-5-x-x release.*

ADMINISTRATION COMMAND :		Delete a Global Title
MNEMONIC : DEL-GT	CLASS : Update	MENU POSITION : 1 31 16
GENERAL INFORMATION		

COMMAND	:	Delete an existing Global Title
MNEMONIC	:	DEL-GT
FUNCTION	:	Delete an existing Global Title translation
PARAMETERS REQUIRED	:	GT
REMARKS	:	Before deleting make sure that no routing or service data uses this GT.

DEL-GT : PARAMETER ENTRY FORM

DEL-GT DELETE GLOBAL TITLE TRANSLATION

GT : Type1-ISDN-SUBS-1111

DEL-GT : OUTPUT FORM

Delete Global Title Report

Global Title (TTYP-NUMPL-NAI-ADR) = TYPE1-ISDN-SUBS-1111

7.2.19. Display Global Title Translation

ADMINISTRATION COMMAND :	Display Global Title Translation	
MNEMONIC :	CLASS : Update	MENU POSITION : 1 31 16
GENERAL INFORMATION		

COMMAND : Display Global Title Translation

MNEMONIC : DISPL-GT

FUNCTION : Display the characteristic of a global title.

PARAMETERS REQUIRED : GT

REMARKS : None

GT : PARAMETER ENTRY FORM

INPUT		DISPLAY GLOBAL TITLE
GT	:	Type1-ISDN-SUBS-9998

OUTPUT FORM

DISPLAY GLOBAL TITLE

GT	=	Type 1-ISDN-subs-9998
PC	=	9998
Sig NW	=	NW-NAT
New Add	=	None
New NAI	=	None
Rtind	=	DPCSSN

7.3. CCS7 ADMINISTRATION COMMANDS: DISPLAY CLASS

7.3.1. Display Signalling Route Set Information

ADMINISTRATION COMMAND : Display Signalling Route Set Information		
MNEMONIC : DISPL-SRS	CLASS : Display	MENU POSITION : 1 32 1
GENERAL INFORMATION		

COMMAND : Display Signalling Route Set Information

MNEMONIC : DISPL-SRS

FUNCTION : To display signalling information of a route set.

PARAMETERS REQUIRED : SRS-NUM

REMARKS : Before execution of this command the desired route set should have been created through CRE-SRS command.

Note: *These parameters are available in 1-5-x-x release only.*

DISPL-SRS : PARAMETER ENTRY FORM

DISPL-SRS DISPLAY SIGNALLING ROUTE SET INFORMATION

SRS-NUM : 1

DISPL-SRS : OUTPUT FORM

DISPLAY SIGNALLING ROUTESET REPORT

Signalling Route Set Number	=	1
Self Point Code	=	1104
Destination Point Code	=	9999
Signalling Network	=	NW-NAT
High Route table route status	=	LOC-UNAVAIL
	=	LOC-UNAVAIL
Low Route table route status	=	LOC-UNAVAIL
	=	LOC-UNAVAIL
Current route table	=	None
High Priority Route table	=	1
Low Priority Route Table	=	None
*Sub system Number List		
(SSN-BKDPC-BKNWID-BKSSN)	=	SCMG-NONE-NONE-NONE
	=	INAP-NONE-NONE=NONE
Global Title Associated	=	TYPE1-ISDN-SUBS-9998

7.3.2. Display Signal Point Code Information

ADMINISTRATION COMMAND :		Display Signal Point Code Information
MNEMONIC : DISPL-SPC	CLASS : Display	MENU POSITION : 1 32 2
GENERAL INFORMATION		

COMMAND : Display Signal Point Codes for Exchange.

MNEMONIC : DISPL-SPC

FUNCTION : To display all the point codes defined for the exchange.

PARAMETERS REQUIRED : None

REMARKS : Response shows the list of SPCs for each signalling network of which this node is a member. There can be maximum number of four PCs in all.

DISPL-SPC : PARAMETER ENTRY FORM

DISPL-SPC DISPLAY SIGNAL POINT CODE

(No parameters required).

DISPL-SPC : OUTPUT FORM

DISPLAY SIGNALLING POINT CODES REPORT

Signalling Network	Self Point Code
NW-NAT	1104
NW-NAT	9998

7.3.3. Display Linkset Information

ADMINISTRATION COMMAND :		Display Linkset Information
MNEMONIC : DISPL-LS	CLASS : Display	MENU POSITION : 1 32 3
GENERAL INFORMATION		

COMMAND : Display Link Set

MNEMONIC : DISPL-LS

FUNCTION : To display the parameters of a linkset.

PARAMETERS REQUIRED : LS-NUM

REMARKS : The output report shows the following information on the specified LS :

a) LSB number of which this LS is a member

b) Link threshold

c) Error correction option (Basic or PCR)

d) List of point codes served

e) Identity of constituent links

DISPL-LS : PARAMETER ENTRY FORM

DISPL-LS DISPLAY LINK SET

LS-NUM : 1

DISPL-LS : OUTPUT FORM

REPORT FOR DISPL-LS

Link Set Number	=	1
Link Set Bundle Number	=	1
Maximum Active Links	=	3
Minimum Active Links	=	3
Maximum Available Links	=	3
Minimum Available Links	=	1
Error Correction Option	=	BASIC
Max. MSU Rtb	=	127
Max. Octet Rtb	=	4095
Link Management Method	=	BASIC
*Flags Between ISUS	=	0
*Timers :T1-TL2-TH2	=	450-450-800
*Timers : T3-TN4-TE4	=	19-82-5
*Timers : T5-T6-T7	=	10-50-15
PCs served	=	9998
Logical Links	=	0
		1
		2
Data links (TEN)	=	7-1-3-17-16
		7-1-3-17-17
		7-1-3-17-18

***Note :** These parameters are available only in release 1_5_x_x.*

7.3.3.1. Display Circuit Group Set Information

ADMINISTRATION COMMAND :	Display Circuit Group Set Information	
MNEMONIC : DISPL-CGS	CLASS : Display	MENU POSITION : 1 32 4
GENERAL INFORMATION		

COMMAND : Display Circuit Group Set Information.

MNEMONIC : DISPL-CGS

FUNCTION : To display the characteristics of one or all circuit group sets in the exchange.

PARAMETERS REQUIRED : [CGS-NUM], [CGS-NAME]

REMARKS : This command is used to display the characteristics of a particular circuit group set or all circuit group sets defined for the exchange.

For displaying characteristics of all CGS, do not give any parameters. The command should be executed with default values of both the parameters.

It is a very useful command for knowing the relation between the voice and the signalling networks.

DISPL-CGS : PARAMETER ENTRY FORM

DISPL-CGS DISPLAY CIRCUIT GROUP SET

[CGS-NUM] : 1
[CGS-NAME] : NONE

DISPL-CGS : OUTPUT FORM

DISPLAY CIRCUIT GROUP SET CHARACTERISTICS

Circuit Group Set Number	=	1
Circuit Group Set Name	=	1
Self Point Code	=	9998
Destination Point Code	=	1104
Signalling Network	=	NW-NAT
User Part Type	=	ISUP
Link Set Bundle Number	=	1
Trunk Groups of CGS	=	10,12,50,52,70,72,90

7.3.4. Display Linkset Bundle Information

ADMINISTRATION COMMAND :		Display Linkset Bundle Information
MNEMONIC : DISPL-LSB	CLASS : Display	MENU POSITION : 1 32 5
GENERAL INFORMATION		

COMMAND : Display Linkset

MNEMONIC : DISPL-LSB

FUNCTION : To display the characteristics of a link set bundle.

PARAMETERS REQUIRED : LSB-NUM

REMARKS : Each linkset bundle is associated with a particular circuit groupset number. This command displays the identity of CGS which is served by this LSB and the LSB parameters. The constituent signalling links of the LSB are also shown.

DISPL-LSB : PARAMETER ENTRY FORM

DISPL-LSB DISPLAY LINK SET BUNDLE

LSB-NUM : 1

DISPL-LSB : OUTPUT FORM

DISPLAY LINK SET BUNDLE CHARACTERISTICS

Link Set Bundle Number	=	1
Circuit Group Set Number	=	1
Circuit Group Set Name	=	1
Link Management Method	=	SECOND
Maximum Message Size	=	DATA272
Self Point Code	=	9998
Destination Point Code	=	1104
Signalling Network	=	NW-NAT
STP Users	=	NONE
DEST PCs	=	NONE
Link Set in LSB	=	1
Data Links (TENs) of LSB	=	7-1-1-17-18
		7-1-1-3-18

7.3.5. Display Circuit Groupset Number to Name Mapping

ADMINISTRATION COMMAND :		Display Circuit Groupset Number to Name Mapping.	
MNEMONIC :	DISPL-CGS-NUM-NAME	CLASS : Display	MENU POSITION : 1 32 6
GENERAL INFORMATION			

COMMAND : Display Circuit Group Set Number to Name Mapping

MNEMONIC : DISPL-CGS-NUM-NAME

FUNCTION : To translate the circuit group set name into number and vice-versa.

PARAMETERS REQUIRED : [CGS-NUM], [CGS-NAME]

REMARKS : If default parameters are selected, the entire list of circuit group set numbers created for the exchange are shown with their corresponding names.

DISPL-CGS-NUM-NAME : PARAMETER ENTRY FORM

DISPL-CGS-NUM-NAME DISPLAY CIRCUIT GROUP SET NUM TO NAME MAPPING

[CGS-NUM] : 1
[CGS-NAME] : ALL-CGS

DISPL-CGS-NUM NAME : OUTPUT FORM

REPORT FOR DISPL-CGS-NUM-NAME

Circuit Group Set Number	Circuit Group Set Name
1	CGS1
2	CGS2

7.3.6. Display Charge Band to Charge Rate Association

ADMINISTRATION COMMAND :		Display Charge Band to Charge Rate Association
MNEMONIC : DISPL-CHB-CRG	CLASS : Display	MENU POSITION : 1 41 8
GENERAL INFORMATION		

COMMAND : Display Charge Band to Charge Rate

MNEMONIC : DISPL-CHB-CRG

FUNCTION : This command displays the charge Rate Numbers associated with a particular charge Band

PARAMETERS REQUIRED : [CRG-BND]

REMARKS : This command can be used to see the association of charge band and charge rate for a single charge Band or for all the charge Band existing in the system.

DISPL-CHB-CRG : PARAMETER ENTRY FORM

DISPL-CHB-CRG		DISPLAY CHARGE BND - CHARGE RATE ASSOCIATION
[CRG-BND]	:	5

DISPL-CHB-CRG : OUTPUT FORM

DISPL-CHB-CRG Association

CHARGE BAND NUMBER	CHARGE RATE NUMBER
5	31
	32

7.4. CCS7 MAINTENANCE COMMANDS: UPDATE CLASS

7.4.1. Test Signal Link

MAINTENANCE COMMAND : Test Signal Link		
MNEMONIC : TST-SGNL-LNK	CLASS : Update	MENU POSITION : 2 12 1
GENERAL INFORMATION		

COMMAND : Test Signal Link

MNEMONIC : TST-SGNL-LNK

FUNCTION : To perform tests on a link.

PARAMETERS REQUIRED : LSB-NUM, LOG-LNK

REMARKS : Before testing, the link is inhibited. After inhibition, a test pattern is sent to the remote end on the link to be tested. The other end of the link echoes back the pattern. The sent and received patterns are matched. In case of mismatch, the link test is deemed to have 'failed' else 'successful'. After the test the inhibited link is uninhibited.

TST-SGNL-LNK : PARAMETER ENTRY FORM

TEST-SGNL-LNK TEST SIGNAL LINK

LSB-NUM : 1
LOG-LNK : 1

TST-SGNL-LNK : OUTPUT FORM

SIGNALLING LINK TEST REPORT

LSB-NUM	=	1
LSB-LINK-ID	=	1
STATUS	=	LINK-TEST-PASSES

7.4.2. Modify Link Set Status

MAINTENANCE COMMAND :		Modify Link Set Status	
MNEMONIC :	MOD-LS-STS	CLASS : Update	MENU POSITION : 2 12 2
GENERAL INFORMATION			

COMMAND : Modify Linkset Status

MNEMONIC : MOD-LS-STS

FUNCTION : To change the status of the linkset.

PARAMETERS REQUIRED : LS-NUM, ACTION

REMARKS : When activation is done for the first time, no. of links equal to the MN-ACT-LN threshold in the linkset will be activated.

Deactivation of the linkset deactivates the least priority link within the linkset.

The 'action' can also be inhibit, uninhibit, block and unblock.

MOD-LS-STS : PARAMETER ENTRY FORM

MOD-LS-STS MODIFY LINK SET STATUS

LS-NUM : 1
ACTION : ACTIVATE

MOD-LS-STS : OUTPUT FORM

MODIFY LINKSET STATUS REPORT

LS-NUM = 1
ACTION = ACTIVATE
STATUS = LINKSET-ACTIVATION-SUCCESSFUL

7.4.3. Modify Link Status

MAINTENANCE COMMAND :		Modify Link Status	
MNEMONIC :	MOD-LNK-STS	CLASS : Update	MENU POSITION : 2 12 3
GENERAL INFORMATION			

COMMAND : Modify Link Status

MNEMONIC : MOD-LNK-STS

FUNCTION : To change the status of a specific link in the linkset.

PARAMETERS REQUIRED : LSB-NUM, LOG-LNK, ACTION

REMARKS : This command is used when the status of only one link is to be changed in the LS. The 'action' types are the same as in MOD-LS-STS.

MOD-LNK-STS : PARAMETER ENTRY FORM

MOD-LNK-STS		MODIFY LINK STATUS
LSB-NUM	:	1
LOG-LNK	:	0
ACTION	:	INHIBIT

MOD-LNK-STS : OUTPUT FORM

MODIFY LINK STATUS REPORT

LSB-NUM	=	1
LOG-LINK-ID	=	0
ACTION	=	INHIBIT
STATUS	=	LINK-INHIBITION-SUCCESSFUL

7.4.4. Modify Block 7 Status

MAINTENANCE COMMAND :		Modify Block 7 Status	
MNEMONIC :	MOD-BLK7-STS	CLASS : Update	MENU POSITION : 2 12 4
GENERAL INFORMATION			

COMMAND : Modify Block 7 Status

MNEMONIC : MOD-BLK7-STS

FUNCTION : This command is used to block, unblock or reset one or more CCS7 trunks.

PARAMETERS REQUIRED : BLK-TYP, TEN

REMARKS : The response only indicates that the request for the action to be taken, i.e. block, unblock or reset has been sent. The success of the action can be confirmed by giving DISPL-BLK7-STS command.

For this test, the destination node should be accessible else the command will show TEN's status as DEST-NOT-ACC.

MOD-BLK7-STS : PARAMETER ENTRY FORM

MOD-BLK7-STS		MODIFY BLOCK 7 STATUS
BLK-TYP	:	BLOCK
TEN	:	7-1-1-17-2 to 7-1-1-17-8

MOD-BLK7-STS : OUTPUT FORM

BLOCK OR UNBLOCK NO7 TRUNKS REPORT

TRUNK GROUP TEN(S)	STATUS
7-1-1-17-2	NREQ-SENT
7-1-1-17-3	NREQ-SENT
7-1-1-17-4	NREQ-SENT
7-1-1-17-5	NREQ-SENT
7-1-1-17-6	NREQ-SENT
7-1-1-17-7	NREQ-SENT
7-1-1-17-8	NREQ-SENT

7.5. CCS7 MAINTENANCE COMMANDS: DISPLAY CLASS

7.5.1. Display Linkset Status

MAINTENANCE COMMAND :		Display Linkset Status	
MNEMONIC :	DISPL-LS-STS	CLASS : Display	MENU POSITION : 2 13 1
GENERAL INFORMATION			

COMMAND : Display Linkset Status

MNEMONIC : DISPL-LS-STS

FUNCTION : The command displays the detailed status of each link forming the linkset.

PARAMETERS REQUIRED : LS-NUM

REMARKS : The links status can be any or combination of the following

a. Activation attempt failed on the link

b. Link is active and carrying traffic

c. Link is remotely inhibited

d. Link is locally inhibited

e. Link has been deactivated

f. Link is active

g. Link is in the out of service status

h. Link is remotely blocked

i. Link is locally blocked

By default, the status of all the linksets is displayed by this command.

DISPL-LS-STS : PARAMETER ENTRY FORM

DISPL-LS-STS		DISPLAY LINK SET STATUS
[LS-NUM]	:	ALL

DISPL-LS-STS : OUTPUT FORM

DISPLAY LINK STATUS REPORT

LS-NUM	LSB-NUM	LOG-LINK-ID	DATA-LINK	PHC-TERMINAL	STATUS
1	1	1	7-1-1-17-18	7-1-3-10-5	Activated & Available
1	1	2	7-1-1-3-18		Out-of-service
2	2	1	7-1-1-21-18	7-1-3-9-5	Activated & Available
2	2	2	7-1-1-7-18		Out-of-service

7.5.2. Display Network Status

MAINTENANCE COMMAND :		Display Network Status	
MNEMONIC :	DISPL-NET-STS	CLASS : Display	MENU POSITION : 2 13 2
GENERAL INFORMATION			

COMMAND : Display Network Status

MNEMONIC : DISPL-NET-STS

FUNCTION : This command displays the accessibility status of specific/all point code(s) in the one or all the signalling network(s).

PARAMETERS REQUIRED : [NET-ID], [PC-NUM]

REMARKS : The value of the accessibility flag in the output response can be “not accessible” or “accessible”. A destination can be inaccessible if all the signalling routes to it are unavailable locally or remotely. The availability of SRS further depends upon the health of signalling links serving the SRS.

This command should be used whenever CCS7 calls to any destinations are not getting through. It will be known via this command whether the fault is local or due to the distant end.

DISPL-NET-STS : PARAMETER ENTRY FORM

DISPL-NET-STS		DISPLAY NETWORK STATUS
[NET-ID]	:	ALL
[PC-NUM]	:	ALL

DISPL-NET-STS : OUTPUT FORM

DISPLAY NETWORK STATUS REPORT

DPC-NUM - OPC-NUM	=	9998 - 1101	
DPC Signalling Network	=	NW-NAT	
Accessibility	=	ACCESSIBLE	
Signalling Route Set Number	=	2	
Link Set Bundle Number	=	2	
Circuit Group Set Number	=	2	
Status of routes	=	(route-id	status)
High Priority	=	2	AVAIL
		NONE	LOC-UNAVAIL
Low Priority	=	NONE	LOC-UNAVAIL
		NONE	LOC-UNAVAIL
Current Priority	=	High	

**SSN Report : SSN status bak-dpc bak-net-id bak-ssn status

NONE PROHB NONE NONE-NONE-PROHB

* *Similarly, network status of all the point codes of the node will be displayed.*

** *This parameter is present in 1-5-x-x release only.*

7.5.3. Display Block7 Status

MAINTENANCE COMMAND :		Display Block7 Status	
MNEMONIC :	DISPL-BLK7-STS	CLASS :	MENU POSITION : 2 13 3
GENERAL INFORMATION			

COMMAND : Display Block 7 Status

MNEMONIC : DISPL-BLK7-STS

FUNCTION : This command displays the blocking status of #7 circuits.

PARAMETERS REQUIRED : TEN (A range of TENs can be given)

REMARKS : In the output response, the following information about the TENs specified is shown :

- Local blocking status
- Reason for blocking
- Remote blocking status
- Maintenance status

Datalinks are always shown to be in busy state.

DISPL-BLK7-STS : PARAMETER ENTRY FORM

DISPL-BLK7-STS		DISPLAY BLOCK 7 STATUS
TEN	:	7-1-1-3-17 to 7-1-1-3-28

DISPL-BLK7-STS : OUTPUT FORM

DISPLAY THE BLOCKING STATUS OF NO7 TRUNKS REPORT

TEN	LOCAL-BLK-STS	RMT-BLK-STS	BLK-REASON	MTCS-STS
7-1-1-3-17	NOT-BLOCKED	NOT-BLOCKED	NOT-APPLICABLE	INS-FRC
7-1-1-3-18	NOT-BLOCKED	NOT-BLOCKED	CKT-IS-DATALINK	INS-FRC
7-1-1-3-19	NOT-BLOCKED	NOT-BLOCKED	NOT-APPLICABLE	INS-FRC
7-1-1-3-10	NOT-BLOCKED	NOT-BLOCKED	NOT-APPLICABLE	INS-FRC
7-1-1-3-21	NOT-BLOCKED	NOT-BLOCKED	NOT-APPLICABLE	INS-FRC
7-1-1-3-22	NOT-BLOCKED	NOT-BLOCKED	NOT-APPLICABLE	INS-FRC
7-1-1-3-23	NOT-BLOCKED	NOT-BLOCKED	NOT-APPLICABLE	INS-FR

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7.6. EXISTING COMMANDS MODIFIED FOR CCS7

7.6.1. Create Trunk Group

MAINTENANCE COMMAND : Create Trunk Group		
MNEMONIC : CRE-TGP	CLASS : Update	MENU POSITION : 1 3 1
GENERAL INFORMATION		

COMMAND : Create a Trunk Group

MNEMONIC : CRE-TGP

FUNCTION : To create a trunk group with the desired characteristics.

PARAMETERS REQUIRED : TGP-NUM, TGP-NAME, TGP-STA, LIN-SIG, REG-SIG, [MF-SIG], [CGS-NUM], [CGS-NAME], [RNK-DGT], [TRK-PRI], [PFX-DGT], [PAD-LEV], TGP-TYP, [TGP-FCY], [DGT-SZFD], [RNG-DWN], [DIAL-TN], AC-STA, [AC-INFO], [TGP-CAT], [HNT-TYP], [SIG-INF], [CONT-CHK], [ECHO-SUP], [SAT-IND], TEN, TEN-NO7

REMARKS : TGPs using NO7 signalling are characterised by the circuit group set (CGS) to which they belong. Also the NO7 TEN has an additional PCM number sub-field which when combined with conventional TEN gives CIC (Circuit Identification Code) i.e. the trunk circuit on which NO7 call is being routed.

The following parameters are significant from CCS7 point of view :

[CGS-NUM] : CGS Number
[CGS-NAME] : CGS Name
[SIG-INF] : Signalling Information
[CONT-CHK] : Continuity Check Indicator
[ECHO-SUP] : Echo Suppression Indicator
SAT-IND] : Satellite Indicator
[TEN-NO7] : No.7 TENs (include PCM number)

For description of these, please refer to the remarks given for DISPL-TGP command.

CRE-TGP : PARAMETER ENTRY FORM

CRE-TGP		CREATE TRUNK GROUP
TGP-NUM	:	45
TGP-NAME	:	TAX-BW
TGP-STA	:	OG
LIN-SIG	:	DIG-CCS
REG-SIG	:	CCITT-R7
[MF-SIG]	:	INVALID
[CGS-NUM]	:	1
[CGS-NAME]	:	CAL-TAX
[RNK-DGT]	:	3
[TRK-PRI]	:	1
[PFX-DGT]	:	NIL
[PAD-LEV]	:	1
TGP-TYP	:	ORD
[TGP-FCY]	:	NO-FAC
[DGT-SZFD]	:	3
[RNG-DWN]	:	NO
[DIAL-TN]	:	NO
AC-STA	:	2WP
[AC-INFO]	:	770000
[TGP-CAT]	:	1
[HNT-TYP]	:	SEQ
[SIG-INF]	:	ISUP-CRG-CHB
[CONT-CHK]	:	CHK-NRQD
[ECHO-SUP]	:	ECH-SP-NRQD
[SAT-IND]	:	NO-SAT
[TEN]	:	NONE
[TEN-NO7]	:	7-1-3-17-1-2 to 7-1-3-17-1-32

CRE-TGP : OUTPUT FORM

CREATE TRUNK GROUP REPORT

Trunk Group Number	=	45
Trunk Group Name	=	TAX-BW
Trunk Type	=	BW
Line Signalling Scheme	=	DIG-CCS
Register Signalling Scheme	=	CCITT R7
MF-SGN-TYPE	=	INVALID
Circuit Group Set Number	=	1
Circuit Group Set Name	=	CAL-TAX
Rank of Digits	=	3
Trunk Priority	=	1
Prefix Digits	=	Nil
PAD Level	=	1
Trunk Group Type	=	ORD
Special Facility	=	NO-FAC
MIN DIG Seize FWD	=	3
Ring Down Signalling	=	No
Dial Tone	=	No
Trunk Group Category	=	1
Trunk Group Hunt Type	=	SEQ
Signalling Information	=	ISUP-CRG-CHB
Continuity Check Indicator	=	CHK-NRQD
Echo-Suppression Indicator	=	ECH-SP-NRQD
Satellite Indicator	=	NO-SAT
Answer Circuit Status	=	2 WP
No. of Answering Circuits	=	570000

Contd....

Answering Circuit Information =

Successful TENS =

Failed TENS =

Successful TEN-NO7 (bm-rack-frame-slot-pcm-ckt)

7-1-3-17-1-2

7-1-3-17-1-3

7-1-3-17-1-4

7-1-3-17-1-5

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Failed TEN-NO7 (bm-rack-frame-slot-pcm-ckt)

7.6.2. Delete a Trunk Group

MAINTENANCE COMMAND :		Delete a Trunk Group	
MNEMONIC :	DEL-TGP	CLASS :Update	MENU POSITION : 1 3 2
GENERAL INFORMATION			

COMMAND : Delete a Trunk Group

MNEMONIC : DEL-TGP

FUNCTION : This command is used to delete an entire trunk group.

PARAMETERS REQUIRED : [TGP-NUM], [TGP-NAME]

REMARKS : The desired trunk group should not have a route associated to it and also the status of the TGP should be OOS-OPR.

DEL-TGP : PARAMETER ENTRY FORM

DEL-TGP DELETE A TRUNK GROUP

[TGP-NUM] : 45

[TGP-NAME] : NONE

DEL-TGP : OUTPUT FORM

DELETE TRUNK GROUP REPORT

TRUNK GROUP NUMBER	=	45
TRUNK GROUP NAME	=	TAX-BW

7.6.3. Delete Trunks from a Trunk Group

COMMAND :	Delete Trunks from a Trunk Group	
MNEMONIC : DEL-TRK	CLASS : Update	MENU POSITION : 1 3 3
GENERAL INFORMATION		

COMMAND : Delete Trunks from a Trunk Group

MNEMONIC : DEL-TRK

FUNCTION : To delete one or more TEN(s) from a TGP.

PARAMETERS REQUIRED : [TGP-NUM], [TGP-NAME], TEN

REMARKS : The TGP should be out of service (OOS-OPR). The deleted TEN(s) go to the free list, which can be seen through DISPL-TEN command.

DEL-TRK : PARAMETER ENTRY FORM

DEL-TRK DELETE TRUNKS FROM A TRUNK GROUP

[TGP-NUM] : 1
[TGP-NAME] : NONE
TEN : 7-1-3-17-20

DEL-TRK : OUTPUT FORM

DELETE TRUNKS FROM A TRUNK GROUP REPORT

TRUNK GROUP NUMBER = 1
TRUNK GROUP NAME = TGP20
LIST OF TENS DELETED = 7-1-3-17-20

7.6.4. Add Trunks to a Trunk Group

MAINTENANCE COMMAND :	Add Trunks to a Trunk Group	
MNEMONIC : ADD-TRK	CLASS : Update	MENU POSITION : 1 3 4
GENERAL INFORMATION		

COMMAND : Add Trunks to a Trunk Group

MNEMONIC : ADD-TRK

FUNCTION : This command is used to add free trunks to a trunk group. The added trunks assume all the characteristics of the trunk group.

PARAMETERS REQUIRED : [TGP-NUM], [TGP-NAME], [TEN], [TEN-NO7].

REMARKS : The trunk group should be Out Of Service (OOS-OPR) before this command is attempted.

ADD-TRK : PARAMETER ENTRY FORM

ADD-TRK ADD TRUNKS TO A TRUNK GROUP

[TGP-NUM] : 45
[TGP-NAME] : NONE
[TEN] : NONE
[TEN-NO7] : 7-1-3-17-20

ADD-TRK : OUTPUT FORM

ADD TRUNKS TO A TRUNK GROUP REPORT

TRUNK GROUP NUMBER	=	45
TRUNK GROUP NAME	=	TAX-BW
SUCCESSFUL TENS	=	7-1-3-17-20
FAILED TENS	=	

7.6.5. Modify Trunk Group Characteristics

MAINTENANCE COMMAND :		Modify Trunk Group Characteristics	
MNEMONIC :	MOD-TGP-CHAR	CLASS : Update	MENU POSITION : 1 3 5
GENERAL INFORMATION			

COMMAND : Modify Trunk Group Characteristics

MNEMONIC : MOD-TGP-CHAR

FUNCTION : All the parameters values mentioned below can be modified through this command.

PARAMETERS REQUIRED : TGP-NUM, [TGP-NAME], [LIN-SIG],
[REG-SIG], [MF-SIG], [RNK-DGT],
[TRK-PRI], [PFX-DGT], [TGP-FCY], [DGT-SZFD],
[TGP-CAT], [HNT-TYP],
[SIG-INF], [CONT-CHK], [ECHO-SUP],
[SAT-IND], [AC-STA], [AC-INFO]

REMARKS : When TGP-NUM is entered, the system gets the current values of all the command parameters and displays them. The operator can than go to the appropriate parameter/s and modify them.

MOD-TGP-CHAR : PARAMETER ENTRY FORM

MOD-TGP-CHAR MODIFY TRUNK GROUP CHARACTERISTICS

TGP-NUM	:	45
[TGP-NAME]	:	TAX-BW
[LIN-SIG]	:	DIG-CCS
[REG-SIG]	:	CCITT-R7
[MF-SIG]	:	INVALID
[RNK-DGT]	:	1
[TRK-PRI]	:	1
[PFX-DGT]	:	NIL
[TGP-FCY]	:	MH (Only this parameter, say, is changed)
[TGP-CAT]	:	1
[HNT-TYP]	:	SEQ
[DGT-SZFD]	:	3
SIG-INF]	:	ISUP-CRG-CHB
[CONT-CHK]	:	CHK-NRQD
[ECHO-SUP]	:	ECH-SP-NRQD
[SAT-IND]	:	NO-SAT
[AC-STA]	:	2WP
[AC-INFO]	:	5770000

MOD-TGP-CHAR : OUTPUT FORM

MODIFY TRUNK GROUP CHARACTERISTICS REPORT

Trunk Group Number	=	45
Trunk Group Name	=	TAX-BW
Rank of Digits	=	1
Trunk Group Hunt Type	=	SEQ
Min DGT Seize FWD	=	1
Trunk Priority	=	1
Prefix Digits	=	Nil
Trunk Group Facility	=	MH*
Trunk Group Category	=	1
Answer Circuit Status	=	2WP
Signalling Information	=	ISUP-CRG-CHB
Continuity Check Indicator	=	CHK-NRQD
Echo-Suppression Indicator	=	ECH-SP-NRQD
Satellite Indicator	=	NO-SAT
Answering Circuit Information	=	5770000

* *The changed parameter is confirmed.*

7.6.6. Display Trunk Group Characteristics

TRUNK & ROUTING ADMINISTRATION COMMAND : Display Trunk Group Characteristics		
MNEMONIC : DISPL-TGP	CLASS : Display	MENU POSITION : 1 4 1
GENERAL INFORMATION		

COMMAND : Display Trunk Group Characteristics

MNEMONIC : DISPL-TGP

FUNCTION : The command displays the characteristics of a trunk group.

PARAMETERS REQUIRED : [TGP-NUM], [TGP-NAME]

REMARKS

Only one of the two input parameters needs to be specified.
The following parameters have been added or modified in the existing CEP to accommodate CCS7 related information.

a) Signalling Information
Used to specify ISUP charging method.
ISUP-CRG-CHB = Charge Band method.
ISUP-CRG-CHW = Charge Unit method

b) CGS number and name of which this TGP is a constituent.

c) Line Signalling Scheme
DIG-CCS (i.e. common channel)
Register Signalling Scheme
CCITT-R7 (i.e. CCS7)

d) Echo Suppression Indicator
Whether incoming or outgoing echo suppressor is included.

e) Satellite Indicator
Whether a satellite hop follows or not.

f) Continuity Check Indicator
Whether continuity check on the trunk circuits is required or not.

g) #7 TEN (includes PCM number) to CIC table.
CIC numbers start from 1. There can more than one such TGPs in a CGS

DISPL-TGP : PARAMETER ENTRY FORM

DISPL-TGP DISPLAY TRUNK GROUP CHARACTERISTICS

[TGP-NUM] : 10
[TGP-NAME] : NONE

DISPL-TGP : OUTPUT FORM

DISPLAY BOTHWAY TRUNK GROUP REPORT

Trunk Group Number	=	10
Trunk Group Name	=	TGP10
Line Signalling Scheme	=	DIG-CCS
Register Signalling Scheme	=	CCITT-R7
MF-SGN-TYP	=	INVALID
Circuit Group Set Number	=	1
Circuit Group Set Name	=	CGS1
Pad Level	=	1
Trunk Group Type	=	ORD
Special Facility	=	NO-FCY
Signalling Information	=	ISUP-CRG-CHB
Echo Suppression Indicator	=	ECH-SP-NROD
Satellite Indicator	=	NO-SAT
Answer Circuit Status	=	2WP
Prefix Digits	=	548

Trunk Priority	=	1
Dial Tone	=	No
Trunk Group Category	=	2
Rank of Digits	=	4
Min DGT Seize FWD	=	1
Ring Down Signalling	=	NO
Trunk Group Hunt Type	=	PROG
Continuity Check Indicator	=	CHK-NRQD
Answering Circuit Information	=	
No. of TENs	=	30
TEN (bm-rack-frame-slot-pcm-ckt)		CIC
7-1-3-17-1-2		1
7-1-3-17-1-3		2
7-1-3-17-1-4		3
7-1-3-17-1-5		4
.		
.		
.		
7-1-3-17-32		31

7.6.7. Put Terminal Out of Service
Put Terminal In Service

MAINTENANCE COMMAND :		Put Terminal Out of Service Put Terminal In Service	
MNEMONIC :	PUT-TRM-OOS PUT-TRM-INS	CLASS : Update	MENU POSITION : 2 3 1/2
GENERAL INFORMATION			

COMMAND : Put a terminal out of service/inservice

MNEMONIC : PUT-TRM-OOS/INS

FUNCTION : To change the status of specified type and number of terminal out of service or inservice.

PARAMETERS REQUIRED : TML-TYP, [TEN], [DIRNO]

REMARKS : For CCS7 a new terminal type will be introduced i.e. PHC. This command will be used to force PHC terminals out of service/inservice

Note : *Never force out all the equipped PHC terminals simultaneously. If it is done accidentally then unequip and equip any one of the PHC cards.*

PUT-TRM-OOS/INS : PARAMETER ENTRY FORM

FRC-TRM-OOS/INS PUT TERMINAL OUTOF SERVICE / IN SERVICE

TML-TYP	:	PHC
[TEN]	:	1-1-2-7-1 to 1-1-2-7-4
[DIRNO]	:	NONE

PUT-TRM-OOS : OUTPUT FORM

PHC STATUS CHANGE REPORT

TML-TYPE = PHC

TEN	RESULT	NEW STATUS	OLD STATUS
1-1-2-7-1	PASS	OOS-OPR	INS-FREE
1-1-2-7-2	PASS	OOS-OPR	INS-FREE
1-1-2-7-3	PASS	OOS-OPR	INS-FREE
1-1-2-7-4	PASS	OOS-OPR	INS-FREE

PUT-TRM-INS : OUTPUT FORM

PHC STATUS CHANGE REPORT

TML-TYP = PHC

TEN	RESULT	NEW STATUS	OLD STATUS
1-1-2-7-1	PASS	INS-FREE	OOS-OPR
1-1-2-7-2	PASS	INS-FREE	OOS-OPR
1-1-2-7-3	PASS	INS-FREE	OOS-OPR
1-1-2-7-4	PASS	INS-FREE	OOS-OPR

7.6.8. Display Terminal Status

MAINTENANCE COMMAND :		Display Terminal Status	
MNEMONIC :	DISPL-TRM-STATUS	CLASS : Display	MENU POSITION : 2 8 3
GENERAL INFORMATION			

COMMAND	:	Display the status of the specified terminal
MNEMONIC	:	DISPL-TRM-STATUS
FUNCTION	:	Display the status of the specified terminal
PARAMETERS REQUIRED	:	[STAT-TRM], TML-TYP, [TEN], [DIRNO]
REMARKS	:	Command can be used to see the status of PHC terminals.

DISPL-TRM-STATUS : PARAMETER ENTRY FORM

DISPL-TRM-STATUS		DISPLAY TERMINAL STATUS
[STAT-TRM]	:	ALL
TRM-TYP	:	PHC
[TEN]	:	1-1-2-7-2 to 1-1-2-7-4
[DIRNO]	:	NONE

DISPL-TRM-STATUS : OUTPUT FORM

PHC STATUS INTERROGATION REPORT

TML-TYPE	NEW STATUS	STAT-TRM
PHC	1-1-2-7-1	OOS-OPR
PHC	1-1-2-7-2	OOS-OPR
PHC	1-1-2-7-3	OOS-OPR
PHC	1-1-2-7-4	OOS-OPR

7.6.9. Start / Stop Traffic Report

MAINTENANCE COMMAND :		Start / Stop Traffic Report	
MNEMONIC :	START/STOP-TRF RPT	CLASS : Update	MENU POSITION : 1 9 1/2
GENERAL INFORMATION			

COMMAND	:	Start / Stop Traffic Report
MNEMONIC	:	Start / Stop-TRF-RPT
FUNCTION	:	To start and stop traffic report.
PARAMETERS REQUIRED	:	RPT-TYP
REMARKS	:	This command can be used to start or stop CCS7 related traffic reports. Two traffic reports are supported for CCS7. LNK-REP for link report and RTSET-REP for signalling route set report.

START / STOP – TRF - RPT : PARAMETER ENTRY FORM

START-TRF-RPT	TRAFFIC REPORT
RPT-TYP	LNK-REP & RTSET-REP & SCCP-REP* & TCAP-REP*
STOP-TRF-RPT	STOP TRAFFIC REPORT
RPT-TYP	LNK-REP & RTSET-REP & SCCP-REP* & TCAP-REP*

START / STOP-TRF-RPT : OUTPUT FORM

REPORT-TYPE	UNIT	PERIODICITY
Signalling-Link-Report	MIN	60
Signalling-Route Set Report	MIN	60
*SCCP	MIN	60
*TCAP	MIN	60

***** *Note: These reports are available in 1-5-x-x release only.*

7.6.10. Display Traffic Report

MAINTENANCE COMMAND :		Display Traffic Report	
MNEMONIC :	DISPL-TRF-RPT	CLASS : Display	MENU POSITION : 1 10 5
GENERAL INFORMATION			

COMMAND	:	Display Traffic Report
MNEMONIC	:	DISPL-TRF-RPT
FUNCTION	:	To display one or more traffic reports.
PARAMETERS REQUIRED	:	REP-TYP
REMARKS	:	This command can be used to display traffic report for CCS7.

DISPL-TRF-RPT : PARAMETER ENTRY FORM

DISPL-TRF-RPT		DISPLAY TRAFFIC REPORT
RPT-ID	:	LNK-REP
[FRM-DATE]	:	8-8-1997
[TO-DATE]	:	8-8-1997
[FRM-TIME]	:	19:00:16
[TO-TIME]	:	20:00:16
[MOD-NO]	:	SUM

DISPL-TRF-RPT : OUTPUT FORM

PERIODIC REPORT ON SIGNALLING LINK

DATE	8-AUG-1997 19:00:16
MODULE NO	SUM
Duration Of Observation	6 minutes

Link Set Bundle Number	1
Logical link in the Bundle	0
Number of signalling octets transmitted	44017
Number signalling octets received	15273
Duration of link in the inservice state	3360 Seconds
Duration of link unavailability	0 Seconds
Number of signalling units received in err	0
Duration of link failure	10 Seconds
Number of MSUs dumped due to SL congestion	0
Number of link failures	2

Time of link failure	Reason for link failure
18:30:33	High_Bit_Error_Rate
18:38:17	High_Bit_Error_Rate
00:00:00	0
00:00:00	0
00:00:00	0

.

DISPL-TRF-RPT : OUTPUT FORM

PERIODIC REPORT ON SIGNALLING ROUTE SET

DATE	14-MAR-1997 13:30:27
MODULE NO	SUM
Duration Of Observation	15 minutes
Destination point code of Routeset	9998
Signalling Network	NW-NAT
Signalling Route set number	1
Duration of Unavailability of Routeset	0
Number of Message dumped due to Routing Error	0
Number of times point code became inaccessible	2*
Time when point code became inaccessible	18:30:33
	18:38:17
	00:00:00
	00:00:00
	00:00:00
	00:00:00
	00:00:00

* *Since there is only signalling link to DPC 9998, whenever the link fails, this particular destination will become inaccessible.*

PERIODIC REPORT ON SCCP

DATE: 29-JAN-1998 15:59:56 OBS DUR: 60 MINUTES

MODULE NO. SUM

REPORT ON ROUTING FAILURE OCCURRENCES

No translation for address of such nature	0
No translation for specific address	0
SCCP user not accessible	0
Syntax Error	0
Unknown Message	0
Total no. of reassembly failures	0

REPORT ON NUMBER OF SCCP MESSAGE EXCHANGED PER SUBSYSTEM

	SCMG	INAP
UDT sent	0	0
UDT rcvd	0	0
XUDT sent	0	0
XUDT rcvd	0	0
UDTS rcvd	0	0
XUDTS rcvd	0	0
Total no. of UDTS messages sent by SCCP		0
Total no. of XUDTS messages sent by SCCP	0	
Total no. of messages sent by SCCP	0	
Total no. of messages received by SCCP		0
Total no. of reassemblies		0
Total messages for local subsystem		0
Total messages requiring Global Title Translation		0
Total messages sent to a backup Subsystem	0	
Total relay messages	0	

PERIODIC REPORT ON TRANSACTION CAPABILITIES APPLICATION PART

DATE: 29-JAN-1998 15:00:15 OBS DUR: 60MINUTES

MODULE NO. BM_1

REPORT ON NUMBER OF TCAP MESSAGES EXCHANGED

Number of TCAP Messages Received	80
Number of TCAP Messages Sent	20
Number of P-ABORT Messages Received	0
Number of P-ABORT Messages Sent	0

REPORT ON NUMBER OF COMPONENTS EXCHANGED

Number of Components Received	80
Number of Components Sent	20
Number of Rejected Components Received	0
Number of Rejected Components Sent	0

REPORT ON DIALOGUES

Total no. Of Dialogues	20
Maximum Dialogue Duration (ms)	230
Minimum Dialogue Duration (ms)	150
Average Dialogue Duration (ms)	160

7.6.11. Display Switch Unit Status

MAINTENANCE COMMAND :		Display Switch Unit Status	
MNEMONIC :	DISPL-SWU-STATUS	CLASS : Display	MENU POSITION : 2 8 1
GENERAL INFORMATION			

COMMAND	:	Display a switch unit status
MNEMONIC	:	DISPL-SWU-STATUS
FUNCTION	:	Displays the maintenance status of the specified switch unit.
PARAMETERS REQUIRED	:	MOD-NO, UNIT-ID
REMARKS	:	This command can be used to display the status of switch units of the Signalling Unit Module (SUM).

DISPL-SWU-STATUS : PARAMETER ENTRY FORM

DISPL-SWU-STATUS DISPLAY SWITCH UNIT STATUS

MOD-NO : SUM

UNIT-ID : SU7-0/MU-0

DISPL-SWU-STATUS : OUTPUT FORM

SWITCH UNIT STATUS REPORT

MOD NO = SUM

MOD SAT = INS-ACT

UNIT ID = SU7-0/MU-0

STATUS = INS-ACT

UNIT-TYPE =

7.6.12. Force Switch Unit Out of Service / Inservice

MAINTENANCE COMMAND :		Force Switch Unit Out of Service / Inservice	
MNEMONIC :	FRC-SWU-OOS/INS	CLASS : Update	MENU POSITION : 2 6 2/1
GENERAL INFORMATION			

COMMAND	:	Force switch unit Out of Service or Inservice
MNEMONIC	:	FRC-SWU-OOS/INS
FUNCTION	:	To force the specified switch unit out of service or inservice.
PARAMETERS REQUIRED	:	MOD-NO, UNIT-ID
REMARKS	:	These commands can be used to change the status of SU7-0/1 and MU-0/1 units of SUM.

FRC-SWU-OOS/INS : PARAMETER ENTRY FORM

FRC-SWU-OOS/INS ADD TRUNKS TO A TRUNK GROUP

MOD-NO : SUM

UNIT-ID : SU7-1

FRC-SWU-OOS/INS : OUTPUT FORM

PUT/FORCE SWITCH UNIT OUT OF SERVICE

MOD NO: SUM	UNIT ID: SU7-1	RESULT: PASS
NEW STATUS:	OOS-OPR	OLD STATUS: INS-FREE

Chapter 8.

SUM Packaging & Interconnections

8.1. SUM PACKAGING

The Signalling Unit Module (SUM) frame houses the following type of cards. The number of cards is indicated in the parentheses.

- Signalling Handler Module (SHM) cards (max. 4 or 8)
- Base Memory Extender (BME) cards (2, duplicated)
- Central Processor Unit (SU7) cards (2, duplicated)
- Terminal Unit Controller (TUC) card (2, duplicated)
- Terminal Unit Interface (TUI) card (2,duplicated)
- Loader (CUL) Cards (2). Not required in case of HPC CPU.
- Power Supply Unit (PSU II) cards (2 in each plane, duplicated)
- Mother Board (split into three sections)*****

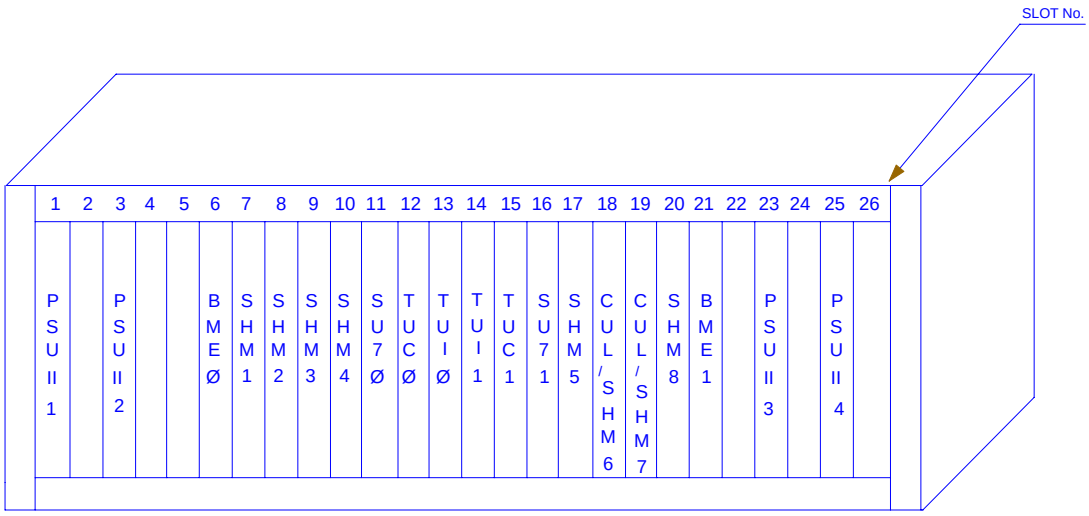
***** *The motherboard is split into three sections. The two side sections receive the PSU cards (2 each) and the central section receives all the control cards and interface cards.*

The arrangement of cards in the SUM frame is depicted in Fig. 8.1 and listed in Table 8-1 below.

Table 8-1

SUM Equipage

Plane	Slot No.	Card	Remarks
0	1	PSU II	The two PSU II cards of a plane work is load sharing mode.
	2	*blank*	
	3	PSU II	
	4	*blank*	
	5	*blank*	
	6	BME	BME card is same as that used in BM.
	7	SHM 1	SHM cards are placed in plane 0 only in case of BPC CPU.
	8	SHM 2	
	9	SHM 3	
	10	SHM 4	
	11	SU7 0	SU7 card is same as BPC/HPC card used in the BM but the firmware is different.
	12	TUC 0	Same as used in Digital Trunk Unit (DTU).
	13	TUI 0	
1	14	TUI 1	Same as used in Digital Trunk Unit (DTU).
	15	TUC 1	
	16	SU7 1	SU7 card is same as BPC/HPC card used in the BM but firmware is different.
	17	SHM5	The two CUL cards are inserted in slots 18 & 19 or 18 & 20 only when the CPU is BPC. In case of HPC CPU, another 4 SHM cards can be equipped in slots 17 to 20 in addition to the 4 cards in plane 0.
	18	CUL1/SHM 6	
	19		
	20	CUL2/SHM 7	
		CUL2/SHM 8	
	21	BME	BME card is same as that used in BM.
	22	*blank*	
	23	PSU II	The two PSU II cards of a plane work in load sharing mode.
	24	*blank*	
	25	PSU II	
	26	*blank*	



NOTES :-

1. PSU No. 1 & 2, AND, 3 & 4 SUPPLY POWER IN LOAD SHARING MODE TO THEIR RESPECTIVE PLANES.
2. SU7 CARD IS INFACT BPC/HPC CARD USED IN OTHER CPU COMPLEXES BUT HAS DIFFERNT FIRMWARE.

FIG. 8.1
SUM CARD FRAME

\DESIGN\CCS7-UM\CCS7-CF

8.2. SUM FIRMWARE

The SUM controller cards (SHM, SU7 and TUC) have firmware resident in the PROMs and EPLDs. The position of these on each card is given in Table 8-2 below. For the checksums of the devices, please refer to the appropriate software release document.

Table 8-2

SUM Firmware

Card	Device Type	Device ID	Position
SHM (APC-SHM473/H-S01)	PROM (120ns) PROM (120ns) PROM (120ns) PROM (120ns) EPLD EPLD EPLD EPLD	LPHC HPHC LPHC HPHC IMP IMP SCC TUC	U17 U5 U20 U10 U6 U9 U47 U51
SU7 (BPC) (APC-BPC441/D-S02)	PROM PROM	HNPC LNPC	U43 U45
SU7 (HPC) (APC-HPC393/O-S01)	PROM EPLD EPLD EPLD EPLD EPLD EPLD	NPC EPLD1 EPLD2 EPLD3 EPLD4 EPLD5 EPLD6	U55 U13 U3 U52 U15 U4 U14
TUC (APC-TUC046/T-S03)	PROM PROM	LTUC HTUC	U68 U85

8.3. SUM INTERCONNECTIONS

8.3.1. SUM-BM Interconnection

SUM can be equipped in any terminal unit frame position of a NON-RSU BM in the exchange. It can be placed in the principle frame or in concentration with any analogue terminal unit/Digital Terminal unit* frame. The connections of SUM frame to the Time Switch Unit (TSU) frame are same as that of any analog TU. Cable from each copy of TUC of SUM will be connected to each plane of the TSU. Similarly if 7SU is in concentration, cables from 7SU's TUC will terminate at TIC of principal TU just like any other concentration TU. The TU-TSU (hence SUM-TSU), TSU-BPU and overall BM interframe cabling is shown in Fig. 8.2, .8.3 & 8.4.

**** Note**:*

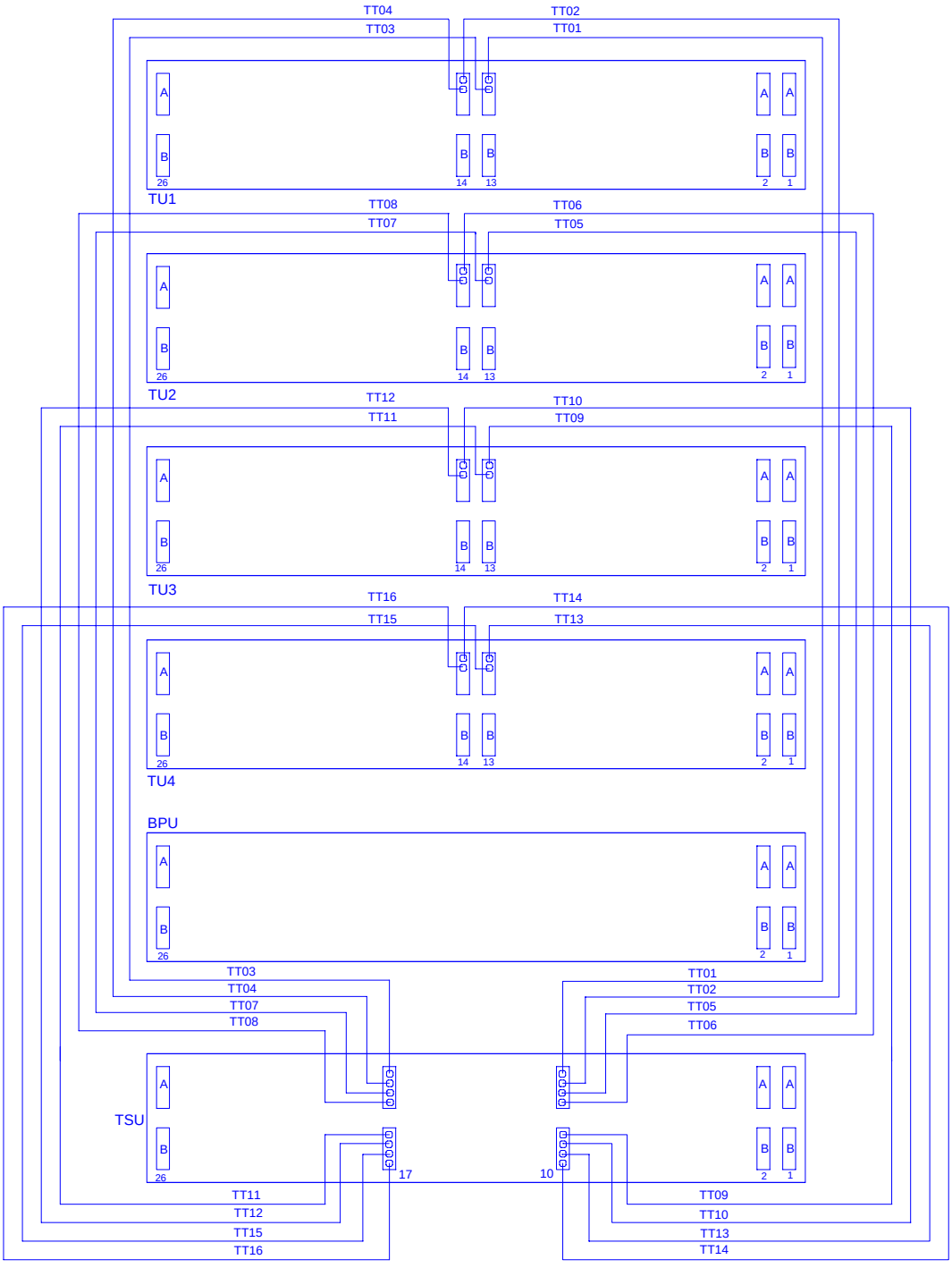
When SU is in concentration with DTU total no. of trunks equipped in DTU and PHC terminals in 7SU together should not exceed 126.

8.3.2. Power Supply Connections of SUM

SUM is given power supply from a set of 4 filter boxes of 4A, 2mH rating. From the two filter boxes, mounted on each copy of bus bar, -48 volt supply is given to both the planes. Details of PSU connections are shown in Fig. 8.5. Fig. 8.6 shows the details of the interconnections of error signal cables of filter box and the SUM back plane.

Motherboard Interconnections

Interconnections between the three portions of the split mother board are shown in Fig. 8.7.



NOTE -
1. TU-TSU INTERCONNECTIONS ARE SAME FOR DIFFERENT TU CONFIGURATION.
2. SUM CAN BE PLACED IN ANY TU POSITION

FIG. 8.2
TU-TSU INTERFRAME CONNECTIONS

\DESIGN\CCS7-UM\CCS7-TIC

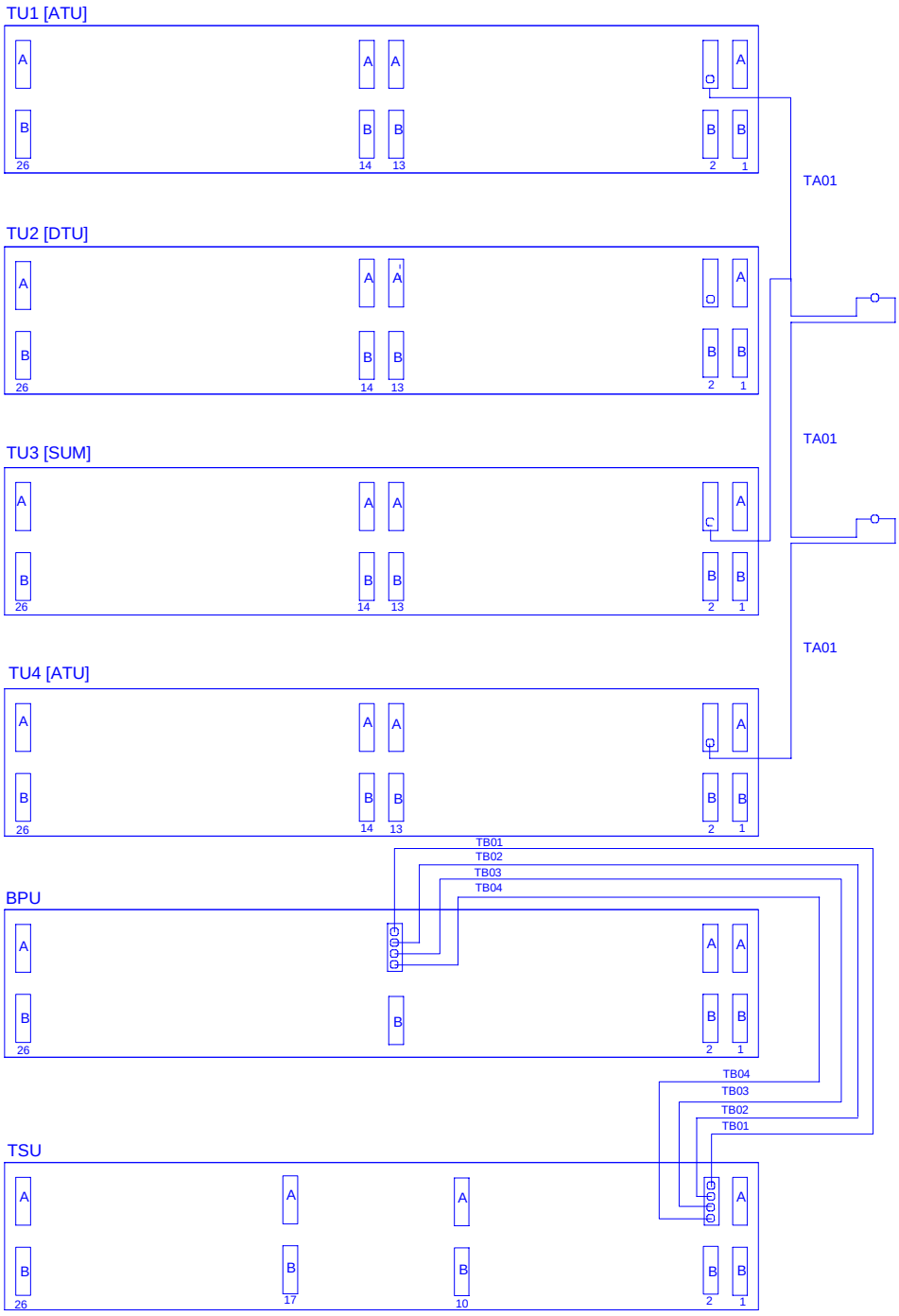
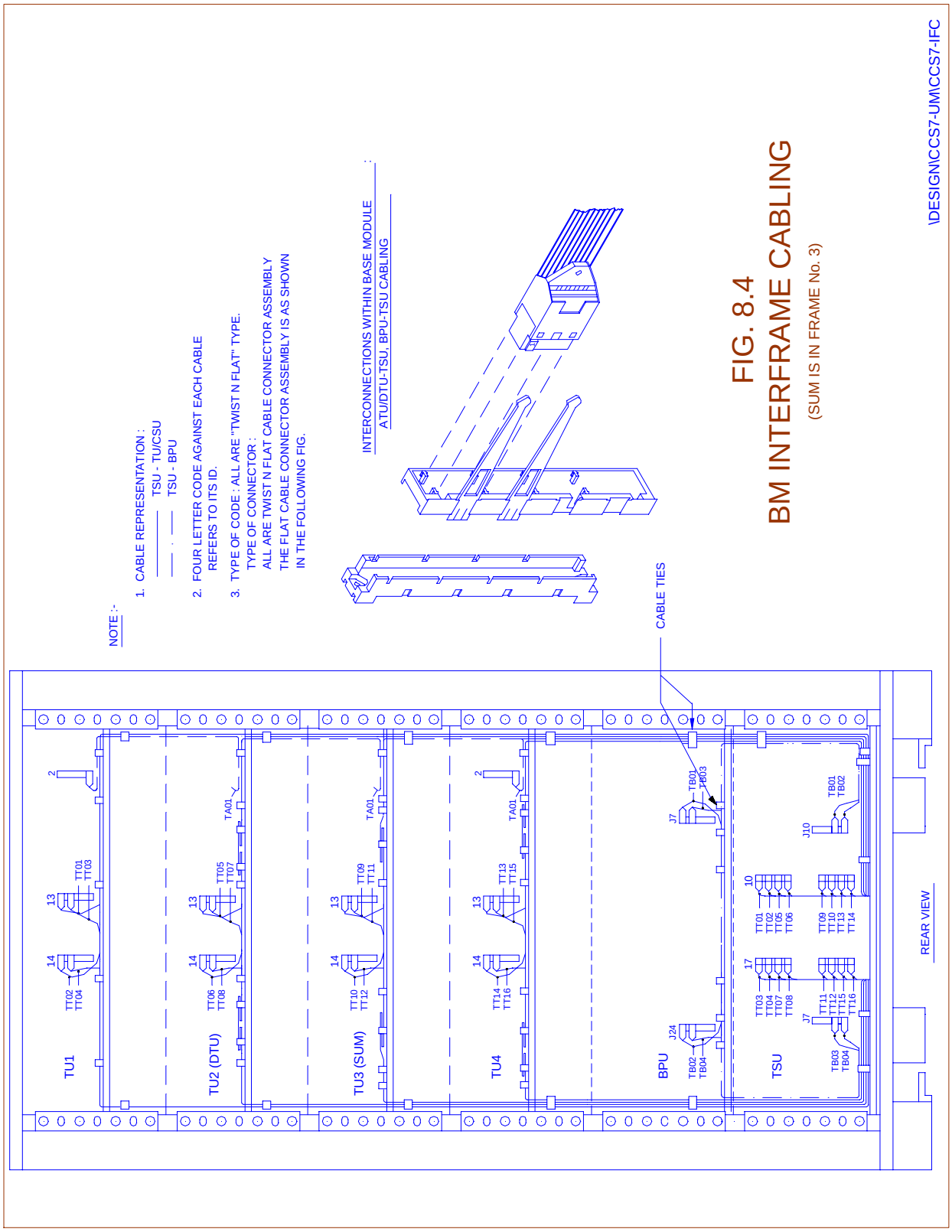
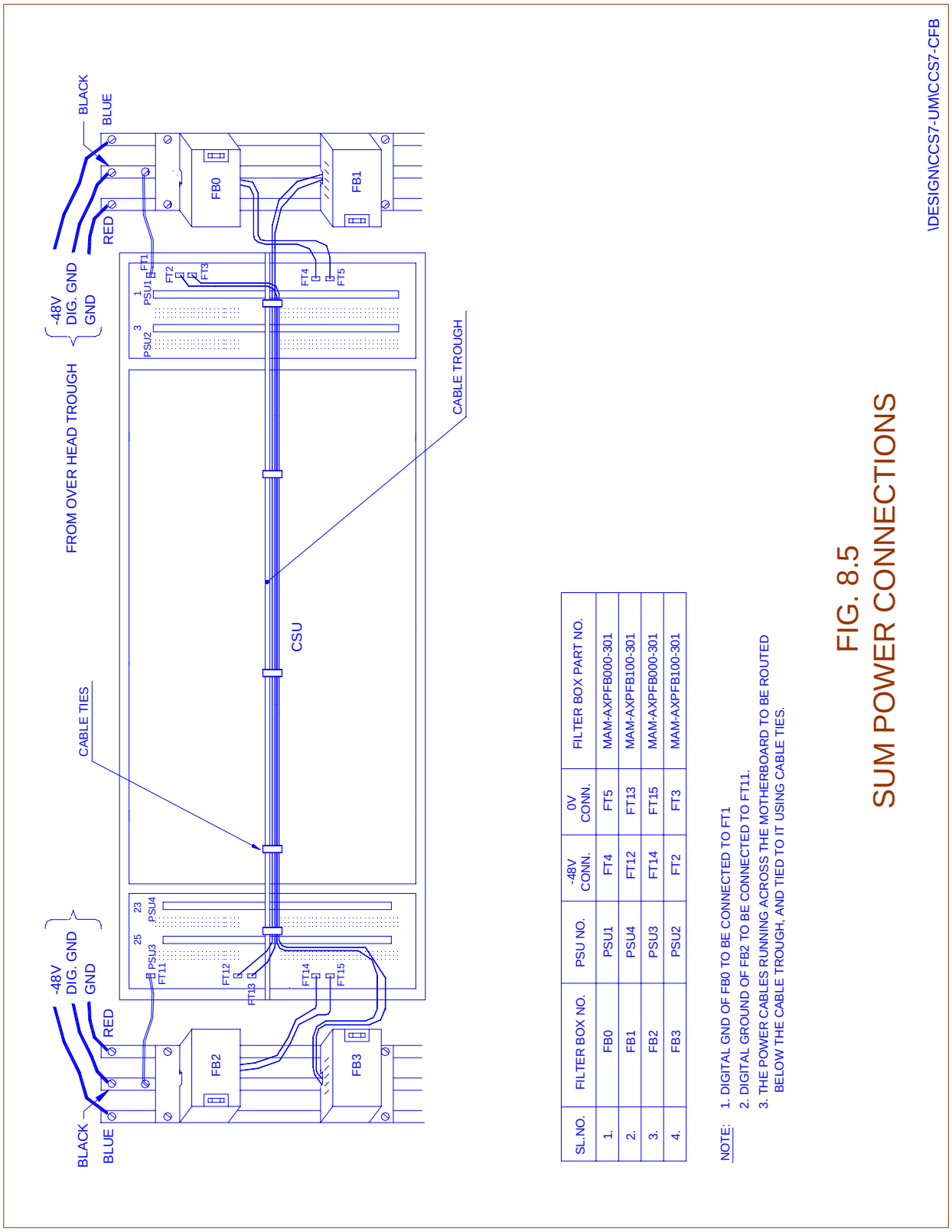


FIG. 8.3
TSU-BPU (FOR BM-L) &
TU-DTU/SUM INTERFRAME CONNECTIONS

\DESIGN\CCS7-UM\CCS7-TSU


\DESIGN\CCS7-UM\CCS7-IFC
FIG. 8.4
BM INTERFRAME CABLING
(SUM IS IN FRAME No. 3)
NOTE :-
1. CABLE REPRESENTATION :
TSU - TU/CSU
TSU - BPU
2. FOUR LETTER CODE AGAINST EACH CABLE REFERS TO ITS ID.
3. TYPE OF CODE : ALL ARE "TWIST N FLAT" TYPE.
TYPE OF CONNECTOR :
ALL ARE TWIST N FLAT CABLE CONNECTOR ASSEMBLY
THE FLAT CABLE CONNECTOR ASSEMBLY IS AS SHOWN IN THE FOLLOWING FIG.
INTERCONNECTIONS WITHIN BASE MODULE :
ATU/DTU-TSU, BPU-TSU CABLING
CABLE TIES
REAR VIEW
TU1
TU2 (DTU)
TU3 (SUM)
TU4
BPU
TSU



SL.NO.	FILTER BOX NO.	PSU NO.	-48V CONN.	0V CONN.	FILTER BOX PART NO.
1.	FB0	PSU1	FT4	FT5	MAM-AXPFB000-301
2.	FB1	PSU4	FT12	FT13	MAM-AXPFB100-301
3.	FB2	PSU3	FT14	FT15	MAM-AXPFB000-301
4.	FB3	PSU2	FT2	FT3	MAM-AXPFB100-301

NOTE:
1. DIGITAL GND OF FB0 TO BE CONNECTED TO FT1
2. DIGITAL GROUND OF FB2 TO BE CONNECTED TO FT11.
3. THE POWER CABLES RUNNING ACROSS THE MOTHERBOARD TO BE ROUTED BELOW THE CABLE TROUGH, AND TIED TO IT USING CABLE TIES.

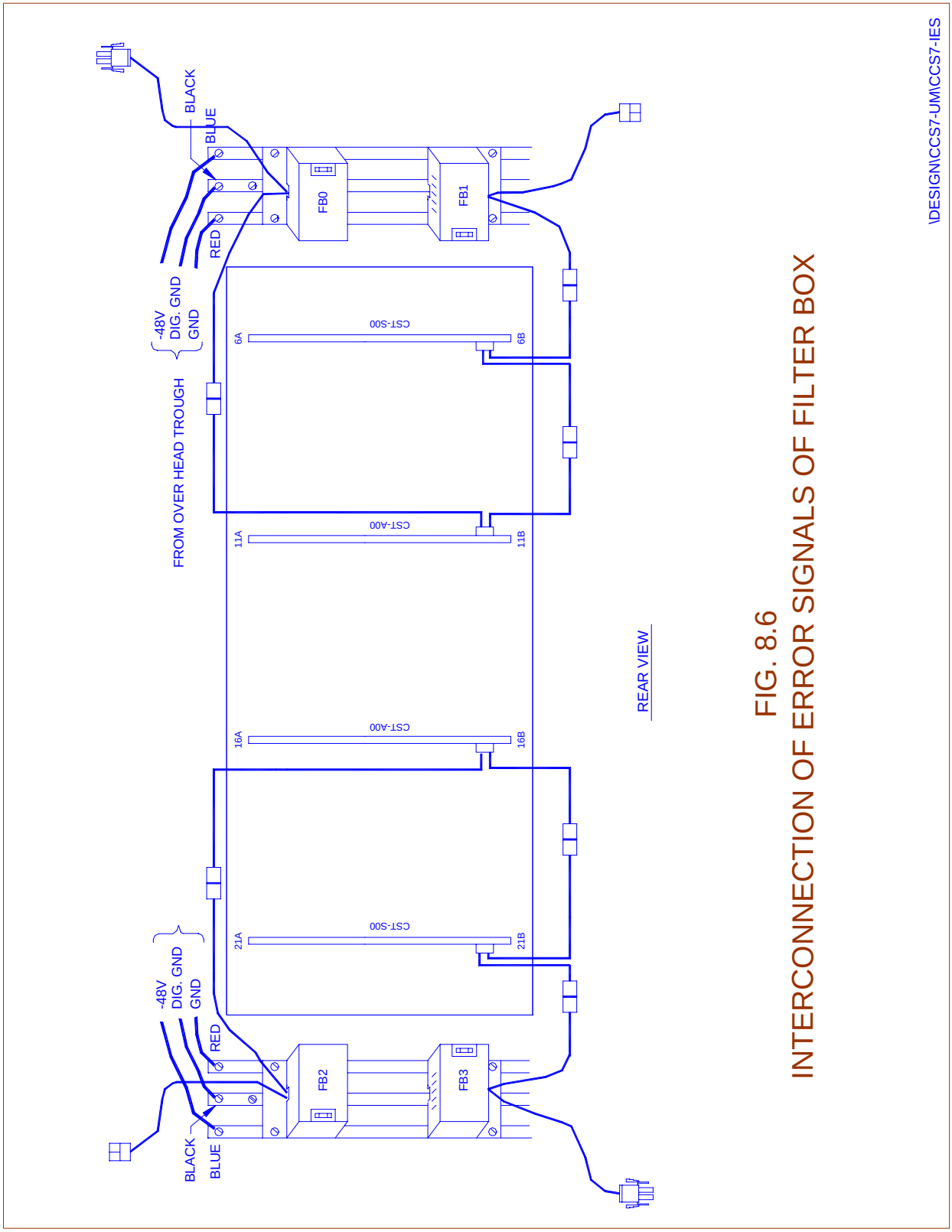
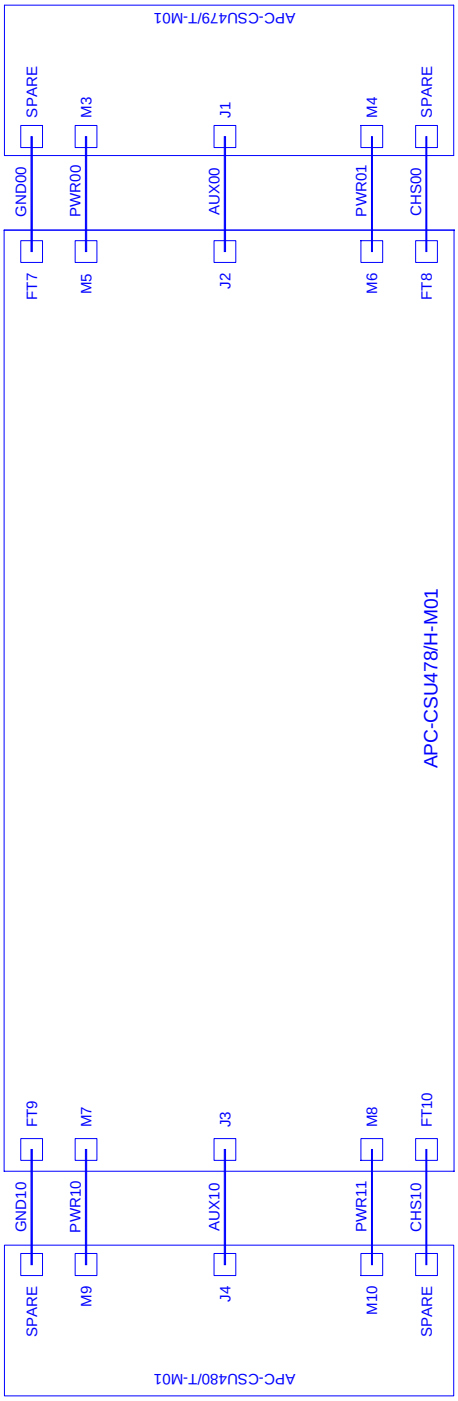


FIG. 8.6
INTERCONNECTION OF ERROR SIGNALS OF FILTER BOX



REAR VIEW

SL.NO.	CABLE MARKER NO.	SOURCE CONNECTOR	DESTINATION CONNECTOR
1.	PWR00	M3	M5
2.	PWR01	M4	M6
3.	PWR10	M7	M9
4.	PWR11	M8	M10
5.	AUX00	J1	J2
6.	AUX10	J3	J4
7.	GND00	SPARE	FT7
8.	GND10	FT9	SPARE
9.	CHS00	SPARE	FT8
10.	CHS10	FT10	SPARE

FIG. 8.7
INTERCONNECTION BETWEEN MOTHER BOARD FOR POWER DISTRIBUTION

\DESIGN\CCS7-UM\CCS7-IBM

Chapter 9.

SUM Retrofit Procedure

9.1. INTRODUCTION

As pointed out in Chapter 1, only one SUM can be equipped in the switch, in any TU position in any of the co-located BMs. **The SUM should not be equipped in a remote BM (RSU).** In the SUM, max. 4 or 8 SHM cards can be equipped, each catering to 8 terminals. Thus, a maximum of 32 or 64 time-slots out of 128 channels on the 8 Mbps link between SUM and TSC are consumed by the SUM.

The remaining time-slots of the terminal group can be utilized for equipping analog or digital terminations, using a separate frame in the concentration TU positions. Conversely, if SUM is equipped in a concentration frame position, it requires 8x free time-slots, where x = no. of SHM cards equipped in that terminal group. More information on utilization of free time-slots can be found in section 9.4.

9.2. SUM RETROFIT PROCEDURE.

The data required for equipage of the SUM in C-DOT DSS MAX is different from the data for an ordinary TU frame. Since only one SUM can be equipped in the exchange, the validation of the data is done in a different way. The information that the SUM is equipped in BMx (referred to as the “home BM”) should also be available at the Central Module (CM) processor complexes (SSC and APC). Normally, such data is not available at APC or SSC for the frames.

Thus, handling of SUM equipage is different from the equipage of a TU frame. However, like in the case of equipping of TUs, the SUM can also be equipped in concentration with an ATU or DTU. When SU is in concentration with DTU total no. of trunks equipped in DTU and PHC terminals in 7SU together should not exceed 126.

Data creation for CCS7 network entities is done separate from the exchange data. In the Bare Minimum Data Cartridge (BMDC), SUM is not equipped. This is so because CCS7 capability is not required at all the exchange sites and, wherever required, the SUM can be equipped over and above the exchange data.

The following procedure assumes that appropriate exchange release with CCS7 support has already been loaded by using the suggested procedures.

To equip SUM in a MAX switch in a principal or concentration TU position, the following procedure is to be followed.

a. In a working switch, if all principal TUs are already equipped and 7SU is to be equipped in a principal TU position, unequip a non-SUM type TU frame from the BM. Else, unequip a concentration TU frame.

   Follow the standard procedure for deleting routes/subscribers, TGPs, cards, etc., and unequip the frame.

   Use the command UNEQ-FRAME with the following parameters:

   MOD-NO = BM number of the home BM.

   RACK-NO = 1/2/3

   FRAME-NO = 1/2/3/4/5/6, depending on the frame to be unequipped

   With this, the status of the corresponding TIC/TUC will become UNEQUIPPED.

b. Pull out the TU frame if SUM is to be put in a principal TU position, i.e. in rack number 1.

   Note:

   In a working switch with available TU frame positions, or in a switch being installed, the above two steps should be skipped.

c. Insert SUM frame in place of the ATU/DTU removed, or in a free TU frame position or in a separate cabinet.

d. Complete all the physical connections of the SUM with the TSU as given in the previous chapter.

e. Replace the four 2A filter boxes on the busbars by 4A, 2mH filter boxes. The standalone cabinet should be fitted with four filter boxes of 4A, 2mH type.

   Connect the power supply to the SUM frame from the filter boxes as shown:

f. Check that the SUM jumper-ID is 5E (in copy0) and 5F (in copy1) on the frame, as shown (there are 8 jumpers each on both copies for this).

7SU Copy0	7SU Copy1
W1 *==* [close]	W13 * *
W2 * * [open]	W14 * *
W3 * *	W15 * *
W4 * *	W16 * *
W5 * *	W17 * *
W6 *==*	W18 *==*
W7 * *	W19 * *

W8 *==* W20 *==*

The TUC jumper setting will be according to the position where the 7SU is put.

Principal TU	1st Conc TU	2nd Conc TU	3rd Conc TU
W9 &W11 *==*	* *	*==*	* *
W10&W12 *==*	*==*	* *	* *

The TUI jumper setting will be as per the position of the SUM.

Note:

If the SUM is not being equipped for the first time, the above steps should be skipped.

g. Equip the SUM frame using the command EQUIP-FRAME with the following parameters:

MOD-NO = BM number

RACK-NO = 1/2/3

FRAME-NO = 1/2/3/4/5/6, depending on the frame to be equipped

TIC-ID = TIC ID of the frame to be equipped e.g. TI09-0/1 or TI10-0/1, etc.

FRM-TYPE = SU

This command will do the following:

- Check if the home BM is equipped
- Check if the corresponding frame is unequipped
- Download read only data in SSC, APC, all the BMs, including the home BM
- Update the unit status and card status for SUM with the Central Configuration Manager (CCM).
- Update equipage information of 7SU in the home BPC
- Check if TIC is OOS-OPR
- Update the existence of SUM in SSC and APC

If the frame was previously unequipped and this is the only frame equipped as SUM frame in the switch, this command will be honoured, otherwise rejected. (This can be confirmed after checking the database at the IOP. The data at IOP is created for SUM. BM Configuration Manager (BMCM) in the home BPC then marks the status of TIC as OOS-OPR.)

All further requests to EQUIP-FRAME should be rejected henceforth.

The report of the 7SU equipage is sent after the above procedure. The alarms for the 7SU are allowed henceforth.

h. Equip PHCs in the slots in which SHM cards are physically present.

Use the command EQUIP-TRML-CARD with the following parameters:

HW-TYP = PHC

VER-NO = 1

CARD-SLT = BM-rack-frame-slot, where slot=7/8/9/10 and 17/18/19/20, depending on the slot position of the PHC. [At least one PHC must be equipped in any of the slots to provide the C.85 channel towards the home BM, and hence enable SUM initialization.]

(This equips the SHM card/s in the SUM. The command will be rejected if SUM is not already equipped in the switch.)

i. Initialize SUM.

Use the command PUT-SWU-INS with the following parameters :

MOD-NO = Home BM Number

UNIT-ID = TUC ID of the 7SU, i.e. the value given for the parameter TIC=ID in EQUIP-FRAME.

The command will be rejected if the home BM goes down or equipage of C.85 (PHC) terminal with home BM is not available.

With the corresponding TIC becoming INS-ACT, the SUM gets a path to the APC and code load request from it is now entertained at the APC. A critical alarm will now be raised for SUM on the ADP.

After successful code, patch & data loading, SUM establishes ETE with APC, IOP & home BPC. The alarm mentioned above is now cleared from the Alarm Display Panel and a “Load Pass Report” is displayed on the OOD terminal and also printed on the printer.

Check: *If on equipping the first SHM card and putting the TUC in service, SUM initialization does not start, may be the PHC terminals are not in services (INS-NRM).*

After SUM comes up and module status is shown as IN SERVICE in DISPL-SYS-ALL command, the retrofit of the SUM is complete. Now create CCS7 data by following the procedures given in Annexes I and II.

9.3. UNEQUIPPING SUM IN A WORKING SWITCH

The procedure for unequiping SUM in a working switch is given below:

a. Delete all Signalling Point Codes, Signalling Route Sets, Signalling Links and related data.

b. Force out all terminal (SHM) cards in the SUM frame by using the command FRC-TRM-OOS with the following parameters:

TML-TYPE = PHC

TEN = bm-rack-frame-slot-trml, where slot = 7/8/9/10 or 17/18/19/20 and trml = 1/2/3/4/5/6/7/8

Note:

Each PHC has 8 terminals in 2 terminal complexes of 4 terminals each. Forcing out one or more terminals in a terminal complex forces out all 4 terminals in that complex.

The terminal-complex containing the C.85 terminal(s) towards the home BM can be forced out only when all other terminal complexes in the frame are OOS-OPR.

c. Unequip all the SHM cards in the SUM frame.

Use the command UNEQ-TRML-CARD

with CARD-SLT = bm-rack-frame-slot, where slot = 7/8/9/10, 17/18/19/20.

d. Force out the TUCs of the SUM frame. Use the command FRC-SWU-OOS with the following parameters:

MOD-NO = Home BM number

UNIT-ID = TUC ID of the SUM.

e. Unequip 7SU. Use the UNEQ-FRAME command with the following parameters:

MOD-NO = BMx (the home BM)

RACK-NO = 1/2

FRAME-NO = 1/2/3/4/5/6

All the BMs, SSC and AP are informed that SUM no longer resides in the exchange.

All subsequent commands for EQUIP-FRAME henceforth are allowed on this frame. All the CCS7 related commands henceforth should be rejected until SUM is equipped again.

9.4. UTILISATION OF UNUSED TIME-SLOTS

The SUM can be equipped in any frame position, as well as in any concentration position. In the home BM, if all four TUs are equipped, the SUM can be in a separate cabinet, in a concentration position with a principal TU. Similarly, the SUM can be in the principal TU position, and a TU frame in concentration position can use the unused time-slots. It is also possible to concentrate these unused time-slots and use them for subscriber lines or trunks.

The parameters for the commands discussed above will get changed depending on the placement of the SUM. The unused time-slots can be used by equipping terminal cards using EQUIP-TRML-CARD command with appropriate TIC IDs.

Presently, the PHCs in 7SU utilize up to 32 time-slots allotted by BPC. With HPC 7SU utilizes 64 time slots for 64 PHC terminals. The terminal IDs (8..15, 24..31, 40..47, 56..63) get mapped to the time-slots allotted by BP at the time of connection. While establishing a #7 or C.85 link, it is desirable that a time-slot is available whenever a connection is to be made, without any contention and re-attempt. Hence, 32 time-slots are to be kept reserved for SUM. The TU sharing the 128 time-slots with the SUM should be equipped such a way that its requirement is restricted to 96 time-slots.

Concentration with a DTU: The SUM can be put behind a DTU with the DTU in the primary position. With minor changes in DTU backplane, it also can be used in concentration position behind SUM. Here, 3 PCMs can be equipped by which 96 time-slots will get nailed up to TUC. The remaining 32 (with BPC cards, with HPC 64 time slots will be used by SUM) will be meant for SUM whenever a CCS7 or C.85 link is required to be set up.

Concentration with a ATU: After initialization of SUM (and setting up of CCS7 and C.85 links according to initial configuration), all the remaining time-slots can be utilized by the ATUs, in concentration mode. However, if more time-slots are required by 7SU later on, and if they are not available, trunks will have to be deleted through operator commands to make time-slots available.

Chapter 10.

SUM Initialization

10.1. OVERVIEW

Initialization procedures are used to bring up the system from `cold' level and load the code, patches, data and initialize the entire system to a level in which calls can be processed. During initialization if at any time the system faces a unrecoverable software/hardware problems, it will try to solve the same by going for higher level recoveries like soft start, stable clear, partial initialization or code load.

10.2. LEVELS OF INITIALIZATION

There are many levels of SUM initialization. Each level will involve a subset of the steps c) through h). Only after completion of step h) will the system be ready for service.

a) Code loading

b) Patch loading

c) Exchange data base loading

d) Administration data loading

e) Call processing data initialization (viz. creating time slot maps etc.)

f) Maintenance data loading

g) Process initialization in BPC

h) Initialization of all units

The different levels of initialization are described below:

Power On	This will occur when the power to Administrative Processor (APC)/Base Processor (BP) or SUM is switched on. In this case (the SUM CPU) SU7 will go for power on tests. After these tests pass, it will try to communicate with the copy to find out whether it is active or not. If no reply comes from the copy it tries to become active by acquiring the memories. If the SU7 is able to contact at least one memory (BME), it will become active with that memory. Then it undergoes all the steps from c) through h).
Code Load (Level 0)	This level is triggered by software recovery or by operator command. In this case all the steps from c) to h) are executed.
Patch Init (Level 1)	This level is triggered by operator command only. In this case all the steps from d) to h) are executed.
Part Init (Level 2)	This level is triggered by software recovery or by operator command. In this case all the steps from e) to h) are executed.
Stable Clear (Level 3)	This level is triggered by software recovery or by operator command. In this case all the steps f) to h) are executed.
Soft Start (Level 4)	This level is triggered by software recovery or by operator command. In this case only the steps i) & h) are executed.

In all the above levels of initialization, all the calls which were in progress will be terminated.

10.2.1. Sequence of System Initialisation

The system initialization sequence is as follows.

AM --> CM -->BMs --> SUM

Only after the highest module has completed its initialization can the lower module/modules start their initialization, however, the levels of initialization can be different. If AM gets initialized when all other modules are in initialized state all these modules will initialize to stable clear. Irrespective of level of initialization of AM, BMs can be initialized independently. However, only 16 BMs can down load code/patch parallel at a time. After home BM containing SUM has completed initialization, SUM will start initialization.

10.2.2. Relation between Home BM Initialisation and 7SU Initialisation

Whenever the home BM goes for initialization, SUM will also go for initialization. The relationship between home BM initialization and SUM initialization is given in the table below.

Home BM Initialisation	Corresponding 7SU initialisation
Code load	Code load
Patch load	Patch load
Part init	Part init
Soft start	Soft start
Stable clear	Stable clear

10.3. CONDITIONS OF INITIALIZATION

The system can go for initialization in two ways -

- by itself, or,
- as a result of operator command.

The reasons for spontaneous initialization can be many and are summarized in the table below.

Level of Initialisation	Reasons
Code load	• System power off/on or reset. • Unrecoverable error in code area in simplex memory condition. Data comparison error in code area. • More than a certain number of recoveries in certain time. • Switchover of APC/BPC/SSC/SU7 during patch or code loading.
Patch Init	• Switch over during data loading.
Part Init	• Data comparison error in read only data (ROD) area. • Unrecoverable error in ROD area in simplex memory condition.
Stable Clear	• Data comparison error in read- write data (RWD) area. • Unrecoverable error in RWD area in simplex memory condition. • Overflow of software recovery counters within certain time. • Failure of both time switches, message switches or SCICs
Soft Start	• Any exception when Operating System (OS) of a static process is running.

On the other hand, Operator can give INIT-MOD/INIT-SYS commands to make the system go for any level of initialization by giving a proper initialization option.

10.4. POST-INITIALIZATION CHECKS

As a matter of practice, the operator should always make the following checks after every initialization activity - spontaneous or otherwise.

- Check the status of all the switch units and alarms
- Check the status of all the signalling links
- Check the status of ISUP trunks and PHC terminals
- Make one or two calls through all the trunk groups
- Verify that incoming calls are successful
- Verify that switch unit status and alarms are proper and are identical on both the IOPs
- Check whether all ADP LEDs are functional (use “LED Test” button on the ADP).

Chapter 11.

Routine Maintenance

11.1. GENERAL

Initiatives to be taken by maintenance personnel in the best interest of the system's health are highlighted in this chapter.

Routine maintenance philosophy, as applicable to the system as a whole, is described first. What needs to be done for the maintenance of switch hardware, terminal hardware, PSU cards and IOPs are covered later.

11.2. ROLE OF MAINTENANCE PERSONNEL

Keeping a watch on the system's health, trouble fixing and programming periodic routining strategy in advance form the major functions to be performed by the maintenance personnel.

In addition to above, following functions also require human attention:

1. Co-ordination with remote exchanges for trunk testing and signalling link maintenance.
2. Providing the necessary feedback to the support centre.
3. Day to day logging of important observations and maintenance actions.

Some of the above functions are briefly described in the following paragraphs :-

11.2.1. Watch on System's Health

This involves ensuring periodic dump of desired information, scanning reports generated by the system and verifying systems integrity with a view to uncover any abnormalities in system's behavior, and being vigilant towards the audio-visual alarms raised by the system.

Moreover, when a new card is brought to service, vigilance towards system's behavior is needed to uncover any malfunctions, which can be attributed to the new card.

11.2.1.1. Ensuring Periodic Dump of Desired Information

System, on its own initiative, keeps generating various reports regarding system's health as and when significant events take place. Maintenance personnel too can programme the system in advance, for generating various periodic reports including the following. Such reports are to be scanned daily to enable them to track the system's health on a day-to-day basis.

i. List of all switch units and terminals having OOS-OPR status.

ii. List of all switch units found faulty by the system (OOS-SYS).

iii. List of all terminals found faulty by the system (OOS-SE/ OOS-SO)

iv. List of service circuits and trunks found faulty by the system or by the operator.

v. List of CCS7 circuits (CICs) having status as BLOCKED INS-S7BSY or as OOS- TRANS.

Above reports can be generated by storing appropriate commands along with the execution time and interval in the system's calendar.

11.2.1.2. Scanning Spontaneously Generated Reports

All reports, periodic or otherwise, should be scanned daily keeping following objectives in view:

i. To identify fresh repair needs.

ii. To verify the repair activity done earlier is successful or not.

iii. To verify that no. of lines and CCS7 circuits (CICs) having Out of Service (OOS) status is within acceptable limits.

iv. To detect any abnormality in system's behaviour.

v. To verify that no unit or link of the system remains untested or in passive service, for a long duration.

vi. To identify important observations, reports, which are of interest to the support centre.

11.2.1.3. Verifying System Integrity

It is worthwhile to keep verifying system's integrity manually from time to time. This can help in uncovering those faults that might have remained undetected so far.

11.2.2. Trouble Shooting

The need for this phase arises either on external complaints or observation of abnormal situations or when the system itself finds one or more units faulty.

Fault isolation involves interpretation of Alarm and associated Report and if applicable, use of on-demand tests and reference to system trouble fixing procedures' given this chapter.

Repair action such as card replacement, if not critical, can be deferred to convenient hours as the system (in most of the cases) can automatically recover from faults through reconfiguration.

11.2.3. Periodic Routining

This involves exercising those parts of the system hardware elements which are not normally in use so as to bring out the latent faults much before they adversely affect user services and to reduce the chances of an active unit going faulty in case of duplex units. This can be done manually by issuing diagnostic commands by the operators.

The system has however, the capability to periodically routine entire hardware and generates routining reports. Maintenance personnel have to dictate the time of day at which routining should be done, the sequence in which units be tested, and the periodicity of routining. The strategy regarding assignment of active or passive role to a duplex unit found fault-free after routining is to be chosen and communicated to the system in advance.

Following steps are needed for periodic testing: -

a) Deciding a schedule for routine testing.

b) Conveying the schedule to the system.

c) Analysing routining reports.

Each one of the above steps is described below.

11.2.3.1. Deciding a Schedule

This involves the following:

i. To choose the time of testing/routining in such a way that subscriber services are least affected.

ii. To choose appropriate interval for routining giving due weightage to the fact that faults should not remain hidden for "too long".

iii. To choose a sequence in which units are to be tested.

iv. To ensure that various units and links of the system do not remain in "non-active" service for too long.

A typical schedule could be as follows:

Periodic testing is performed daily at low traffic hours, say at 00-30 hrs at night. Higher level unit, say BP is tested before a lower level circuit, say a terminal circuit, gets tested. After a duplex unit is found fault free, it is assigned ACTIVE state and its mate standby state. Care is also taken that "links" which have been unused earlier become (under use) active now.

11.2.3.2. Conveying the Schedule to System

This involves preparing a file of commands needed for periodic testing and specifying in the system's calendar the time of day and the periodicity for executing the command file.

Once this is done, at specified time interval, System automatically keeps routining exchange hardware and generates reports.

In case of manual testing, the operator needs to initiate the tests manually as per the schedule drawn.

11.2.3.3. Scanning Routining Reports

Routining reports convey the test results to maintenance personnel. It is essential to scan the said reports daily so as to confirm the following: -

i. Periodic testing/routining schedule is actually being done.

ii. No unit or link remains in passive role for a long period.

iii. No unit or termination remains un-tested for a long period.

iv. Routining was not abandoned in-between.

v. Units or terminations are generally found in good health after routining.

vi. Routining failures also result in generation of diagnostic reports, alarm reports and appropriate alarms on the OOD.

In case above is not true, further investigations are initiated.

11.3. Routine Maintenance of SUM

Routine maintenance for the CCS7 Signalling Unit Module is described in the following sections. These section contain-

i) Fault maintenance of SUM describing the hardware faults in signalling unit and their corrective actions.

ii) CCS7 circuit related problems and their solutions.

iii) Signalling link related problems and their solutions.

iv) Initialization related problems.

11.3.1. Fault Maintenance of SUM

S.No.	Hardware Unit	Switch Unit Fault	Alarm type	Corrective action
1.	SU7	Both SU7 in Out Of Service (OOS) state	Critical Alarm at OOD. On ADP, critical alarm will be raised for SUM.	• In this situation, SUM will be under initialization. First check the status of both the TUCs of SUM. If they are out of service, bring them in service. After TUCs come in service, code loading will automatically start for SUM • If TUCs are inservice, then see all the pending alarms for SUM from OOD log or DISPL-ARM-LIST. This situation can arise if both the SU7 cards have failed simultaneously or both the BME cards memories have failed simultaneously. Find this out from the pending alarms for these units from OOD and replace these cards one by one. After this, give a reset to both CPU and code loading should start.
2.	SU7	One CPU of a plane in OOS state	Urgent alarm at OOD. Urgent In ADP alarm will be raised for SUM.	• Check if both PSUs in that plane are inservice (Check if there is any PSU alarm in the alarms list) • If PSU is Okay then diagnose SU7. If SU7 found faulty, replace the same and bring it inservice by PUT-SWU-INS command
3.	BME	One memory in	Urgent alarm at	• Check both the PSUs of

S.No.	Hardware Unit	Switch Unit Fault	Alarm type	Corrective action
		OOS state	OOD. On ADP, Urgent alarm will be raised for SUM.	that plane they should be inservice. • Diagnose the memory (BME) and if found faulty, replace the card and bring it in service by PUT-SWU-INS command
4.	BME	Both memory out of service	Critical alarm at OOD. On ADP, critical alarm will be raised for SUM.	Same as in 3 above.
5.	TUC	One TUC out of service	Non urgent alarm at OOD. On ADP alarm will be raised for the home BM	• Check if any higher unit of that copy is out of service • Check if PSU of that plane is out of service • Check the fuse of TUI card • Diagnose the TUC and see if there is a communication problem between the TUC and other units (i.e. cable problem etc. or with SPC). If TUC found faulty replace the card and bring it inservice by PUT-SWU-INS command
6.	TUC	Both TUCs out of service	Critical alarm at OOD. On ADP, alarm will be raised for the home BM. Also critical alarm will be raised for SUM.	• In this case SUM will go out of service and after TUC comes inservice SUM will go for initialization. • Check if some higher unit is down e.g. If SUM is in concentration then Principle TUC or TSC is down. • If all higher units are inservice then check the

S.No.	Hardware Unit	Switch Unit Fault	Alarm type	Corrective action
				fuse of TUI cards. Diagnose both TUCs and find the exact fault. (i.e., communication problem with higher unit due to cable problem or problem with SPC etc.). If TUCs found faulty then replace the card and bring it inservice by PUT-SWU-INS command
7.	SHM (PHC Terminals)	One SHM (PHC) card out of service	Non urgent/urgent/ critical alarm at OOD depending on the threshold kept at system limit	• Test all the PHC terminals by giving TST-TRM command. • If the test fails, jackout and jack in the PHC card and test again. If the card fails again, replace the card.
8.	SHM (PHC)	All PHC cards out of service	Critical alarm at OOD. At ADP critical alarm for SUM will be raised.	• SUM goes for initialization • Check if PSU of that plane are inservice or not. If PSU of plane faulty/replace the PSUs. • The test the terminals of that card • If cards are found faulty, replace the cards.

Note:

Do not Put/free out all the PHC cards of SUM. If such a situation arises then see the corrective action given in dos & dont's

11.3.2. CCS7 Voice Circuit Related Problem

In the event of unavailability of signalling links the CCS7 voice circuits will come in INS/INSF - S7BSY state. In such an event, the circuits will be blocked and not available for voice communication. First check if the signalling link corresponding to the voice circuits (CICs) are “ACTIVATED &

AVAILABLE". If all the signalling links are down (i.e. out of service, deactivated or blocked) voice circuit will be S7BSY. So try to activate at least one signalling link. If even one signalling link is in "ACTIVATED & AVAILABLE" state then follow the corrective procedure given in Fig. 11.1.

11.3.3. Signalling Link Related Problems

Status of a signalling link can be one of the following :

i) Activated and Available

ii) Out of Service

iii) Activated and Blocked/Remotely Blocked

iv) Deactivated

v) Activated and Locally Inhibited/Remotely Inhibited

Signalling link will carry signalling messages only in the "Activated & Available" state.

- If signalling link is locally blocked or locally inhibited then unblock or uninhibit the link by using the "Mod-lnk-sts" command. If the link is remotely blocked or remotely inhibited then ask the other exchange personnel to unblock or uninhibit the signalling link from his side by using appropriate status change command.
- If the signalling link is in deactivated state then try signalling link activation by using MOD-LNK-STS or MOD-LS-STS command and follow the steps given in Fig. 11.2/Fig. 11.3.

11.3.4. Initialisation Related Problems

If SUM was up and it goes for some level of initialization due to ETE failure with home BPC or APC, or PSU fault etc. and then does not come up, then Check if TUC of SUM is inservice and atleast one copy of SU7 is inservice. If yes, then, reset all the SHM (PHC) cards. Else, first bring atleast one TUC copy in service. If initialization does not start still then give a soft start to the home BM.

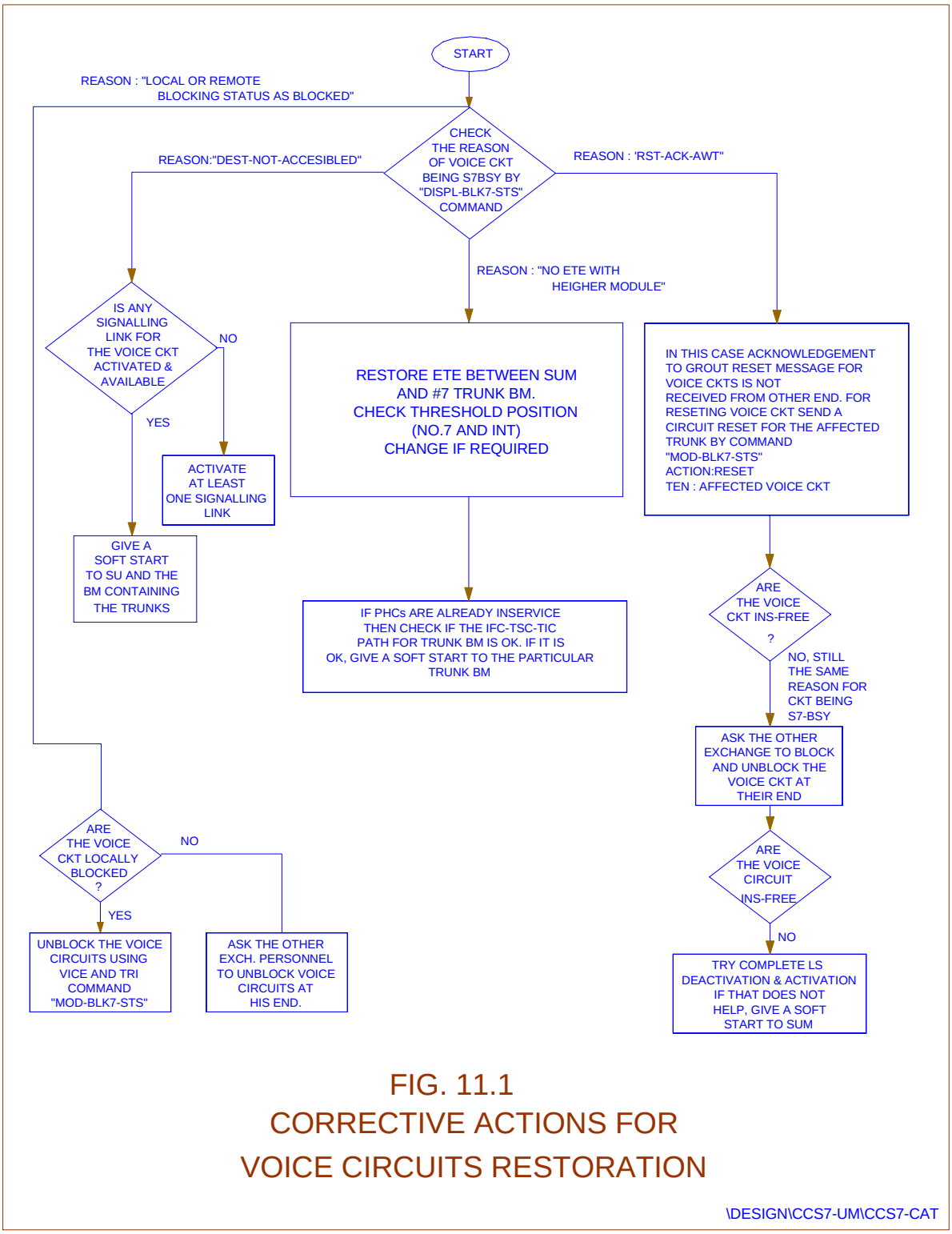


FIG. 11.1
CORRECTIVE ACTIONS FOR
VOICE CIRCUITS RESTORATION

\DESIGN\CCS7-UM\CCS7-CAT

11.3.5. CCS7 Related Do's & Don'ts

a) Always create atleast two signalling links between any two nodes, one each in a different PCM. These links work in load sharing mode.

b) Do not make all PHC terminals OOS-OPR at any given time. It is not possible to bring terminals INS from this situation. The only possibility is to unequip PHC terminal and equip it again & proceed.

c) Also if only one SHM card is available, do not jack it out or make all its terminals OOS-OPR.

d) Take printouts of CCS7 link report (LNK-REP) and route set report (RTSET-REP) during busy hour and lean hours, and during link and route outages. These will help in traffic and equipment planning and problem analysis.

e) Carefully log OOD alarms and spontaneous fault reports corresponding to SUM entities. The reports can come in the following situations:

   a) CCS7 destination node becomes inaccessible/accessible.

   b) Link Set Bundle becomes faulty or first link comes up.

   c) Link thresholds are breached in a linkset

   d) Linkset status changes leading to rerouting

   e) Linkset failure

   f) Do not put/force out TUC's of SUM out of service. This will lead to initialization of SUM.

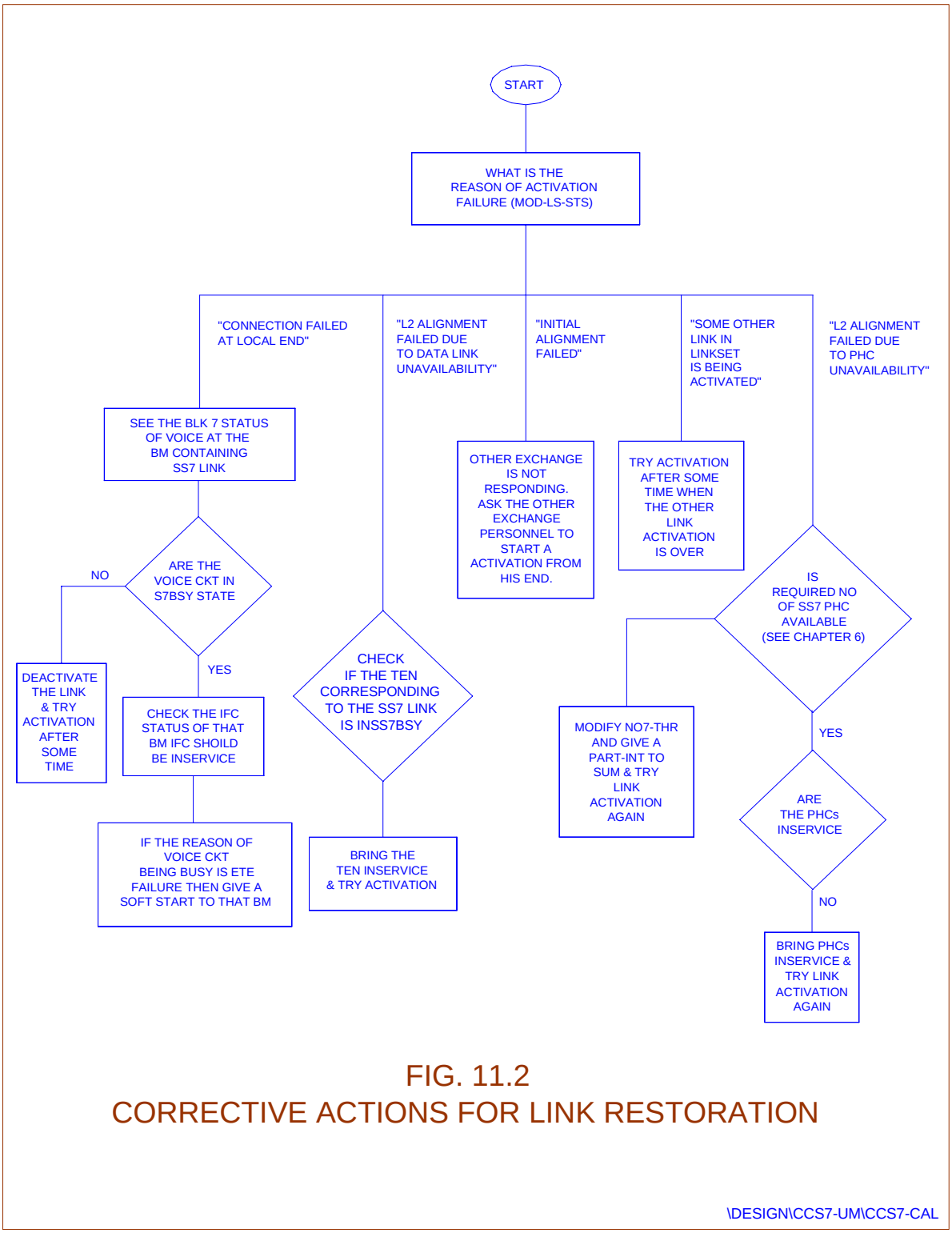


FIG. 11.2
CORRECTIVE ACTIONS FOR LINK RESTORATION

\DESIGN\CCS7-UM\CCS7-CAL

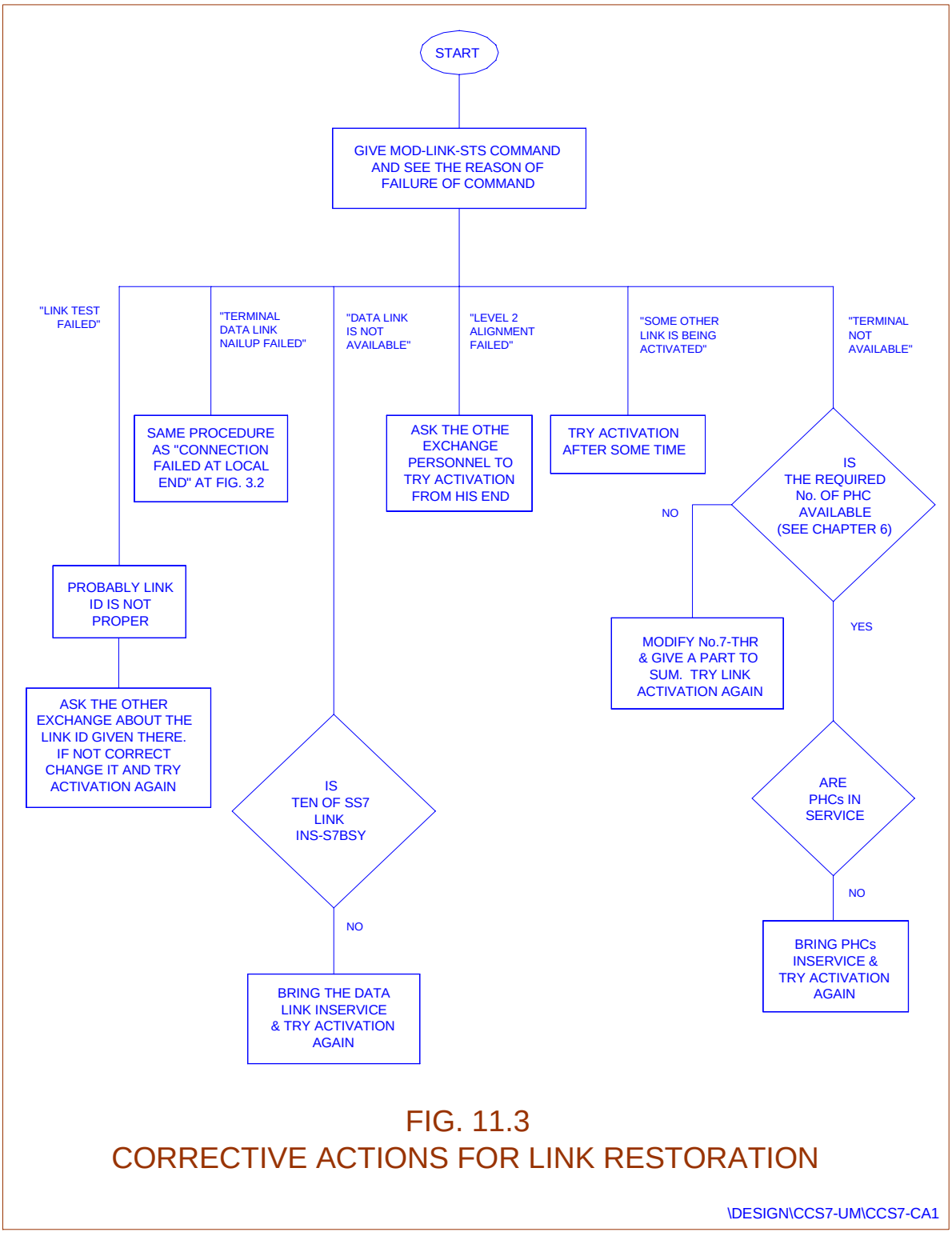


FIG. 11.3
CORRECTIVE ACTIONS FOR LINK RESTORATION

\DESIGN\CCS7-UM\CCS7-CA1

Chapter 12.

Engineering the SUM

12.1. ENGINEERING CONSIDERATIONS

The only growth element in SUM is the SHM card. SHM card contains Protocol Handler Controller (PHC) terminals, which can be configured as signalling terminals or internal message protocol (C.85) terminals. The maximum number of SHM cards can be 4 (if the SUM CPU is BPC) or 8 (if the SUM CPU is HPC). Since there are 8 terminals on a SHM card, total 32 or 64 terminals are available. Out of the pool of PHC terminals (say N = 32 or 64) the minimum overhead for internal communication is as follows:

a) Two (2) C.85 terminals for internal message communication of the SUM with the home BM.

b) One (1) C.85 terminal each for any other BM having CCS7 trunk circuits or signalling data links. In case of Service Switching Point (SSP) application, one C.85 terminal per equipped BM is required.

Hence total requirement for C.85 type of terminals will be, say, `m' where-

m = No. of BMs other than "home BM" having CCS7 circuits/links

+2 – (i); or = No. of BMs + 1 – (ii) in case of SSP application.

And, the no. of terminals available for signalling = n = N-m (iii)

At the time of SUM initialization, there is automatic allocation of C.85 and signalling terminals in the rates dictated by the system parameters INT-THR and NO7-THR. These parameters are infact the threshold for the internal (C.85) and signalling (NO7) terminals. **The value of these thresholds should be set such that the minimum number of internal (C.85) terminals are available at initialization. Else, the thresholds have to be modified.**

The value of INT-THR is given by

$$\text{INT-THR} = \frac{m}{N} \times 100\ \% \text{ - (iv); and,}$$

NO7-THR = 100 – [INT-THR]%

$$= \frac{N-m}{N} \text{ x } 100\% \text{ - (iv)}$$

Out of the n signalling terminals, the actual utilization of will depend on the signalling network connectivity of the node and the amount of signalling traffic to be handled. The above discussion is further illustrated by way of example in the following section.

12.2. SIGNALLING NETWORK CONNECTIVITY: AN EXAMPLE 1

Let us say, the C-DOT exchange (signalling network node) is connected to four other nodes A, B, C & D via signalling links. The CCS7 trunks are spread over four (4) trunk BMs in the switch. This is depicted in Fig. 12.1. From (1) we have that the requirement of internal message (C.85) terminals.

M = No. of trunk BMs other than the home BM +2 = 4 + 2 = 6 ---------- (v)

Hence, from (iv) we calculate that

$$\text{INT-THR} = \frac{6}{32} \text{ x } 100 = 18.75\% \text{ or } 19\%,$$

and, NO7 – THR = 100-19 = 81%

Note that we are assuming SUM CPU to be BPC and hence maximum 32 PHC terminals.

The system parameters INT-THR and NO7-THR should be set to these values by MOD-SYS-PARAM command. The terminals left for CCS7 signalling will be

n = N-M = 32 - 6 = 26

These 26 terminals can be used to create upto 26 signalling links. Number of signalling links towards a particular destination depends on the volume of traffic and redundancy consideration. However, it is advisable that for redundancy atleast two (2) signalling links on two different PCM streams should be used.

Each signalling link can carry a traffic of about 35,000 to 40,000 BHCC with BPC CPU. If the volume of traffic towards a destination exceeds 80,000 BHCC, one more signalling link apart from the two existing should be used.

In the network of Fig. 6.1, total PHC terminals that will be used for CCS7 signalling = 2+2+2+2 = 8 ------ (v)

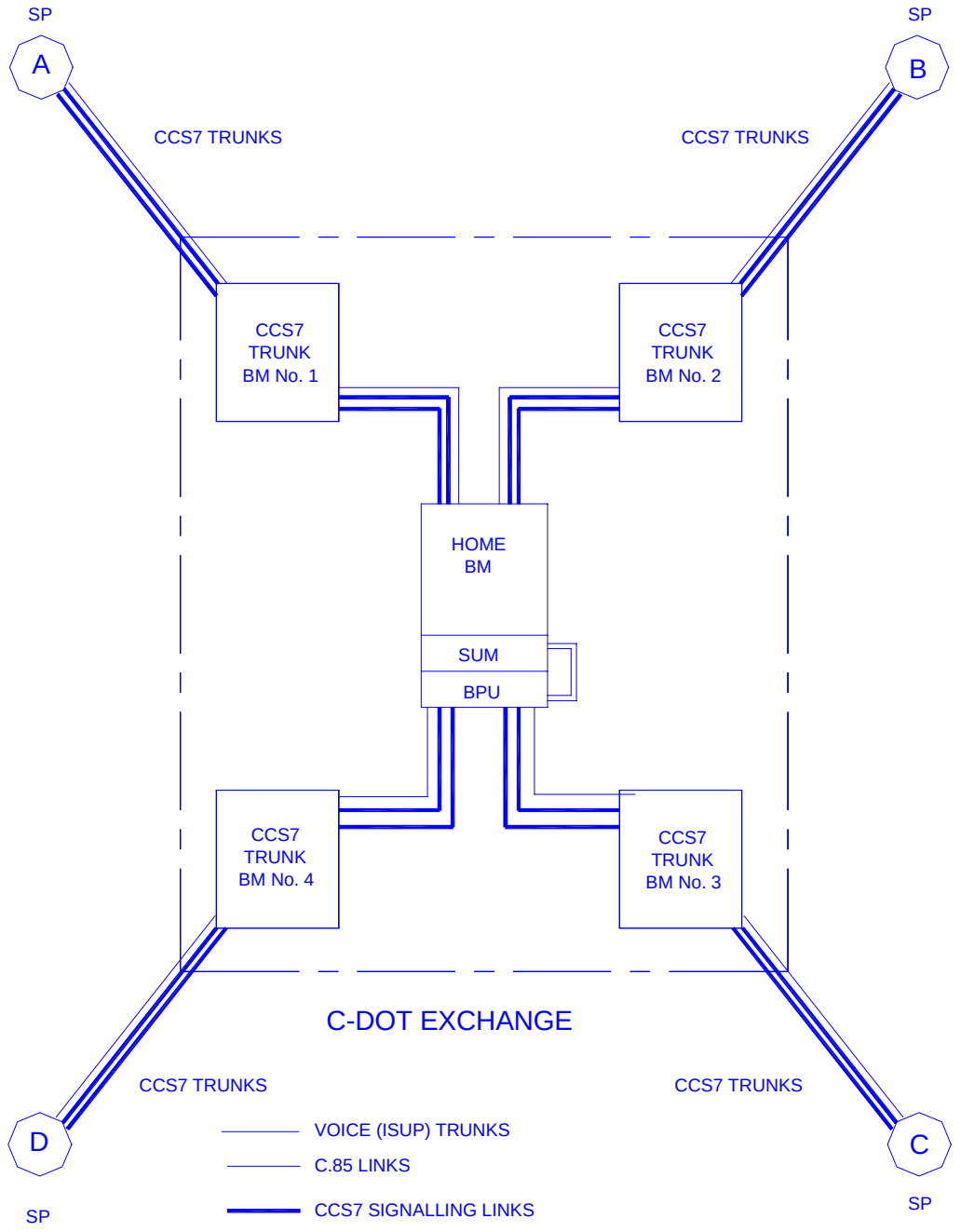


FIG. 12.1
SIGNALLING NETWORK CONNECTIVITY FOR PSTN/ISDN

\DESIGN\CCS7-UM\CCS7-SNC

This means that out of the 26 signalling terminals, only 8 will be utilised and 18 will be spare. In order to economize on SHM equipage, it is advisable here that only two (2) SHM cards be equipped. If it is so then;

N = 16

m = 6

n = N-m = 10

still, 2 signalling terminals will be spare!

By keeping in mind prudent spare card equipage philosophy, in addition to these two (2) SHM cards, one more may be kept as spare and used only in case of failure of one of the two equipped cards.

12.3. SIGNALLING NETWORK CONNECTIVITY: EXAMPLE 2

In this example, the requirement of SUM resources in a SSP application is calculated. The connectivity and equipage of the SSP is depicted in Fig. 12.2. Here,

The number of BMs = 10

The number of other network nodes to which the SSP is connected = 10

The no. of C.85 terminals required will be = no. of BMs + 1 = 10+1 = 11; and

The min. no. of CCS7 terminals required will be = (10x2)+ 2(towards SCP)=22

∴ Total no. of PHC terminals required will be = 11+22=33

This means that HPC card will be required for SU7.

The value of terminal thresholds assuming 5 SHM cards will be as follows:

INT-THR = 11/40 x 100% = 30% ; ≈ 12 terminals

NO7-THR = 100-30% = 70% ; ≈ 28 terminals

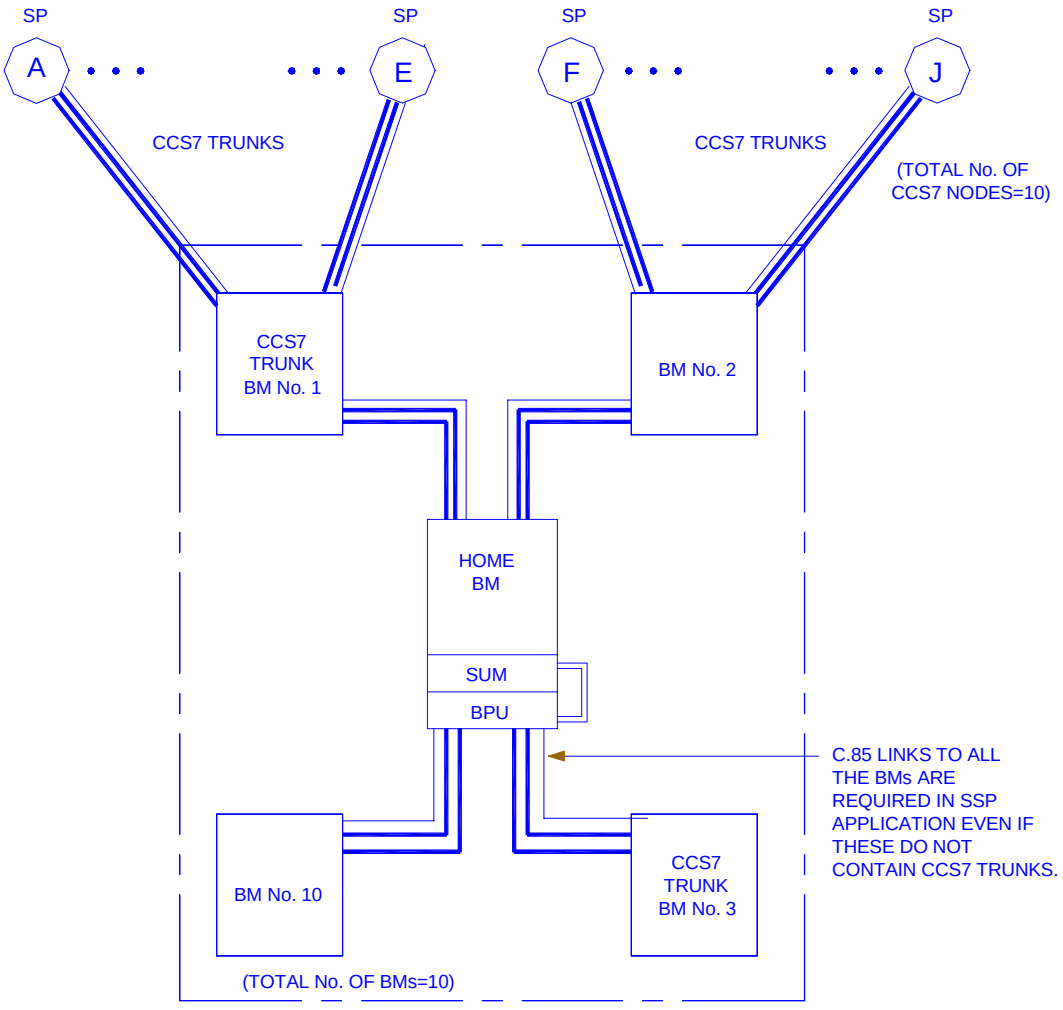


FIG. 12.2
SIGNALLING NETWORK CONNECTIVITY FOR SSP

\DESIGN\CCS7-UM\CCS7-SSP

Annexure - I

CCS7 Data Creation for PSTN/ISDN Application

For creating data is order to realize the connectivity shown in Fig. I.1, the following commands are executed in the order given below.

1. CRE-SPC (Create Signaling Point Code)

[SIG-NW]	=	NW - NAT
SPC-LST	=	1000 (Signaling point code of node A).

2. CRE-CGS (Create Circuit Group Set)

CGS-NUM	=	1 (CGS number)
CGS-NAME	=	CCS71 (CGS name)
SELF-PC	=	1000 (Self point code of the node A)
DEST-PC	=	1001 (Destination point code, of node B).
[SIG-NW]	=	NW-NAT
[USR-PART]	=	ISUP

3. CRE-TGP (Create Trunk Group)

TGP-NUM	=	1 (Trunk group number)
TGP-NAME	=	CCS71 (Trunk group name)
TGP-STA	=	BW (TGP Status = Bothway)
LIN-SIG	=	DIG-CCS (Line Signalling = Digital CCS)
REG-SIG	=	CCITT-R7 (Register Signalling = CCITT No. 7)
[CGS-NUM]	=	1 (CGS number)
[CGS-NAME]	=	NONE (CGS name = None, i.e. not specified)
[RNK-DGT]	=	4 (Rank of digit)
TGP-TYPE	=	ORD (TGP type = ordinary)
[DGT-SZFD]	=	1 (minimum Digit Seize Forward)

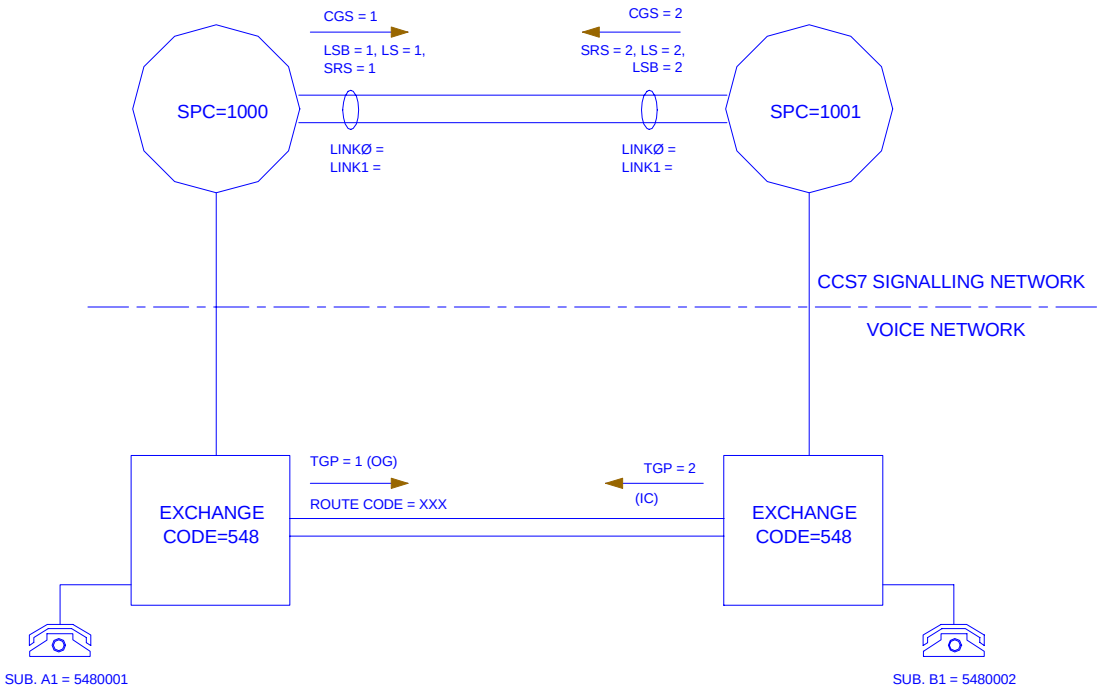


FIG. I.1
SIGNALLING & VOICE NETWORKS SETUP

\DESIGN\CCS7-UM\CCS7-VNS

AC-STA = 2WP (Two Wire Protocol)

[SIG-INF] = ISUP-CRG-CHB (ISUP Charging Methods = Charge Band)

[#7 TEN] = BMNO-FRAMENO-RACKNO-SLOTNO-PCMNO-CKTNO

#7 Terminal Equipment Numbers, e.g., if only one PCM is included in the circuit group then #7 TEN numbering will be as follows :

X-X-X-X-1-2 TO X-X-X-X-1-32, where 1 is the PCM id and X-X-X-X is the DTK slot no. Depending on the PCM id the voice circuits of the trunk group are given CIC numbers. The CIC numbers at the remote and should be same for the particular PCM otherwise the voice circuits will be blocked.

Rest of the parameters are given default values. Also, see the notes at the end for a discussion of important TGP-related parameters.

4. CRE-LSB (Create Link Set Bundle)

LSB-NUM = 1 (Link set bundle number)

[CGS-NUM] = 1 (CGS number)

[CGS-NAME] = NONE (CGS name)

[STP-USER] = NONE (Signaling Transfer Point user = None, since the exchange is not a STP).

[DEST-PCS] = NONE (Destination point codes = None; same reason as above)

LM-MTHD = BASIC (Link management method = BASIC. For a LSB, once the LM method is defined, then all the link sets will have the same method).

MX-MSGSZ = DATA272 (Maximum MSU size = 272 octets)

5. CRE-LS (Create Link Set)

LS-NUM = 1 (Link set number)

LSB-NUM = 1 (LSB number in which this LS will exist)

[MNAC-LN] = 2 (Minimum active Links threshold for alarm)

[MXAV-LN] = 2 (Maximum available links thresholds for alarm)

[MNAV-LN] = 2 (Minimum available links threshold for alarm)

PC-LST = 1001 (Point code of the destination)

EC-OPTN = BASIC (Error correction option = Basic)

[MXMS-RB]	=	127 (Maximum no. of MSUs in retransmission buffer)
[MX-OCTET-RTB]	=	4095 (Maximum no. of octets in retransmission buffer).
LOG-LNK	=	0&1 (Logical link identity in the LS. The logical link ids should be same for the corresponding time slot at the remote end also.)
[DAT-LNK]	=	X-X-X-X-16 & X-X-X-X-17 (TENs corresponding to #7 signalling links. The TEN X-X-X-X-16 and hence time slot 15th will have logical link id as 0).

6. CRE-SRS (Create Signaling Route Set)

SRS-NUM	=	1 (Signaling route set number)
DPC	=	1001 (Destination point code)
[SIG-NW]	=	NW-NAT
PR1-RT-TBL	=	1 (High priority route table)
[PR2-RT-TBL]	=	NONE (If low priority route code is not to be given)

Rest of the parameters are given the default value. After each command, appropriate display commands should be used to confirm the data created. Also, see notes at the end for description of some important parameters.

Note:

1. TGP Related Parameters

- TGP-STA (TGP status) should always be bothway (BW)
- SIG-INF (Signalling Information) parameter controls the charge method to be used for this TGP at TAX and nature of address indication for STD/ISD calls. The parameters are described as follows.

ISUP-CRG-CHB: If SIG-INF is set to ISUP-CRG-CHB, Charging will be done according to charge Band message coming from remote end, when the exchange is acting as a local exchange and expecting charging information from TAX. Charge Band contains a Band number corresponding to which a charge rate association should be there. This Band is used by exchange to refer to the charge rate number and, then charging is done according to that charge rate. Charge rate number - Charge Band association is done by command MOD-CHB-CRG.

Similarly if the exchange is TAX then the charge rate number being used in the outgoing route should have a Band number attached to it. For the route calls this band number will be sent back to local exchange.

Charge band is to be used only when the full link between local exchange and TAX supports CCS7.

ISUP-CRG-CHU: This method of charging is just like charging in case of MF trunks using charging pulses. For each unit to be charged, here a charge message is sent by TAX to local exchange. In this case association of charge

band with charge rate number will not make any difference. According to the charge rate on outgoing route, TAX will generate periodic charge message and local exchange will do the charging accordingly.

ACCS-CD-NPFX: Access Code Not Prefixed. This parameter is used for access code suppression in case of STD/ISD calls in out going trunks. It also sets the NATURE OF ADDRESS for called party as National Significant or International number. This parameter setting will be required for other technology exchange like EWSD who follow E.163 & 164 book the type of nature of address handling implementation. If this parameter is not set then calls will repeatedly fail with CDR showing the reason as "ADDRESS INCOMPLETE". So while creating CCS7 trunk please ensure nature of address at other end. If this parameter is not set then "0"/"00" will be sent to remote end with nature of address for called subscriber as National Significant/International number.

PCM-ID field in NO7 TEN NO7-TEN contains six field arranged in the format BM NO-RACK NO-FRAME NO-SLOT NO-PCM ID-CIRCUIT NO. PCM-ID field allots a unique number (called CIC number) to the TENs of TGP, i.e. with PCM-ID = 1 (1-1-2-7-1-2 to 32) the TENs, 1-1-2-7-2 to 32 will have CIC numbers starting from 1 to 31. Similarly for PCM id - 2 CIC numbers will start from 32 onwards. It has to be ensured that a particular circuit should have same CIC number at both the ends.

TGP-CAT: Always give a unique number to "TGP-CAT" parameter for CCS7 tgps. It should not be given to any other non-CCS7 trunk groups.

Subscriber Charge: For CCS7 TGPs modify subscriber charge characteristic for calling category =CCS7 tgp cat, called category = subscriber category. For these two categories "non-metered' charge rate number (with "metering info" as "charged") should be used only if "charge band" method of charge is being used on CCS7 trunks.

2. CRE-LS Related Parameters

LOG-LNK: Logical link id should be same at both the end or nodes. For example if TEN (DAT-LNK) 1-1-2-7-17 is given logical link id as 0 at C-DOT end then the same time slot or PCM circuit should be made logical signalling link 0 at other end also.

3. CRE-SRS Related Parameters

PRI-RT-TBL should contain the link set (LS) number going towards the destination specified in the DPC parameter.

Annexure – II

CCS7 Data Creation for SSP Application

II.1 SIGNALLING NETWORK DATA CREATION FOR SSP-SCP CONNECTIVITY

In case of IN application the C-DOT DSS acts as an SSP, which is connected, to SCP (Service Control Point) via SS7 link and interacts on SCCP, TCAP and INAP stack of CCS7 protocol. This involves creation of SCCP specific data i.e. Global Title and Subsystem specific data apart from MTP data for links and TGP. Depending on the type of connectivity towards SCP from SSP the data creation method charge which is specified in the following sections:

II.1.1 Data between SSP and SCP when SSP is connected directly to SCP

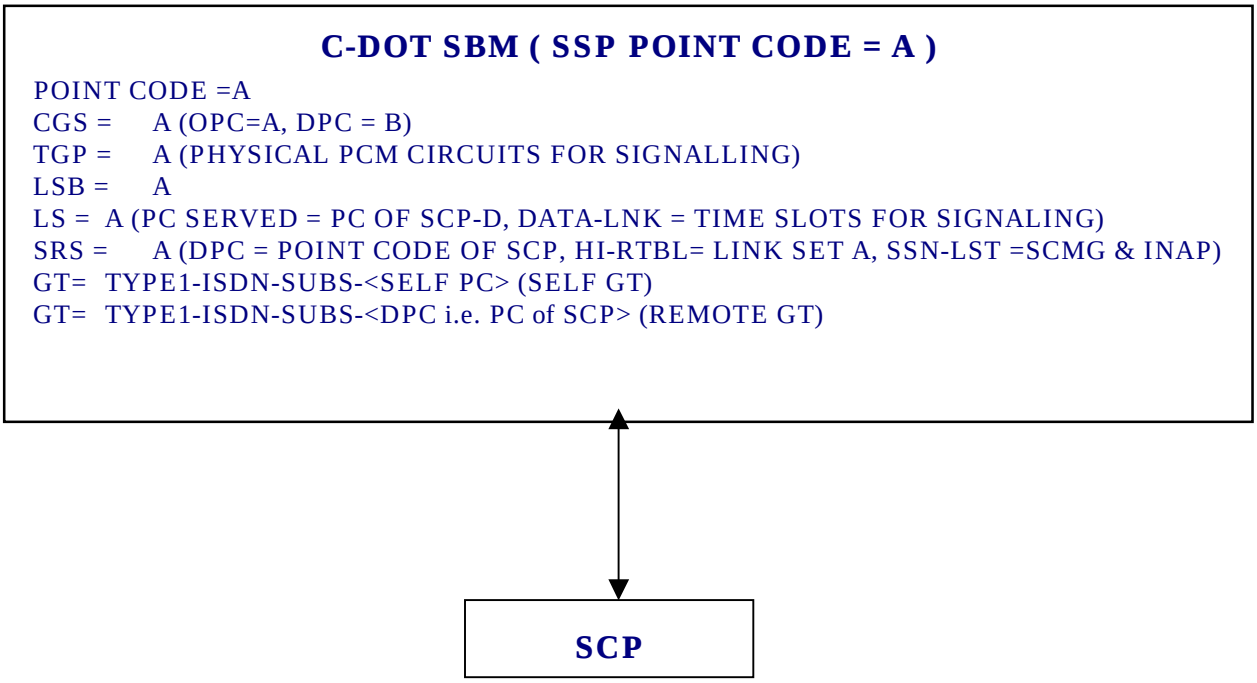
1. Create CCS7 network data up to link set.
2. Create **Signalling Route Set (CRE-SRS)**. In the Sub System Number (SSN) list give "SCMG & INAP". Rest of the parameters are to be filled in the same way as described in the chapter 8 of this document.
3. Create a **Self Global Title (GT)** by giving **CRE-GT** command with the following parameters :

   GT = Type1-ISDN-SUBS-<Self Point Code>
   PC = <Self Point Code>
   SSN = INAP
4. Create a **Remote GT** towards SCP by using **CRE-GT** command with the following parameters:

   GT = Type1-ISDN-SUBS-<Point Code of SCP>
   PC = <Point Code of SCP>
   SSN = INAP
   RTINGIND = DPCSSN
   Rest of the parameters are to be given default values.

   This completes CCS7 network data creation for SCCP layer. The signalling network data created in the above steps is depicted in the diagram on the next page.

DATA FOR SS7 NETWORK WHEN SSP IS CONNECTED DIRECTLY TO SCP



II.1.2 Data creation between SCP and SSP when STPs are involved

Data between SSP and STP:

1. Create SS7 network data up to link set by following the procedure given in the document - chapter 8 of this document
2. The PC served parameter in the *CRE-LS* will contain the DPC's of STP and SCP.
3. Create **Signalling Route Set (CRE-SRS)**. There will be two signalling route sets. One route set will go towards the STP and the other route set will have its DPC as that of SCP and both will have high priority linkset as that between SSP and STP1. In the SRS having DPC as that of SCP, Sub System Number (SSN) list will have "SCMG & INAP". Rest of the parameters are to be filled in the same way as described in the chapter 8 of this document
4. Create a **Self Global Title (GT)** by giving **CRE-GT** command with the following parameters :

   GT = Type1-ISDN-SUBS-<Self Point Code used as GT address>
   PC = <Self Point Code>
   SSN = INAP
   Rest of the parameters are to be given default values.

   Note : *<Self Point Code> means the actual value of the SPC of the node, etc.*

4. Create a **Remote GT** towards SCP by using **CRE-GT** command with the following parameters:

   GT = Type1-ISDN-SUBS-<Point Code of SCP used as GT address >
   PC = <Point Code of SCP>
   SSN = INAP
   RTINGIND DPCSSN
   Rest of the parameters are to be given default values.

   This finishes SS7 network data creation for MTP & SCCP layers at SSP.

Data between STPs:

1. Create SS7 network data up to link set by following the procedure given in the chapter 8 of this document

The PC served parameter in the *CRE-LS* of first STP from the SSP will contain the DPC's of second STP and SCP. Similarly PC served parameter in the *CRE-LS* of second STP from the SSP will contain the DPC's of first STP and SSP.

2. Create **Signalling Route Set (CRE-SRS)**. There will be two signalling route sets towards STP 2 direction at first STP. One route set will go towards the second STP and the other route set will have its DPC as that of SCP and both will have high priority linkset as that between STP1 and STP 2. In the SRS having DPC as that of SCP, Sub System Number (SSN) list will have "SCMG & INAP".

Similarly in the STP1 direction there will be two SRS at STP 2. One route set will have the first STP's DPC and the other route set will have its DPC as that of SSP and both will have high priority linkset as that between STP1 and STP 2. In the SRS having DPC as that of SSP, Sub System Number (SSN) list will have "SCMG & INAP". Rest of the parameters are to be filled in the same way as described in the chapter 8 of this document

This finishes SS7 network data creation for MTP & SCCP layers at the STP.

Data between STP and SCP:

1. Create SS7 network data up to link set by following the procedure given in the chapter 8 of this document
2. Create **Signalling Route Set (CRE-SRS)**. The SRS having DPC as that of SCP, Sub System Number (SSN) list will have "SCMG & INAP". Rest of the parameters are to be filled in the same way as described in the document - Chapter 8 of this document
3. IF SCP is sending GT in the calling party number then Create a **Remote GT** towards SSP by using **CRE-GT** command with the following parameters (if SCP is doing the routing towards SSP on DPCSSN then the remote GT need not be created):

   GT = Type1-ISDN-SUBS-<Point Code of SSP used as GT address>
   PC = <Point Code of SSP>
   SSN = INAP
   RTINGIND DPCSSN
   Rest of the parameters are to be given default values.

This finishes SS7 network data creation for MTP & SCCP layers at the SSP. The data created is depicted in diagram below.

DATA FOR SS7 NETWORK WHEN STP's ARE INVOLVED

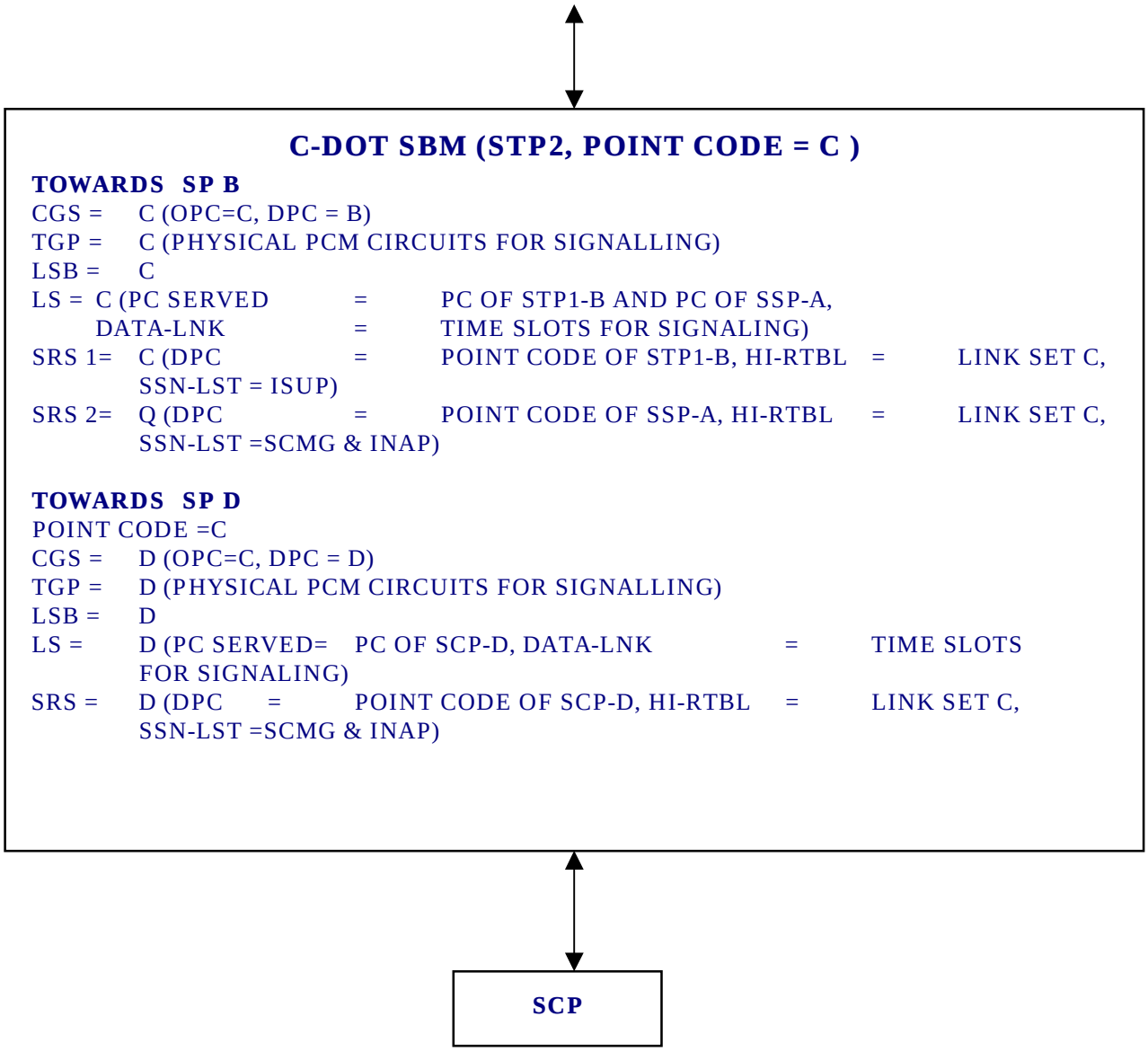
C-DOT SBM (SSP POINT CODE = A)

POINT CODE =A
CGS = A (OPC=A, DPC = B)
TGP = A (PHYSICAL PCM CIRCUITS FOR SIGNALLING)
LSB = A
LS = A (PC SERVED = PC OF STP1-B AND SCP-D, DATA-LNK = TIME SLOTS FOR SIGNALING)
SRS1 = A (DPC = POINT CODE OF SCP, HI-RTBL= LINK SET A, SSN-LST =SCMG & INAP)
SRS2 = A1 (DPC = POINT CODE OF STP1-B, HI-RTBL= LINK SET A, SSN-LST = ISUP)
GT= TYPE1-ISDN-SUBS-<SELF PC>
GT= TYPE1-ISDN-SUBS-<DPC i.e. PC of SCP>

C-DOT SBM (STP1 , POINT CODE = B)

TOWARDS SP A
POINT CODE =B
CGS = B (OPC=B, DPC = A)
TGP = B (PHYSICAL PCM CIRCUITS FOR SIGNALLING)
LSB = B
LS = B (PC SERVED = PC OF SSP-A, DATA-LNK = TIME SLOTS FOR SIGNALING)
SRS = B (DPC = POINT CODE OF SSP-A, HI-RTBL= LINK SET B, SSN-LST =SCMG & INAP & ISUP)
TOWARDS SP C
CGS = C1 (OPC=B, DPC = C)
TGP = C1(PHYSICAL PCM CIRCUITS FOR SIGNALLING)
LSB = C1
LS = C1 (PC SERVED = PC OF STP2-C AND PC OF SCP-D, DATA-LNK = TIME SLOTS FOR SIGNALING)
SRS 1= C1 (DPC = POINT CODE OF STP2-C, HI-RTBL= LINK SET C1, SSN-LST = ISUP)
SRS 2= C2 (DPC = POINT CODE OF SCP-D, HI-RTBL= LINK SET C1, SSN-LST =SCMG & INAP)

Towards STP2


C-DOT SBM (STP2, POINT CODE = C)
TOWARDS SP B
CGS = C (OPC=C, DPC = B)
TGP = C (PHYSICAL PCM CIRCUITS FOR SIGNALLING)
LSB = C
LS = C (PC SERVED = PC OF STP1-B AND PC OF SSP-A,
DATA-LNK = TIME SLOTS FOR SIGNALING)
SRS 1= C (DPC = POINT CODE OF STP1-B, HI-RTBL = LINK SET C,
SSN-LST = ISUP)
SRS 2= Q (DPC = POINT CODE OF SSP-A, HI-RTBL = LINK SET C,
SSN-LST =SCMG & INAP)
TOWARDS SP D
POINT CODE =C
CGS = D (OPC=C, DPC = D)
TGP = D (PHYSICAL PCM CIRCUITS FOR SIGNALLING)
LSB = D
LS = D (PC SERVED= PC OF SCP-D, DATA-LNK = TIME SLOTS
FOR SIGNALING)
SRS = D (DPC = POINT CODE OF SCP-D, HI-RTBL = LINK SET C,
SSN-LST =SCMG & INAP)
SCP

Annexure - III

CCS7 Related System Parameters

The system parameters are very important parameters from exchange performance and compatibility point of view. These should not normally be changed by the users. Please consult C-DOT technical staff before attempting to modify these parameters. Use DISPL-SYS-PARAM command to display the values of these parameters. The 'index' refers to the parameter sequence number in the command 'help'.

SYMBOL	INDEX	VALUE (ms)	MEANING
NT01	193	800	Rerouting timeout to avoid mis-sequencing during changeover
NT02	194	1400	Changeover acknowledgment timeout
NT03	195	800	Time-controlled-diversion to avoid mis-sequencing during changeback
NT04	196	800	Changeback acknowledgment timeout #1
NT05	197	800	Changeback acknowledgment timeout #2
NT06	198	800	Controlled rerouting timeout to avoid mis-sequencing
NT07	199	2000	Signalling datalink connection-ack timeout
NT08	200	1000	Transfer prohibited inhibition timeout
NT10	201	60000	Signalling routset test message repetition period
NT11	202	60000	Transfer restricted timer
NT12	203	1500	Uninhibit acknowledgment timeout
NT13	204	1500	Force inhibit timeout
NT14	205	3000	Inhibit acknowledgment timeout
NT15	206	2000	Waiting to start signalling routeset congestion test
NT16	207	1500	Waiting for routeset congestion status update
NT17	208	1000	Delay to avoid oscillations in initial alignment fail

SYMBOL	INDEX	VALUE (ms)	MEANING
NT18	209	20000	Waiting for signalling links to become available
NT19	210	4000	Waiting to receive all TRA messages
NT20	211	4000	Waiting to broadcast TRA and restart
NT21	212	30000	Waiting to restart traffic
NT22	213	180000	Local inhibit test timer
NT23	214	180000	Remote inhibit test timer
NT24	215	500	Stabilizing timer after removal of LPO
NLTST_ACK	216	10000	Waiting for link test acknowledgement
NLTST_PRD	217	60000	Interval timer for sending signalling link test message (SLTM)
FREE_THR	218	2	Threshold of free PHC terminals
NO7_THR	219	2	Threshold of free #7 PHC terminals
INT_THR	220	2	Threshold of free internal (C.85) PHC terminals
FREE_PHC _NUG_CLR	221	2	Free terminals threshold for clearing non-urgent alarm
FREE_PHC _NUG_RSE	222	2	Free terminals threshold for raising non-urgent alarm
FREE_PHC _UG_CLR	223	2	Free terminals threshold for clearing urgent alarm
FREE_PHC _UG_RSE	224	2	Free terminals threshold for raising urgent alarm
BLKRES	225	1500	Time within which remote exchange replies back
MNTBLK	226	1500	Maximum. Time for maintenance circuits to get unblocked

Notes :

1. All timeout values are in milliseconds.
2. The index refers to the serial number of the parameter in the 'help' of the MOD-SYS-PARAM command. For example, in order to specify NT24, simply its index value 215 can be given in the command.

सी-डॉट C-DOT

System Practices

COMMENTS

The following comments pertain to:

Document Name

CSP Section ☐☐☐ - ☐☐☐ - ☐☐☐☐

Issue/Draft ☐☐ , ☐☐☐ - ☐☐☐☐

No. (Month) (Year)

COMMENTS :

(Use a separate sheet if required)

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