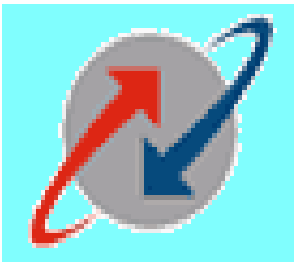
Practical Training Report



At

BSNL, JODHPUR

CONTENTS

BSNL

"BHARAT SANCHAR NIGAM LIMITED" is abbreviated as BSNL. It is fourth largest departement of TeleCommunication Company in Asia and seventh in world today. Which is one of the most earning revenue in India. Above more than 3 laces employees, officer and engineers working in BSNL at present.

Previously electro mechanically exchanges for use in India namely Strowger type exchange, cross bar exchange were there.

These manual telephone exchanges suffered from some disadvantages. To overcome these an automatic exchange was introduced in this system.

In 1980's PITHROTHA LTD. Introduced " C-DOT " exchange in India. These exchanges replaced by electro mechanical exchange.

These exchange which has wide range of capacity replaced electro mechanical exchange, C-DOT-128, C-DOT-256, C-DOT-512, C-DOT-1024(SBM) exchange, C-DOT-2048(MBM) exchange and so on.

Besides C-DOT exchange ILT exchange, E-10B exchange also proved of mild stone in Telecommunication Sector to replace electromechanical exchanges, which were most sophisticated and modern latest techniques electronics exchanges.

There after it was OCB-283 exchange which proved very important exchange in this series to replace electro mechanical exchanges.

Now it is "WLL" & "GSM" mobiles which is also proved a mild stone in Telecommunication sector. It was 31st march 2002 when BSNL started these GSM mobile and today it has provided almost 35 lacks mobiles in all over country. WLL system which is also a mobile with limited mobility in city & can have Tele communication facility in that area almost. While GSM can cover all cities of the country.

DOT provides the following facilities :

- Telegraph services

- Telephone services such as Local calls, Trunk calls, Overseas calls etc.
- Wireless services including mobile wireless services for police, defense, metrological departments, etc
- Renting of Broadcast & TV channels

- Telecom Bureau Services
- Data Services
- FAX Services

Telecom factories to manufacture telephone switching boards and accessories at Bhilai, Mumbai, Calcutta and Jabalpur.

- I.T.I. Bangalore for the manufacturing for the carriers, VFT, Coaxial and microwave equipment.
- I.T.I. Gonda for the manufacturing of E-10B electronic exchange equipment.
- Hindustan Cables LTD. Hyderabad & Rupnarainpur for manufacturing underground cables.
- Hindustan teleprinters LTD Chennai for manufacturing teleprinters.

Local telecom network at the metropolitan cities of Mumbai and Delhi are under the MTNL(Mahanagar Telephone Nigam Limited). Its Corporate office is at Delhi.

Hence Telecommunication sector has changed our life style today entirely and today it seems that world has become very small.

SDH (SYNCHRONOUS DIGITAL HERARCHY)

INTRODUCTION :

It is an international standard networking principle and a multiplexing method. The name of hierarchy has been taken from the multiplexing method which is

synchronous by nature. The evolution of this system will assist in improving the economy of operability and reliability of a digital network.

HISTORICAL OVERVIEW :

In February 1988, an agreement was reached at CCITT study group XVIII in Seoul, on set of recommendations, for a SDH representing a single world wide standard for transporting the digital signal.The three different country standards of PDH developed over a time period. The aim of these standards was to simplify interconnection between network operators by allowing inter-connection of equipment from different vendors to the extent that compatibility could be achieved. It was achieved by SDH in 1990.

DEFINITION :

It is a standardized architecture for use in digital transmission network. It is based on a synchronous multiplexing structure, which has several advantages. The FIBCOM FOCUS AC1 product family is part of the FIBCOM product range for access and regional telecom transmission network based on the standards and recommendations on SDH from EISI and ITU , under technical collaboration from TELLABS Denmark A/S , Denmark.

The FIBCOM FOCUS AC1 is a product family where STM-1 AND STM-4 Add/Drop multiplexers provides a cost efficient solution especially in small nodes where the requirement is to add /drop a limited number of and Terminal Multiplexers (TM) are implemented on a single module giving VC-4 ,VC-3and VC-12 connectivity .This 2Mbits/signals.The number of tributary signals can be increased to full capacity by adding additional tributary modules.The possible protection schemes in the network includes SNC protection of VC-4 ,VC-3 and VC-12 signals.Management of the FIBCOM FOCUS AC1 can be performed from a local craft terminal from network element manager or from a network management system.

MERITS OF SDH :

I. Simplified multiplexing/demultiplexing techniques.

II. Direct access to lower speed tributaries, without need to multiplex/demultiplex the entire high speed signal.
III. Enhanced operations, Administration, Maintenance & provisioning capabilities .
IV. Capable of transporting existing PDH signals.
V. Capable of transporting future broadband channel bit rates.
VI. Capable of operating in a multi-vendor and multi-operator environment .

S.D.H. EVOLUTION :

S.D.H. evolution is possible because of the following factors :

1)FIBRE OPTIC BANDWIDTH : The bandwidth in Optical Fibre can be increased and there is no limit for it. This gives a great advantage for using SDH.

2)INTELLIGENCE : The availability of cheaper memory opens new possibilities.

3)CUSTOMER SERVICE NEEDS :The requirement of the customer with respect to different bandwidth requirements could be easily met without much additional equipment.

ADVANTAGE :

SDH supports the following services :

- Low/High speed data.
- Voice
- Interconnection of LAN
- Computer links
- Broadband ISDN transport

PRINCIPLE :

- SDH defines a no. of “Containers”, each corresponding to an existing plesiochronous rate.
- Each container has a “Path Overhead “ , which provides network management capability.
- Virtual Container = Container + POH
- All equipment is syncronised to a national clock.

- According to recommendation G-709, different combinations of VCs which can be accommodated in the “payload” of an STM-1 frame.
- When STM-1 payload is full, more network management capability is added to form the “Section Overhead”.
- SOH remains with payload for the fibre section between synchronous multiplexers.
- SOH bytes provide communication channels to cater for :

  user channels.

  Protection switching.

  Section performance

  Frame aligment

  Other functions

BASIC DEFINITIONS :

- STM(Synchronous Transport Module)

  This is the information structure used to support information pay load and over head information field organized in a block frame structure which repeats every 125 micro seconds.

- CONTAINER :

  The first entry point of the PDH signal is the container in which the signal is prepared so that it can enter into the next stage i.e. virtual container. In container-1 the signal speed is increased from 32 bytes to 34 bytes in the case of 2Mbps.

- VIRTUAL CONTAINER :

  In virtual container the path over head {POH) fields are organized in a block frame structure either 125 micro seconds or 500 micro seconds. The POH information consists of only 1 byte in VC-1 for 125 micro seconds frame.

In VC-3 and VC-4, POH is 1 column of 9 bytes. The types of virtual container identified are orders VCs VC-1 and VC-2 and higher order VC-3 and VC-4.

- TRIBUTARY UNIT(TU) :

A tributary unit is a information structure which provides adaption between the lower order path layer and the higher order path layer . It consists of a information pay load.

- TRIBUTARY UNIT GROUP :

One or more tributaries are contained in tributary unit group. A TUG-2 consist of homogenous assembly of identical TU-1s or TU-2. TUG-3 consists of a homogenous assembly of TUG-2s or TU-3

- NETWORK NODE INTERFACE(NNI):

The interface at a network node which is used to interconnect with another network node.

- ADMINISTRATIVE UNIT(AU) :

It is the information structure which provides adaptation between the higher order path layer and the multiplex section layer.

- ADMINISTRATIVE GROUP :

It is a group of same type AU.

SDH SYSTEM :

It may functionally be subdivided into four parts :

1. Mechanical system
2. Transport System
3. Management System
4. Power System

1. MECHANICAL SYSTEM : This part covers the mechanical parts. These mechanical parts are :

- RACK : It is a rectangular box of size :
  600mm x 2200mm & 600mm x 1600mm
- SUBRACK : It is a mechanical frame that can be mounted in a rack. It holds the moduls of the system. Upto three mother board groups can be mounted in this subrack. One NE uses one, two or all three motherboard groups in the subrack. The connections between motherboard groups are made by cables. Upto three NEs can placed in the subrack.Empty positions in the subrack are to be covered by a coverplate. Each motherboard section has a width which is 1/3 of the total width.
- MODULE : It is a physical unit that can be plugged into a subrack and pulled out again.
- RCF(RACK CONNECTION FIELD) : It provides the connection of power, protection against surge voltages with secondary power fuses or ckt breakers are available for rack. The RCF also includes rack alarm output and LEDs.
- SRCF(SUBRACK CONNECTION FIELD) : For wide subracks with rear cable access as RCF.
- CABLES : Optical signals are connected on the modules in both rear and front access systems.

2. POWER SYSTEM :

SECONDARY SUPPLY FROM STATION : Dual DC supply with positive terminal to ground. One supply can be used as protection supply for other one.

NOMINAL VOLTAGE : -48V

OPERATING RANGE : -36V TO -75V

TERTIARY SUPPLY(INTERNAL SYSTEM) :

OUT PUT FROM POWER SUPPLY MODULE +5V & -5V

OPERATION LIFE : 15YRS

INSTALLING OPTICAL MODULES :

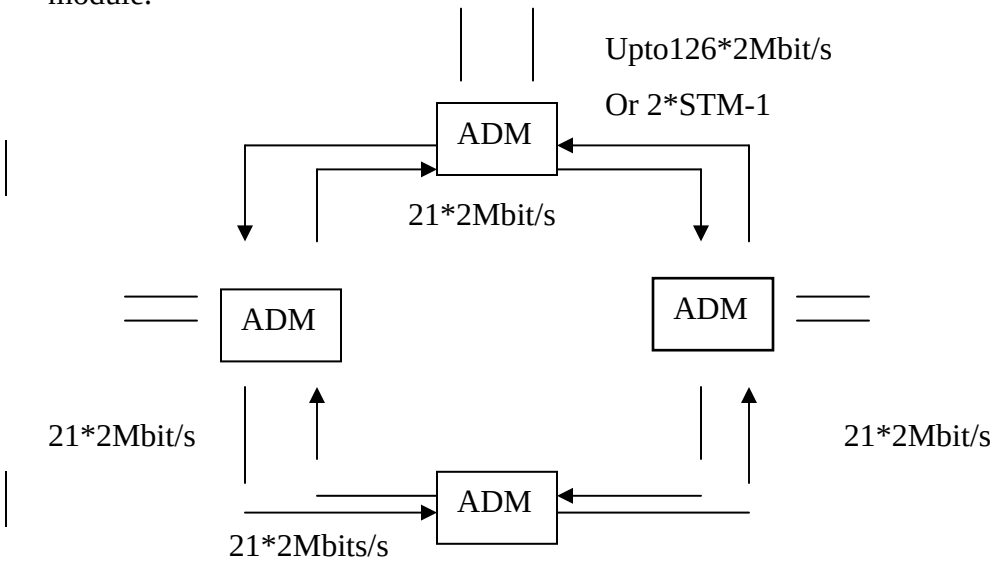
1. Use of adjustements or performance of procedures other than those specified here in may result in hazards radiation exposure.
2. Keep connectors and bare fibre ends at least 25cm away from eyes. To completely eleminate the possibility of eye damage, the far end optical module must be turned off.
3. Never use microscopes or magnifying glasses in connection with laser beam (from fibre ends or connection).
4. To avoid damage to sensitive ckts, use an antistatic bracelet.

APPLICATIONS-

1. RING APPLICATION-

In access network it is common to have STM-1and STM-4 ring where a limited number of signals.

Example-2Mbit/s signals are collected from different nodes into one central node which comprises the local exchange.By using the FIBCOM FOCUS AC1 for this application most of the small nodes can be implemented by using only one ADM module.



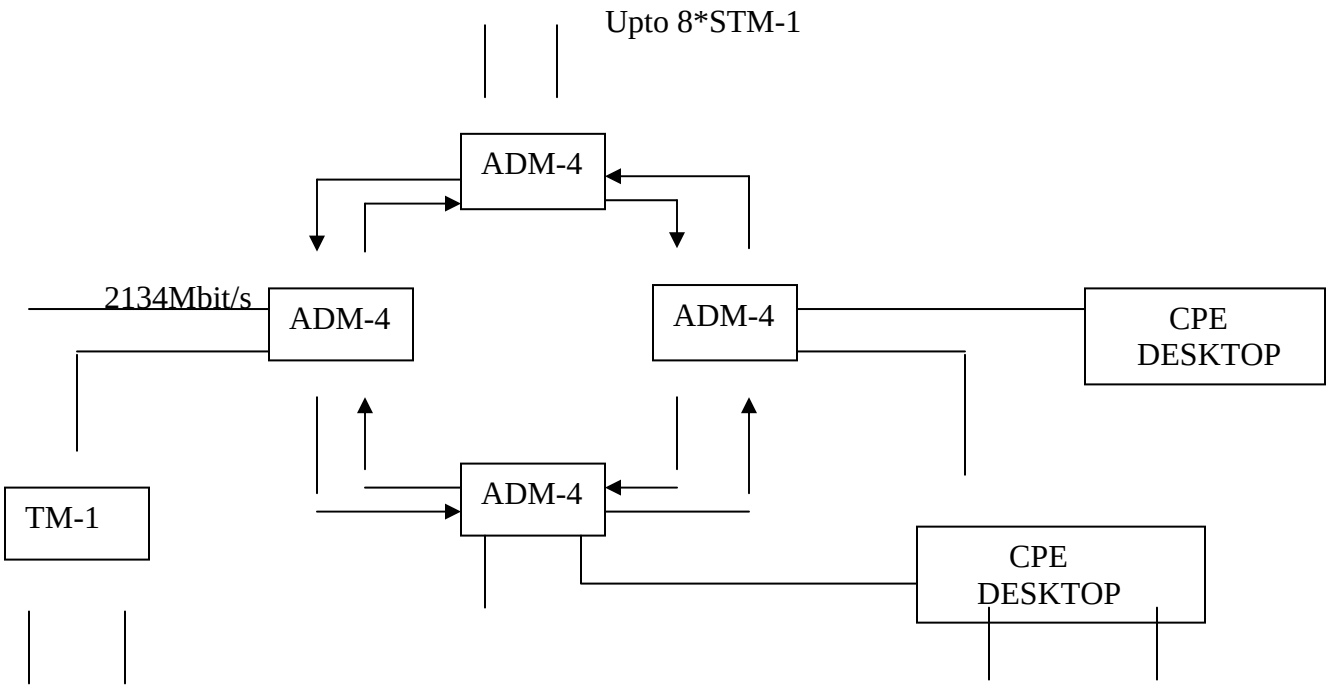
RING APPLICATION

High availability leased lines require protection and performance monitoring of the signal at the customer side .Two customers with different availability requirements are connected to an STM-4 ring .

The concept of STM-1 signal with a payload of 1/3 the bandwidth brings the STM-1 supervisory function to the signal delivery point without sacrificing the overall bandwidth of the ring.

The signals are connected to the Head end ADM-4 for further processing in a telephone switch or a cross connect device.

STM-4 ring with STM-1 branches bringing the supervisory function to the signal delivery point.



2134Mbit/s

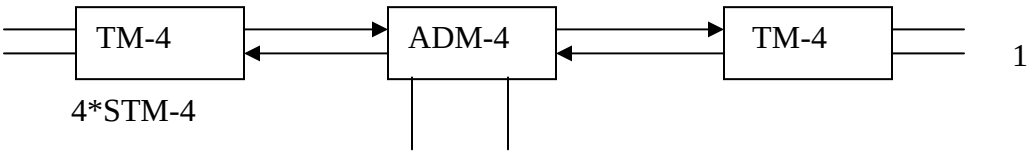
Upto 6*STM-1 each with a payload of one TUG-3

Upto 8*2Mbit/s

2. LINE APPLICATION-

This type of application is a simple point to point system with two terminal multiplexers.

This application can also be expanded with line add/drop multiplexers where an ADM is inserted in each direction.



LINE APPLICATIONS WITH TERMINAL MULTIPLEXERS & A/D MUX

SDH MULTIPLEXING PRINCIPLES-

The SDH multiplexing structure accommodates the mapping and multiplexing of higher order plesiochronous tributary rates into a synchronous signal. The basic synchronous transmission rate 155.52Mbit/s,which is organized in frames each designated a Synchronous Transport Module(STM).Higher bit rates of N*155.52Mbit/s are obtained by multiplexing N subscribers into one STM-N signal.

It shows the SDH multiplexing structure.

The figure comprises the different multiplexing elements which are defined according to their functional level.

The C-12 container is a defined unit of payload capacity ,for carrying 2Mbit/s signals.

The VC-12 comprises a C-12 plus path overhead including information about the origin of the path and a bit interleaved parity over the VC-12 for subsequent error performance monitoring.

Within the defined time slot the VC-12 can drift if the VC-12 and the corresponding C-4 phase/freq. are not the same .This is accounted for by adding the TU-12 pointer at a defined place in the C-4 container .The TU-12 pointer points at the start of the VC-12 container.

TUG-2 and TUG-3 describes the multiplexing into the C-4 container.

63 VC-12s can be multiplexed into one C-4.The C-4 container is a defined unit of payload capacity for carrying one 140Mbit/s signal or 3 TUG-3s.

The Virtual Container (VC-4) comprises a single C-4,including information about the origin of the path and a bit interlesved parity over the VC-4 for subsequent error performance monitoring.

MULTIPLEXING

An Administrative Unit (AU) comprises a VC-4 together with a AU-pointer .The AU-pointer allows the VC-4 to drift within the STM-1frame.

The AU Group (AUG) is identical to the AU-4 in the described multiplexing structure.

A Synchronous Transport Module (STM) comprises AUGs together with system information (Multiplexer and Regenerator Section Overhead MSOH/RSOH).

The STM-1 frame is repeated with 8K giving a line speed of the bit serial data stream of 155.52Mbit/s.

Four AUGs can be multiplexed into an STM-4 which together with SDH has a bit rate of 622.8Mbit/s.16 AUGs can be multiplexed into a STM-16 , which together with SDH has a bit rate of 2.488Gbit/s.

AUG into structure provide adaptation between high order path later and multiplex section layer. It consist payload information

OCB-283

All new technology switching systems are based on Stored Program Control concept. The call processing programmes are distributed over different control organs of the system and are stored in ROM / RAM of different control units. Processor in the control units by using the programme and data stored in unit ROM / RAM process and handle calls. Handling or processing call means to ultimately establish a connection in a switch between i/c and o/g ends. Depending on the name and architecture of control units and switch may change but criterion for switching remains more or less the same.

OVERVIEW OF OCB-283

INTRODUCTION:-

OCB-283 is digital switching system which supports a variety of communication needs like basic telephony, ISDN, etc. This system has been developed by CIT ALCATEL of France and therefore has many similarities to its predecessor E-10B (also known as OCB-181 in France).

SALIENT FEATURES OF THE SYSTEM:

1. It is a digital switching with single ‘T’ stage switch. A maximum of 2048 PCM’s can be connected.
2. It supports both analog and digital subscribers.
3. It supports all the existing signalling systems, like decadic, MF (R2), CAS and also CCITT#7 signalling system.
4. It provides telephony, ISDN, Data communication, cellular radio, and other value added services.
5. The system has ‘automatic’ recovery feature. When a serious fault occurs in a control unit, it gives a message to SMM. The SMM puts this unit out of service, loads the software of this unit in a back up unit and brings it into service. Diagnostic programmes are run on the faulty unit and the diagnostics is printed on a terminal.

6. It has a double remoting facility.Subscribers access unit can be placed at a remote place and connected to the main exchange through PCM links. Further, line concentrators can also be placed at a remote location and connected to the CSNL or CSND through PCMs.

7. Various units of OCB 283 system are connected over token rings. This enables fast exchange of information and avoids complicated links and wiring between various units.

8. The charge accounts of subscribers are automatically saved in the disc, once in a day. This avoids loss of revenue in case of battery failure.

9. The traffic handling capacity of the system is huge.

10. The exchange can be managed either locally or from an NMC through 64 kb/s link.

11. All the control units are implemented on the same type of hardware. This is called a station.

12. The system is made up of only 35 types of cards. This excludes the cards required for CSN. Due to this, the number of spare cards to be kept for maintenance, are drastically reduced.

13. The system has modular structure. The expansion can be very easily carried out by adding necessary hardware and software.

14. The SMMs are duplicated with one active other standby. In case of faults, switch over takes place automatically.

15. The hard disc is very small in size,compact and maintenance free. It has a very huge memory capacity of 1.2 Giga bytes.

16. The space requirement is very small.

17. There is no fixed or rigid rack and suite configuration in the system.

SUBSCRIBERS FACILITY PROVIDED BY OCB-283

OCB-283 provides a large number of subscriber facilities. Some facilities are available to only digital subscribers and as such they cannot be

availed by analog subscribers. To avail these facilities subscriber number are given special categories by man machine commands.

Facilities to analogue subscribers-

- A line can be made only outgoing or incoming.
- Immediate hot line facility-

The subscriber is connected to another predetermined subscriber on lifting the handset without dialling any number.

- Delayed hot line facility-

When subscriber lifts the handset, dial tone is provided he can dial any number. If he does not dial a number, within a predetermined time, he is connected to predetermined number.

- Abbreviated dialling-

The subscriber can record a short code and its corresponding full number in the memory. Later he dial this number, he has to only dial short code.

- Call forwarding-

When activated, incoming calls to the subscriber gets transferred to the number mentioned by the subscriber while activating the facility.

- Conference between four subscribers-

Two subscribers while in conversation can include two more subscribers by pressing button and dialling their numbers.

- Call waiting indication-

When a subscriber is engaged in conversation and if he gets an incoming call, an indication is given in the form of tone. Hearing this, the subscriber has option, either to hold the subscriber in conversation and attend the waiting call or to disconnect this subscriber and attend the waiting call. In the former case, he can revert back to the earlier subscriber.

- Automatic call back on busy-

If this facility is activated and if the called subscriber is found busy, the calling subscriber simply replaces the receiver. The system keeps watch on the called subscriber and when it becomes free, a ring is given to both the subscribers. On lifting they can talk to each other.

- Priority line-

Calls from this line are processed and put through even when the number of free channels are within a threshold.

- Malicious call identification-

In this category, the number of calling subscriber is printed on the terminal

- Battery reversal- the system extends battery reversal when called subscriber answers.
- Detailed billing-

The system provides detailed bills giving details of date, time, etc.

- Absent subscriber service-

When activated, the incoming calls are diverted to absent subscriber service for suitable instructions or information.

Facilities to digital subscribers:

Digital subscribers are provided all the facilities available to analog subscribers. In addition, they are provided following facilities which are called ISDN services. An ISDN subscriber can use many electronic devices on its telephone line and can utilize them for two or more simultaneous calls of either

- Voice
- Data
- Video

The ISDN or Digital Subscribers of OCB-283 can be provided the following types of connections

- 2B+D LINE :- 2 Voice Channel of 64kbps and 1 Data Channel of 16kbps
- 30 B+D LINE :- 30 Voice Channel of 64kbps and 1 Data Channel of 64kbps

The following is the list of some of the services to digital subscribers:

1. It provides 64kb/s digital connectivity between two subscribers for data communication.

2. The system provides facsimile services.
3. It provides videotext services.
4. It provides display of calling subscriber number on called subscribers telephone.
5. It also provides the facility for restriction of the display of calling subscriber number on the called subscriber's terminal.
6. Charging advice - The system is capable of providing charging advice either in real time or at the end of the call.
7. User to user signaling - The system permits transfer to mini messages between calling and called subscribers during call set up and ringing phase.
8. Terminal portability during the call - A subscriber can unplug terminal, carry it to some other place or room and resume the call within 3 minutes.

TIME SWITCH CONCEPT

The time switch comprises of a Speech Buffer Memory, A Control Memory, An Incoming Highway Of Digital Speech In Parallel Bits and An Outgoing Highway. This is an Input Associated Controlled Time Switch.

In this switch the Buffer Memory and Control Memory are controlled write type i.e. the writing in it is controlled. The control function writes in the control memory at the location corresponding to the Incoming Time Slot Number, the location where it should be written in the Buffer Memory. Both these memories are sequential read type. Reading of control memory gives the address in the Buffer Memory for writing Incoming TS Byte. Thus reading of Buffer Memory sequentially the TS will be read from the location given by the Control Memory. Thus a one way Time switching has taken place. Similarly a both way switching requires two sets of such switches.

DUPLICATED SWITCHING-

The switching is done in OCB-283 in two fully duplicated branches simultaneously. For this purpose from each connection units the LR links originate in two parallel branches towards two parallel sets of switching matrices called SMX A and SMX B. The branches of such network are called A and B branches. Also the receive side LR links come from both the SMX's A & B and

are terminated on the respective connection units. The duplicated branches of switching have been designed to provide high reliability switching path for such diverse purposes as data switching, video conference, ISDN applications etc.

With the duplicated paths of switching if there is error in one path the other path which is good can be used continuous without interrupting the call in progress.

SAB FUNCTION

The connection units have their internal duplicated hardware which is called Control Logic, which work in Pilot / Reserve arrangements. Also they have non duplicated hardware such as subscriber cards and PCM termination cards. The duplicated LR's originate from a function in connection units called SAB-Selection And Amplification Of Branches. It's role is to generate two sets of LR's in trans-direction with calculation of parity etc. In receive direction it gets data from both the branches which it checks for parity and compares to detect any error in the two branches. In case of error the samples from only the good branch are taken after automatic testing of the quality of transmission of both the branches by the common control and the faulty branch is withdrawn from the service.

The connection units lr links are formed into group of 8 LR's at the factory into cables with both ends terminated with plugs for the convenience of installation. Such groups of LR's are called GLR.

COMMON CHANNEL SIGNALLING NO.7

The latest signalling being implemented world wide is now the Common Channel Signalling. This type of signalling is essential for the setting up of the ISDN network.

In this type of signalling the signalling information is sent from one exchange to other exchange in the form of message coded in binary which is understandable by the intelligent devices available in both exchange. The CCITT organization has recommended a standard protocol called CCITT signaling.

The signalling message travels over a single Time Slot of the PCM connecting the two exchange . This Time Slot is called Common Channel for signalling, hence the name Common Channel Signalling. The message over this common channel carry all relevant data for any other time slots circuits which carry voice or subscriber data. The channels for subscribers are called Voice Channels.

Signalling is often referred to as the Glue, which holds a network together. It provides the ability to transfer information between subscribers, within networks and between subscribers and networks. Without signalling, networks are inert. By providing effective signalling systems, a network is transformed into a tremendously powerful medium through which subscribers can communicate with each other using a range of telecommunications services.

SUBSCRIBER ACCESS UNITS(CSN)

CSN are so designed that they can be equipped with either analogue or digital subscriber or both. The cards for analog and digital subscribers are different, but can be equipped in any slot of the shelf.

CSN can be either placed in the exchange switch room or at a remote location.

Further, subscriber card shelf can also be placed at the rack or at a remote location. These features provide great flexibility to meet any type of requirement of dense or sparse connection densities.

Depending on their location, CSN is known as CSNL or CSND and subscriber shelf is known as local or remote concentrator.

The CSNL is connected to switching matrix through a minimum of 1 GLR or a maximum of 2 GLR's.

The CSND is connected to SMT rack through a minimum of 2 PCM and a maximum of 16 PCM's.

ROLE AND LOCATION:

ALCATEL 1000 E-10 is the digital system developed by ALCATEL CIT. It can be used for the entire range of switch, from the smallest local exchanges to the largest transit gateway switches. It adapts to every type of environment. System operation and maintenance can be local or common to

several switches, or both at the same time. It provides all modern communication services i.e. basic telephony, isdn, centrex, digital cellular radiotelephony and all in services.

SYSTEM APPLICATIONS:

1. Local subscribers exchange
2. Remote subscribers unit
3. Transit exchange
4. Hybrid local/transit exchange
5. Tandem exchange
6. Centrex(private or public)

GENERAL ARCHITECTURE OF DIGITAL SWITCHING SYSTEM:

A digital switching system uses the S.P.C. concept and a digital switch. A brief description of the components is given below:

1. Subs. Access Interface:

Analogue or digital subscribers make entry to the exchange at this interface.isdn protocol translation is done at this interface.no. of digital links are extended from this interface to switch.

2. PCM Interface:

Any digital exchange can only accept intelligence in pcm decoded form and hence trunks from other exchange or links from remote subscriber units or other access systems.

3. Auxilliary Interface:

It is a service peripheral which take care of one or more functions.

4. Controllers:

Various controllers are required to control switching based on the digital informations received from subscribers or over the trunks.the main control functions are:

- Call Handler(Register):- this is the control function which processes a call right from the point of seizure to called party connection.

- Translator:- this control function basically maintains all data base of subs. and trunks and provides necessary information to call handler enabling the same to establish connection between calling linkst/s to called link t/s.
- Charger:- computation of charge based on set principles is carried out by this control function.

FUNCTIONAL ARCHITECTURE OF OCB-283 SWITCH:

The main functional blocks of a ocb-283 switch are:

- Subscriber access sub system which carries out connection of different types of analogue and digital subscriber.
- "Connection and control" sub system which carries out connections and processing of calls including pcm connections.
- Operation and mtce.sub function which does the management of database and helps in carrying out various maintenance procedures in built in the systems.

BRIEF DESCRIPTION OF THE FUNCTIONAL COMPONENTS:

1. BT(TIME BASE):

Time pulses are generated in triplicate and distributed to lr's at switching unit. The time base is usually synchronised with the network by a synch.interface. It gets the clock from pcms which carry traffic also and synchronises the local clock with the pcm clock and thus network synchronisation is achieved.

2. *HOST SWITCHING MATRIX:*

This is a pure switch of maximum 2048 lrs connectivity capability. The switching of lr time slots are controlled by the function com which in turn obtains the particulars from call handler known as multiregister.

3. AUXILIARIES:

Auxiliary Equipment Manager(ETA).It supports following functions:

-Tone generation

-Frequency generation and reception

-Conference call facility

-Exchange clock

4. CALL HANDLER (MR):

This obtains necessary data from subs.& ckts.&process for connection and disconnection of call with the help of a database manager tr.

In addition this helps in carrying out ckt.tests and some observations. It establishes and releases the calls. It takes real time decisions for processing of a call. The MR also consults TR to find out subscribers entitlements

5. DATA MANAGER(TR):

This is responsible for managing &storing various subscriber and trunks related database. The data is returned by the call handler as & when required during call processing.

It also stores routing and analysis data. It converts (or) translates the received digits into equipment number of the called subscriber.

6. CHARGING FUNCTION (TX):

This function is responsible for charge computation on the basis of certain charging parameters supplied by the traslator during analysis of digits received from a source. This also prepares detailed billing messages & forwarding the same to the operation & maintenance function for further processing .

7. MATRIX HANDLER(GX):

This function is responsible for processing and for defence of connections on receipt of-

-Request for connection & disconnection from MR or MQ.

-Fault in connection

8. MESSAGE DISTRIBUTION FUNCTION MARKER:

Its function is to format if required & distribute messages. Also supervises semipermanent links& inter messages between different communication multiplexes.

9. *PCM CONTROLLER(URM):*PCM interface receives PCM from other exchanges remote subs. access units, access networks and digital recorded announcement systems and the URM function carries out the following—

-hdb3/binary code conversion

-injection/extraction of ts 16 for cas.

10. OM FUNCTION:

This function enables to create all data required for subs/circuits and their testing. This also enables spontaneously issuing faults & alarm messages in case of indications coming from OCB units. Also provides features for saving detail billing/bulk billing messages on magnetic tape. It possess a two way communication path with the exchange.

11. This is implemented in CSNL/CSBD & is responsible to forward new call connection & disconnection requests to control functions.

HARDWARE ARCHITECTURE :

CONTROL FUNCTIONS-CONCEPT OF STATION

For all control function ocb uses concept of a station. Following type of stations are available:

1. SMT - Trunk Multiprocessor Station
2. SMA - Auxiliary Multiprocessor Station
3. SMX - Switch Multiprocessor Station
4. SMC - Command Or Control Multiprocessor Station
5. SMM - Maintenance Multiprocessor Station
6. STS - Synchronisation And Time Base Station

The control stations communicate among themselves on a token ring called "MIS"—Inter Station Multiplex, while the other stations are connected on 1 to 4 "MAS"—Station Access Multiplexes.

The "MAS"are connected to control stations also, so that the "MAS"domain units can communicate with control stations. Most of the time cross over from "MAS" to"MIS" domain or vice-versa may require a gateway function and this is provided in the SMC with marker function.

1. SMT-Trunk Multiprocessors Station

It is also known as PCM trunk control station. The smt is a interface for PCM's coming from the particular exchange and the remaining world.The current version of SMT being supplied to India is SMT 2G.

In each SMT 2G, there are 8 modules and in each module there are 16 PCMs. Thus there are 128 PCMs, in a single SMT 2G. SMT 2G is built around microprocessor 68030.

Function of SMT-

-Provides terminations of a maximum of 128 pcm's from trunks

-Carrying out URM

-Transforming the intelligence in PCM to LR for switching to destinations and transforming the switched LR time slot into PCM.

2. SMA-Auxiliary Multiprocessor Station

Function of SMA-

-Tone generation(GT)

Tone generators generate various tones required to be connected during call processing. These tones are Dial tone, Busy tone, Ring back tone, Processing tone etc.

-Conference call(CCF)

The conference circuits are used to set up connection between a maximum of 4 subscribers. These 4 subscribers can hold conference on the telephone i.e. they can talk to each other.

-Frequency Generation and Reception for R2 MF signalling or for receiving DTMF frequencies(RGF)

The frequency receivers/generators recognizes the digits dialed through DTMF instrument and also the MF(R2) signaling and testing etc.

-Clock

-PUPE signalling management

-Access Network management(AN)

The SMA is connected to the switch by one GLR,on the other side it is connected to MAS token ring over which it communicates with control units. The time base is obtained by the SMA from STS via the switch over GLR cable. Types of software used are

ETA –frequency decoder

PUPE-to handle signaling

3. SMX-Switching Multiprocessor Station

A SMX is one module of the entire switch matrix system with independent control. The station is responsible for carrying out connection of an incoming LR time slot to an outgoing LR time slot.

Switching may effect connection between subscribers, subscriber to junction, junction to junction subs. To tone or rf, junction to tone or rf etc or there may be a semipermanent connection for certain data link.

Besides the connection function,the SMX performs following other functions:-

-clock reception from STS & distribution

-fault and alarm processing

-defence of the station etc.

The SMX is connected on 4Mbps links to units like SMT, SMA referred to as peripherals. Also connected to control units over MAS token rings which provide particulars of connections to be effected.

The network synchronised clock from STS is supplied to SMX. Switching is done on the strobe of clock and also this clock is supplied to the service peripherals-SMT, SMA on LR links.

4. SMC—Main Control Station

All the control functions are supported in SMC and one or more of these functions can be used during call processing. The main control functions are MR,TR,TX,MQ etc. Relative position of SMC in OCB exchange as shown in fig.

Control functions in SMC communicate on MIS while other communicate with SMC on MAS.There are 6 common control functions in OCB-283. The following list illustrates their minimum and maximum numbers.

S.NO.	NAME OF UNIT	MINIMUM	MAXIMUM
1.	MR	2	7
2.	TR	2	2
3.	TX	2	2
4.	MQ	2	2
5.	PC	2	2
6.	GX	2	2

Number of SMC's depends on the capacity of exchange. There can be minimum 2 SMCs required and maximum number of SMC can be 32. Hardware of all SMC's is same but their software is different as per requirement. Types of softwares used are:

- MQ-marker
- MR-multiregister,call analyser
- TR –translator
- TX-charging unit

  -the switch in ocb-283 is a pure time switch.

  -ultimate capacity of switch matrix is 2048*2048lr.

  -modularity 256*256lr in 8 smx module

64*64 lr matrix by adding pcb's.

- each module of smx is duplicated and switching takes place in either branch parallaly.
- 2 mbps access links la issuing from smt or sma are converted into 4 mbps lr links.
- switching is done at 16mbps rate but reception & issue of lr links is at 4 mbps rate

5. SMM-Maintenance Multiprocessor Station

The smm provides the facility for carrying out operation and maintenance of OCB units and also manage the data base.It carries out following functions:-

-database management and storage

-central defence of the OCB system

-supervisor of token rings

-processing of various commands

-general initialisation of the exchange

It provides local link for data processing devices and administration terminals. This can also be connected to a network management system. It is accessible to exchange units on one side and to the peripherals on the other side. The SMM also have access to mass storage devices.

It consists of two units –one act as pilot and other as a standby. Both system share a common communication bus supporting various communication peripherals. The two subsystems are referred as SMMA and SMMB.

6. STS-Synchronisation And Time base Station

This is clock system of OCB-283 system which happens to be the most vital unit of any digital switching system as switching takes place at the strobe of clock. The clock needs to be synchronised with the network. This ensures almost

a common clock at every switching station. The clock system in OCB-283, therefore consists of two parts-synchronisation part and time base generator part. The synchronization interface carries out following functions:-

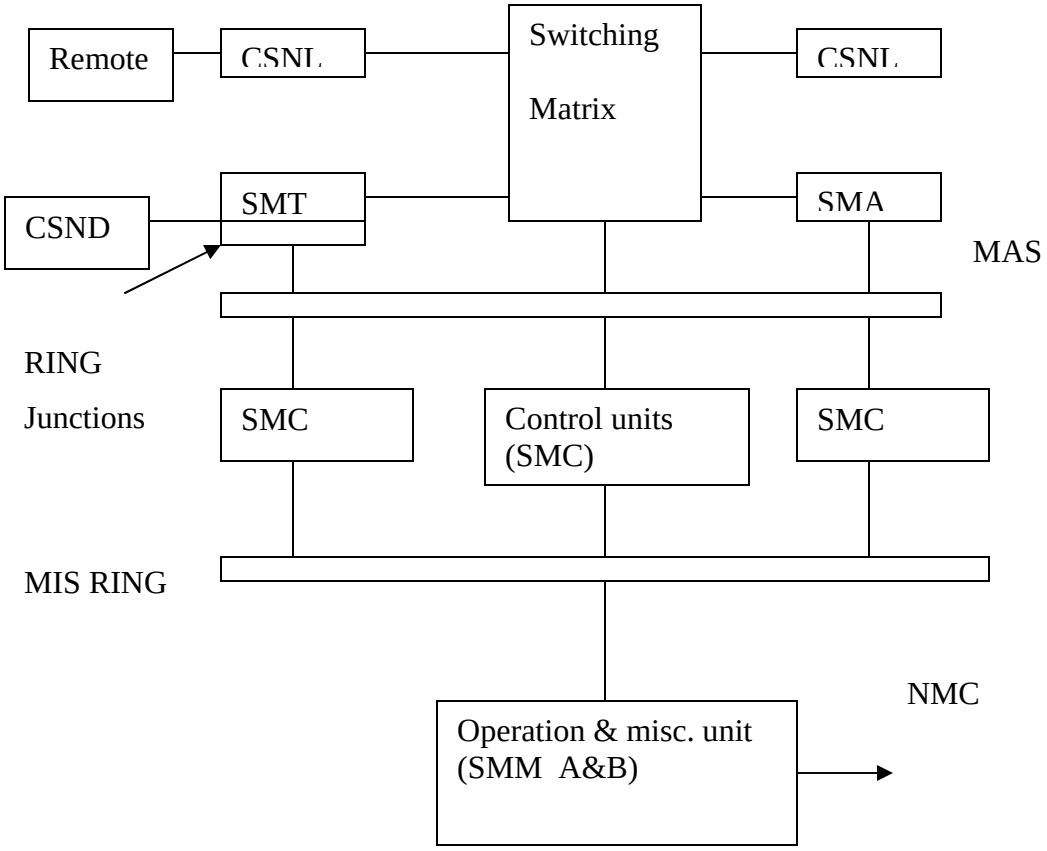
-Receives max 4 clock inputs from PCM's coming from other exchange

-In the event of a error detected on the chosen PCM it shifts to other PCM and gives alarm concerning the faulty PCM

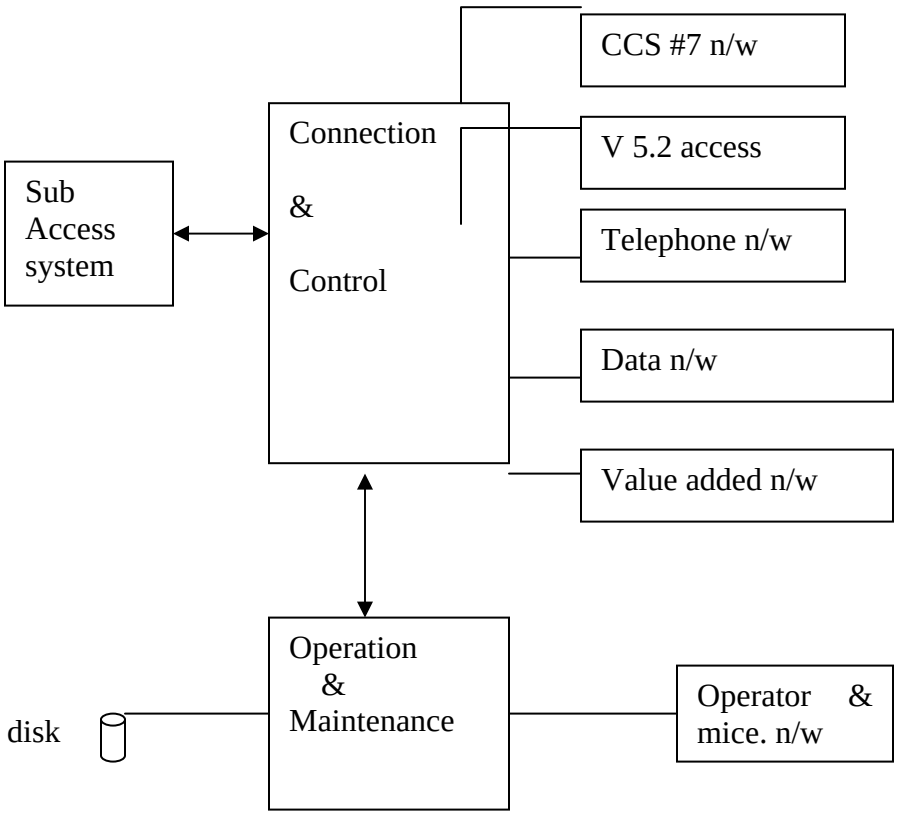
-It maintains reasonably high quality of clock in terms of precision of frequency.

-Counteracts losses of all synchronisation links by very high stability oscillator.

-In the event of loss of PCM synch. Runs on free run mode



GENERAL ARCHITECTURE OF OCB-283



FUNCTION OF OCB

MAIN DISTRIBUTION FRAME

INTRODUCTION

The switching equipment, common to all the subscribers of the area is located in an exchange. To make possible for a subscriber to communicate with remaining subscribers, telephone of each and every subscriber must be connected to the exchange. The function of MDF is to provide a means for connecting side is terminated at OCB where the switching take place. From OCB, through PCM connected to various sections like WLL,TAX etc. A line from the subscriber's telephone set involves :

- Subscribers House wiring
- Overhead wires

- Cable Distribution Point
- Underground cables
- Exchange Main Distribution Frame

From the subscriber's house wiring, the line is brought on overhead wires to a point called distribution point(DP). From the DP, the pairs are extended to the exchange through underground distribution cables, secondary cables and primary cables. At the exchange are brought through underground cables to cable chamber. In the cable chambers, they are jointed to PVC cables for terminating at MDF. This frame incorporates protecting devices and provides for a flexible arrangement for connecting subscriber's lines to exchange equipments.

SUBSCRIBERS HOUSE WIRING :

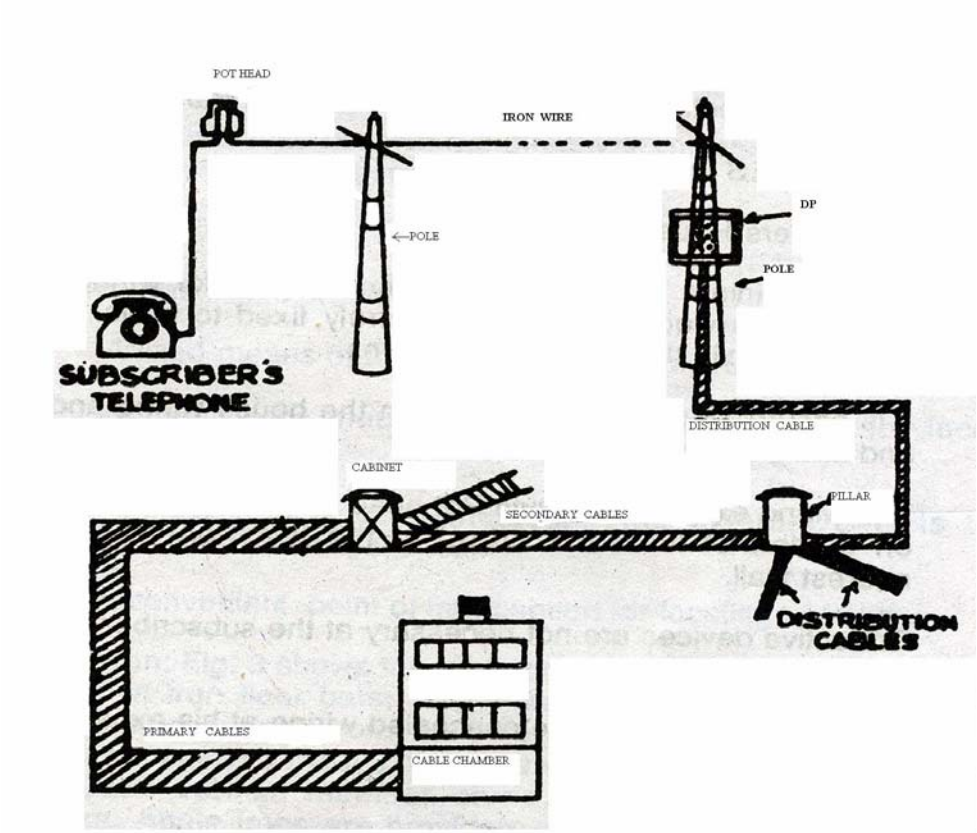
PVC aluminium twin wire 1or1.12 mm is used for wiring at subscriber's house. Protective devices are not necessary at the subscriber's premises as per present standards.

UNDERGROUND CABLES : The underground cables laid at a depth to 2.5 feet below the ground level connect the DP post to the exchange MDF.The cabinets and pillars included in the cable network provide flexible arrangement of interconnection between various sizes of cables.

FUNCTION OF MDF :

- A fixed means of terminating the external cables.
- A means for mounting the protective devices for incoming circuits.
- A convenient point of interception for locating of faults.
- A means for cross connecting the external circuits to the appropriate internal circuits.

The MDF is properly earthed for the protection of the equipment. The external pairs are area wise terminated on the line side of the frame, while connection from the equipment is done on the exchange side in a numerical order. By interconnections at this frame with the help of jumper wires, any subscriber in any area can be given any exchange number. This MDF mounts Delay Fuses only.



GENERAL ARRANGEMENT FOR CONNECTING TELEPHONES

PROTECTIVE DEVICES : Comprehensive protection against effects of lightning and power line contacts, is achieved in practice by fuses, arresters and heat coils. They are not affected by normal speech and signaling voltage and current but operates when the foreign voltage or current on the line is excessive. The line is then disconnected automatically from the equipment or a connection to earth is For safety precautions fuses are used. Every subscriber line has individual fuse. These fuses are made of GD (gas discharge) tube, which are connected in parallel. These fuses have two sides, one is exchange side and other is subscriber side. Connections between the different tag blocks are made using the jumper wires of red and white colours.

GD tubes are connected in parallel while electrical fuses are connected in series. In electrical fuse, when high voltage appears across it, then it will break up the connection and thus safeguard the system. If GD tube is connected in series, then due to high voltage across any line, the whole exchange will be disconnected. Thus when GD tubes are connected in parallel, it will provide the required facility.

GASE DISCHARGE PROCTECTORS : In case of heavy lightning discharges, gas discharge protectors are used and more consistent voltage is obtained. The gas discharge protector essentially consists of two tungsten electrodes sealed in a special glass envelope containing a mixture of inert gases, mainly neon. One of the electrodes are for connections to the lines and the other is the earth electrode. If the potential difference across the electrodes rises to a certain critical value(the striking value) the gas is ionized and becomes conducting. This condition will continue till the potential difference across the electrodes falls to the extinction voltage value. For voltages less than striking value it will not conduct. For normal operating voltages on the lines, it offers extremely high impedance and thus does not introduce any transmission loss.

For equipment side:

MDF has many tag blocks of 100 and that numbered from 1 to 100. In a tag block, there are 128 pair wire theoretically. Therefore, total number of connecting wires are 1024 theoritically. But in practical, there are only 1000 pairs.

For equipment side:

From ground, a single pair of 400 wires originates, which is divided in 4 pairs of 100 wires. Practically, each pair is provided with 102 wires. These exact 2 wires are used in case of any manufacturing defect.

For broadband connections, different coloured tag blocks are provided. Broadband is used to provide different facilities on land-line phones with high speed to access them. A grey coloured tag block is used for line side while yellow

coloured tag block is used on equipment side. These tag blocks has 0 to 47 pairs. In order to know the centre load point.:

Cabinet and pillar are provided with capacity as per requirement. The D.P. box is provided with 10 or 20 or 5 pairs. Now a days, a D.P. box of 5 pairs is used which is wall mount instead of being mounted on pole.

To identify any telephone, we require the following two addresses:-

1. Exchange/line address
2. Equipment address

Exchange address is written in given manner:

Vertical number-tag block number-pair number

For example 7-5-15

Here,vertical no.=7

Tag block no.=5

Pair no.=15

This gives the address of a telephone in the exchange.

Equipment address is given as:-

Rack number-tag block number-pair number

For example7-6-87

Here,rack no.=7

Tag block no.=6

Pair no.=87

This gives the information about the actual location of telephone equipment. This address is provided to lineman for repairing, in case of any fault.

There is an another section of fault repairing located in MDF section. When subscriber's phone is not working, then subscriber call to exchange. For this he dial,198. At other side in exchange anyone on computer feeds subscriber detail and phone number. Further system is fully computerized. Computers do the testing of line and gives fault at its output. Then fault is given to lineman of that area. He checks out the lines of that area and removes the fault. After this, he

informs to the exchange that the line is OK and then the exchange informs the subscriber at their phone number, that there telephone is working now.

PULSE CODE MODULATION (PCM) PROCESS

Pulse Code Modulation (PCM) converts analog signals to a digital format (signal). This process has four major steps.

- *STEP ONE:- FILTERING*

  Frequencies below 300Hz and above 3400Hz (Voice Frequency range) are filtered from the analog signal.. The lower frequencies are filtered out to remove electrical noise induced from the power lines. The upper frequencies are filtered out because they require additional bits and add to the cost of a digital transmission system. The actual bandwidth of the filtered signal is 3100Hz (3400-300). It is often referred to as 4kHz.

- *STEP TWO:- SAMPLING*

  The analog signal is sampled 8000 times per second. The rate at which the analog signal is sampled is related to the highest frequency present in the signal. This is based on Nyquist Sampling Theorem. In his calculations, Nyquist used a voice frequency range of 4000Hz (which represents the voice frequency range that contains “intelligent” speech). Thus, the standard became a sampling rate of 8000Hz, or twice the bandwidth. The signal that is the result of the sampling process contains sufficient information to accurately represent the information contained in the original signal. The output of this sampling procedure is a Pulse Amplitude Modulated, or, PAM signal.

- *STEP THREE:- QUANTIZING*

  In the third step of the A/D conversion process, we quantize the amplitude of the incoming samples to one of 225 amplitudes on quantizing scale (figure 3.13). Thus, in this step the sampled signal is matchrd to the segmented scale. The purpose of step three is to measure the amplitude (or height) of the PAM signal

and assign a decimal value that defines the amplitude. Based on the quantizing scale, each sampled signal is assigned a number between 0 and +127 to define its amplitude.

- *STEP FOUR:- ENCODING*

  In the fourth step of A/D conversion process, the quantized samples are encoded into a digital bit stream (series of electrical pulses).

  A DIGITAL ENCODER-

  It recognizes the 255 different voltage levels of the quantized samples. Converts each into a specific string of 8 bits (1s and 0s) that represent a particular voltage value. Fig.3.14 is helpful for understanding the binary code used in the encoding step. Each bit position in the 8-bit word (byte) iis given a decimal weight (2 to some power), except for the first bit position. Using this coding scheme, we can code any number between +127 and –127 and zero.

  For example:- If the PAM signal measures +45 on the quantizing scale, the output of the encoding step is 10101101 (fig 3.15). This binary number (or 8 bit word) is transmitted over the network as a series of electrical or optical pulses. This series of pulses is called a digital bit stream. The PCM process requires a 64000bps channel to encode a 4kHz audio input signal because 8000samples/sec.*8 bits/word=64000bps. This is known as the DS0 (Digital Signal 0) or VF (Voice Frequency) in the digital hierarchy. It is the basic building block of the digital network.

  DIGITAL-TO-ANALOG CONVERSION-

  At the receive end of the transmission, the digital signal may need to be converted back into its analog form. The digital-to-analog (D/A) conversion consists of two steps .

  Each 8-bit word (byte) that enters the decoder results in one PAM signal value.

  The decoder:

Reads the 8-bit binary word inputs ,creates a sream of 8000 pulses per second. These pulses have an amplitude of +127 to –127. The filtering process smoothes out the stream of 8000 pulses per second into an analog waveform that closely resembles the waveform that was input into the A/D converter at the originating end. The filter stores a part of each pulse's energy and slowly releases it until the next pulse arrives. The filter thus reconstructs the analog signal at a rate of 8000 times per second.

ABBREVIATIONS

IN-Intelligent network

SCP-service control point

SSP-Service switching point

IP-Intelligent peripheral

PRM-premium rate service

ACCS-account card calling service

VCC-Virtual card calling

UAN-universal access number

CIN-change in number

VPN-Virtual private network service

GSM-Global system of mobile

HLR-Home location register

VLR-Visitor location register

CCS-Common cell signal

OSS-Operation support system

WLL-Wireless local loop

CDMA-Code division multiple access

SDH-Synchronous digital hierarchy

DWDM-dense waveleangth division multiplexing

GPRS-General pocket radio service

MMS-Multi media service

STM-Synchronous transport modules

TAX – Trunk automatic exchange

ADM-Add Drop Mux

OCB-Organ Control Base

SDH-Synchronous Digital Hierarchy

STM-Synchonous Transport Module

TM-Terminal Mux

OFC-Optical Fiber Cable

DP-Distribution Point