



## Organe Control Binarie (OCB) - 283: An Instance of Local Exchange

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**Abstract:** OCB-283 is digital switching system, which supports a variety of communication needs like basic telephony, ISDN, interface to mobile, data communication. ALCATEL of France has developed this system. The first OCB-283 exchange of R11 version were commissioned in Brest (France) and Beijing (China) in 1991, first OCB-283 exchange came to India in 1993. The system has been upgraded and current version R20 has fully validated in Jan 1994. The latest version is R24. All new technology switching system, are based on (SPC) stored program control concept. The call processing program is distributed over different control organs of the system and is stored in ROM/RAM of the units. Data required to handle the calls are also managed in RAM of different control units. Basically OCB-283 is just like local exchange which acts like a switch whose function is just to connect or disconnect (i.e. to make or break a call). OCB is both responsible for subscriber to exchange and exchange to exchange interface.

**Keywords:** OCB - 283, SMM, SMX, SMA, SMT, MAX, MAL, PCM, IVRS, INDIN, IDABSE etc.

### I. INTRODUCTION

**OCB-283** is digital switching system, which supports a variety of communication needs like basic telephony, ISDN, interface to mobile, data communication. ALCATEL of France has developed this system. The first OCB-283 exchange of R11 version were commissioned in Brest (France) and Beijing (China) in 1991, first OCB-283 exchange came to India in 1993. The system has been upgraded and current version R20 has fully validated in Jan 1994. The latest version is R24. All new technology switching system, are based on (SPC) stored program control concept. The call processing program is distributed over different control organs of the system and is stored in ROM/RAM of the units. Data required to handle the calls are also managed in RAM of different control units.

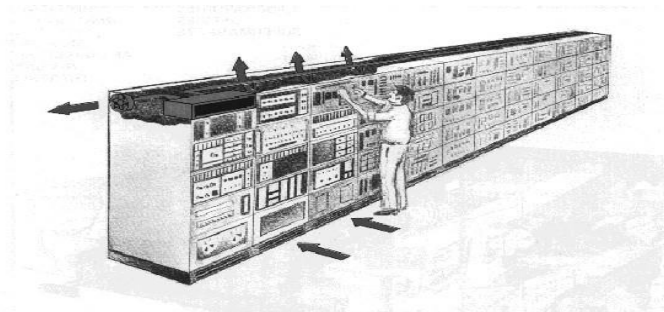


Fig. 1 Local Exchange

#### A. Main Divisions of OCB-283

**MDF (Main Distribution Frame)**, this room is used to distribute the subscriber's call according to his request. In any type of exchange, there is a unit called main distribution frame and is used for interconnection of exchange line and junction unit equipment to external physical lines coming to the exchange. The distribution frame provides easy and flexible interconnection, isolation point for testing, protective devices used for safety of exchange equipment etc. In MDF, all lines are coming from subscribers, non-exchange lines, telex lines and analog junction lines, are terminated on 100 pair krone type tag blocks in which gas discharge tubes type protective devices are provided to tackle voltages and current surges. These tag blocks are located on one side of the MDF called "line side". On the other side of the MDF called "Exchange side" tag blocks are provided for terminating the cables from CSE for subscriber lines and from transmission room for analog junction lines.

#### B. Transmission Media

In many communication systems, it is often necessary to interconnect points that are some distances apart from each other. The transmission of information as an electromagnetic signal always occur as a transverse electromagnetic wave. One of the media for transmission is:

Coaxial Cable:

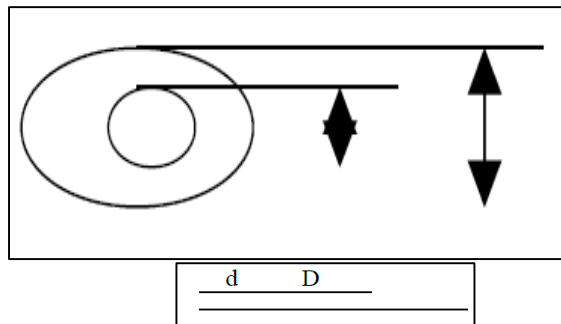


Figure 1.2a Coaxial Cable

Optical Fibre Cable:

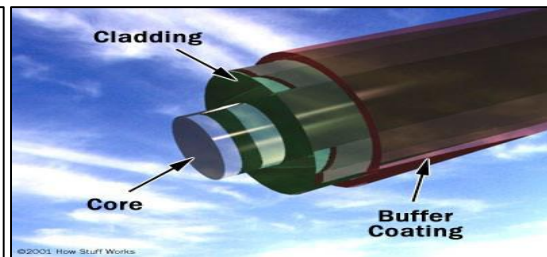


Figure 1.2b OFC

### C. Exploitation Room

The **Exploitation Room** operates the whole OCB-283 exchange. So it is also known as operational room. My main responsibilities are come under this exploitation room. As in this room all the operations are done through system software by operating different commands over there. I have to operate some of these commands, which are named as under and discussed in detail with the help of example as under:

- IDABSE
- INDIN

### D. Power Plant of Exchange

The requirements of power plant for main OCB-283 exchange and RSU are different because of the types of equipment. In OCB-283 equipment there is very little variation in peak hour and slack hour load of power plant contrary to electromechanical exchanges where the load varies with traffic. Therefore, power plants are designed for continuous handling of constant load both at RSU and main exchange.

The requirement of 220V AC power supply is met through direct main supply and inverters, which convert – 48V DC supply into 220V AC supply. The –48V DC power is taken from rectifiers (or battery in case of mains failure) and fed to inverters. The inverter converts the DC supply into 220V AC supply. The reason for using inverters is, firstly, uninterrupted power supply due to battery available as standby and secondly, availability of stabilized power supply, free from variations in voltages and frequency. This ensures safety of both the equipment and the programs stored in various storage devices. The direct main 220V AC supply is used for various testers.

### E. Computer Unit

As the name specified it is the main part of the exchange that deals with the all services provided by the exchange to the customers with the help of computer. It also provides the updated data to all other part of the exchange. The customers are using the services of the exchange by using the internet also gets connected to the main server present this room via an internet room. It mainly consists of the servers that are providing the different services. The main servers of this room are as following:

**IVRS** is used for the change number services provided by the exchange.

**CERS** are provided by the exchange to avoid the problems that the users are facing the repairing of telephone. In this system when the user enters complaint it gets directly entered to the server and user is allotted with an id number.

**LOCAL DIRECTORY ENQUIRY** is another services provided by the exchange, by using this; subscribers calls the particular number and gets the directory enquiry. The server present in the main computer room provides this service.

**INTERNET DIRECTORY ENQUIRY** is the latest service by the exchange. In this type of service makes it enquiry using the internet, which gets connected to the main server at the internet room in the exchange and further to the main server in the computer room.

### F. Central Air Conditioner

For the function of electrical equipment, cooling system is basic requirement. The basic advantages of cooling systems are following:

- It provides the thermal stability so that the temperature does not reach the tolerance limit of electronic equipment
- It saves equipment from dust so to avoid malfunction of equipment's.
- It protects equipment from excess humidity which can caused rusting of equipment.
- The basic unit of measurement used in the industry is known as “ton of refrigeration” (TR) which is equivalent to the heat extracted in 24 hours for converting thousands kg of liquid to ice at zero degree.

## II. FUNCTIONAL ARCHITECTURE OF OCB-283

The hardware equipment of the OCB 283 switching node consists of a set of control (multiprocessor) station SM interconnected by one or several communication multiplexers (MIS or MAS).

There are five types of control stations, corresponding to the types of services they provide:

- SMC: Main Control Station
- SMA: Auxiliary Equipment SM
- SMT: PCM trunk SM
- SMX: Switching Matrix SM
- SMM: Maintenance SM

### A. SMC: Main Control Station

It consists of MR, MQ, TR, TX, PC, GX, which helps, in call processing. The followings are some of the multi registers:

- MR: - Establishes and releases the calls, it takes real time decision for processing for processing of a call.
- TR (Translator): - TR stores exchange data, it also stores routing and analysis data.
- MQ (Marker): - MQ carries out messages between common control function and connection unit for subscribers.
- TX (Charging Unit): - TX carries out charging for each communication set up. It keeps charge account of all subscriber and send detail billing messages to SMM.
- GX (Matrix System Handler): - GX monitors the connection in the switching network also it monitors internal links in the switching network.
- PC (CCS, Controller): - PC carries out routing and traffic management function for CCS7 signalling

### B. (SMA): Auxiliary Multiprocessor Station

#### B.1 Function of SMA

- Tone generation (GT)
- Conference call (CCF)
- Frequency generation & reception for R2 MF signalling or for receiving DTMF frequencies (RGF)
- Clock
- CCITT 7 signalling management (PU/PE)
- Access network management (AN).

#### B.2 SMA Environment

The SMA is connected to the switch by one GLR (i.e. 8 LR links), on the other side it is connected to MAS token ring over which it communicates with control units. A MAL ring collects converter alarms of the station. The SMA obtains the time base from STS via the switch over GLR cable.

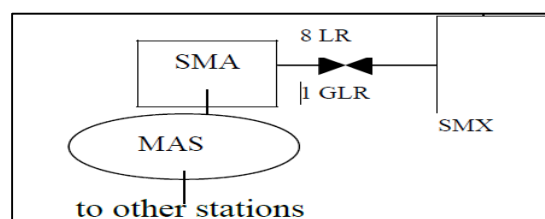


Figure 2.2.2 SMA Protocol

### C. Functional Architecture of SMA:

A SMA station can provide following functions (O) combination.

- ETA & PU/PE
- PU/PE alone
- ETA alone
- AN (access network) alone.

First two SMAs essentially have GT functions and clock function besides other ETA or PU/PE functions. For the above functions and to adapt on token ring different type of couplers and processors are provided. The functional name and PCB names are listed below:

- CMP - implemented by ACAJA5/ACAJB5 or ACAJAG ACASB4
- PUP - ACJTR5 AB
- PUS - ACUTR5 AB – Only one PUS
- MC (Common memory) – ACMCS

- Coupler CTSV – i.e. coupler Treatment Signal Vocal or Voice signal processing couplers. These couplers are used as GT, RGF, CCF and as psophometer.
- Coupler CSMP - Coupler signalling Multiprotocol for CCS#7 or V 5.2 signalling implemented by ACHIL 2 & ACHIL 3 PCBs.

### **C.1 (SMT): Trunk Multiprocessors Station**

#### ➤ **GENERAL:**

The SMT is an interface for PCM coming from RSU, RLU (E-10 B CSED) and as junctions from other exchanges. With the initial supply of OCB-283 exchanges first Generation SMT (SMT – 1G) was supplied and subsequently SMT-2 G replaced them since no more SMT – 1 G are existent in the field only SMT – 2 G is included in the hand-out. The functions of SMT are same whether it is SMT 1 G or SMT 2 G. SMT – 2 G is more powerful and intelligence is extended at the PCM terminal level.

#### ➤ **Function of SMT:**

- (i) Provide terminations of a maximum of 128 PCM from trunks, CSED and CSND.
- (ii) Carrying out URM (Multiplex connection unit function) consisting of:
  - (a) HDB 3/ Binary code conversion.
  - (b) Injection and extraction of CAS on time slot 16 and making over to another functional unit called CLTH for processing
- (iii) Transforming the intelligence in PCM TS to LR T/S for switching to destinations TS and transforming the switched LR time slot into PCM TS.

#### ➤ **Specific features of SMT – 2 G:**

Beside above-mentioned general functions of SMT following special features are available in SMT – 2 G.

- (i) Digital Access cross connect (DACS) where the additional bits (bit 8 to 12) can be used to carry channel associated signalling for PABX with linked numbering scheme.
- (ii) Can support higher order PCM multiplexes e.g. 34 M bit /S.
- (iii) Can support ISDN PRA (30 B + D) links.
- (iv) Reduction of load on MIS/MAS by introducing decentralized processes in a software way.

### **D. (SMX): Switching Multiprocessor Station**

- **ROLE:** 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.
- **FUNCTIONS:** 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 semi-permanent connection for certain data link.

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

- Clock reception from STS and distribution.
- Fault and alarm processing
- Defence of the station etc.

### **E. Maintenance Station (SMM A and B)**

It works as hot stand by it. One of the two SMM is pilot; it has got two mirror unique hard disks of 1.2 GB capacities. Pilot SMM is able to access either of disks; it dialogues with all SMC's over MIS token ring. It consists of one streamer for cartridge drive; it receives all alarms from whole exchange on MAL ring.

#### **Architecture of SMM:**

SMM is built around two identical microprocessor 68030; it works in pilot and hot standby mode. Each of the processor has 16 M bytes primary memory. All the components viz. processor, memory and complex are connected on the x-bus.

Each hard disk has a capacity to 1.2 GB and both of them are connected to active SMM. Data can be read from and written into both the disks Streamer has a memory capacity of 525 M bytes.

### **F. CSN (Rack)**

It is a subscriber connection unit, it can be equipped with either analog or digital subscriber or both CSN can be either placed in the exchange, which is called CSNL i.e. local subscriber connection unit, and at remote location called CSND (Digital Subscriber connection Unit). The subscriber's card shelf called concentrator it is also known as local or remote concentrator i.e. CNL or CNE.

The CSNL is connected to switching matrix (SMX) through minimum of 1 GLR (i.e. Group of 8 LR's is called as a GLR and each LR is PCM having 32 slots). The CSND is connected to UE or SMT rack through a minimum of 2 PCM and a maximum of 16 PCM's.

#### **There are four types of cards:**

- For **Analog Signal:** TABAF, TABASE
- For **Digital Signal:** TABND, TADPB
- The **TABAF** card is for STD PCO/CCB PCO's can accommodated 16 subscribers.
- The **TABASE** card is for local subscriber can accommodated 16 subscribers.

- The **TABNP** card is for basic ISDN and TADPB only 2 channels or circuits are allotted but for TADPB 1(one) PCM allotted @ 64kbps.

### III CALL PROCESSING

- When a subscriber goes off book, it is detected by line equipment. The change in loop state is detected by microprocessor during its scanning. The CSNL allots free TS on LR for this call. The CSNL prepares a new call message and sends it to PU/PE (in SMA) over a signalling link through MCX. The message is sent in local version of CCS7.
- PU/PE receives this message and sends it to MR over MAS. It indicates UR no. UT no. (Line card no.) and equipment no. And T/S allotted.
- MR allots a free register to handle this call. It notes down UR no. Equipment number And T/S allotted for the subscriber. Now MR obtains UR-LR to SMX-LRX correspondence from MQ.
- MR obtains class of service date from TR.

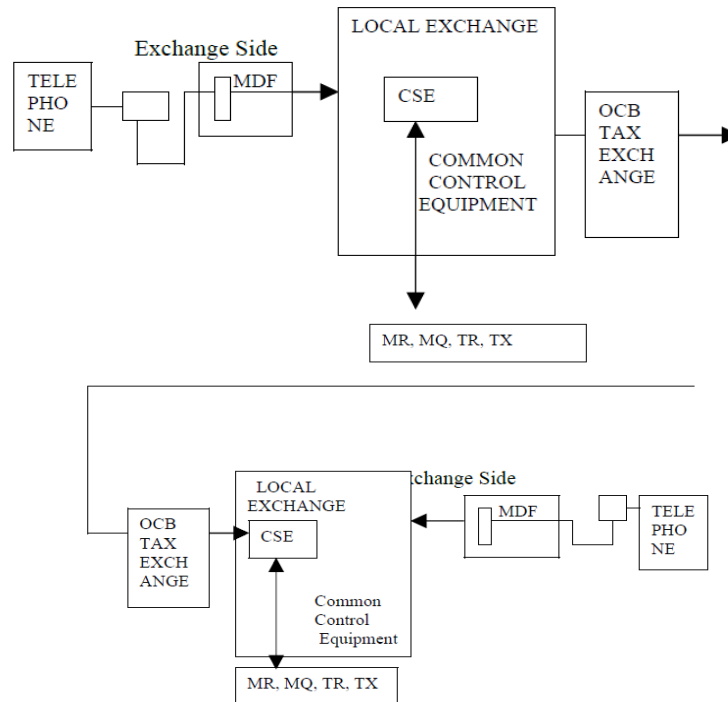


**Fig 3: Call Processing Setup**

- MR orders COM to connect dial tone to the free T/S allotted to subscriber. If subscriber has DTMF instruments it orders for connection of RGF to the T/S of subscriber and then orders for dial tone connection.
- MR also sends acknowledgement message to CSN.
- On receipt of dial tone, the subscriber dials called party's number. The UT (Terminal Unit i.e. subscriber line card) disconnects dial tone from the calling subscriber.
- CSN sends these digits to PU/PE through the same path and signalling system.
- PU/PE sends these digits to MR over MAS.
- On reception of first digit, MR orders COM to disconnect dial tone from the calling sub.
- On receipt of first two digits, MR calls TR for pre-analysis. TR, after analysis of first two digits tells MR, the type of call (i.e. local, STD etc.).
- After receipt of adequate number of digits (or all the digit in case of local call) MR again calls TR for analysis. TR supplies called party's address and charging information to MR.
- MR carries out party's test to know whether it is free, or not. (Path MR-U/PE-CSN).
- CSN tests the called party's equipment. If this is free, it connects ringing current to called subscriber. It also allots free TS to LR and sends a message to MR indicating LR-T/S of called subscriber.
- MR orders COM for connection of ring back tone to calling subscriber. It also obtains UR-Lr to SMX LRX correspondence for called subscriber. MR waits for called sub's reply.
- When called subscriber replies, the concerned CSN sends a message to PU/PE. PU/PE sends the message to MR.

### IV PULSE CODE MODULATION

#### A. Principle

The PCM generator produces a series of numbers or digits. Each digit is a binary code corresponding to the approximate amplitude of the signal sample at that instant. A supervisory or a signalling bit is generally added to

each group representing a quantized sample. The major advantage of the PCM is that the information does not lie in any property of the pulse, but it lies in the presence or the absence of the pulse. Thus even if the noise distorts the pulse, it makes no difference so long as the decision regarding the presence or absence of the pulse is correct. So the PCM is used extensively in telephone conversation, as it provides large number of channels, which previously had carried over the one pair of wires and carried only one conversation. PCM is also used in Space Communication.

### B. Token Rings

In OCB-283 exchange the communication-multiplexed highways are utilized for interchange of messages between various equipment of exchange. These communication multiplexes work on the principle of computer's circular LANs using TOKEN RING protocols. There are three types of communication multiplexed highway according to their use:-

#### - MIS INTERSTATION MULTIPLEX - MAS STATION MULTIPLEX- MAL ALARM MULTIPLEX

The MIS token ring is provided for interchange of messages between two SMCs and between an SMC and SMM. The maximum and minimum number of MIS is only one (duplicated as A&B) The MAS are provided for interchange of messages between CSNL, SMT, SMA and SMX on one hand and control units (SMC) on the other hand. A maximum of four MAS token rings can be provided in a large size exchange, where as no MAS token ring is provided in compact configuration. While SMCs are connected on the entire MAS token ring, the other units are connected only on one of the MAS rings. MAS token ring can be minimum nil & maximum FOUR duplicated as A&B. MAL token ring is provided to handle exchange alarms from all the hardware stations of exchange except CSNL. The token ring conforms to IEEE 802.5 Standard and operates at 4 Mbps.

## V. CONCLUSION & FUTURE WORK

Man is a social being so communication was the first step towards togetherness. Moreover since than the model of communication went through several stages of evolution and now what we are blessed with is the continuous effort of previous generations. As per the statistical information by 2020 there would be 285% hike in the current usage of internet itself with 26 billion devices connected to it by the end of this decade, this terminology is coined as Internet of Things (IOT). So these local exchanges together with the trunk automated exchanges can provide much better connectivity in both the voice & data segment in coming times to come.

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