इरिसेट IRISET

TCS4

I S D N EXCHANGES AND ADVANCEMENTS

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Issued in April 2014

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ISDN EXCHANGES AND
ADVANEMENTS

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CHAPTER 1

I S D N

1.1 Introduction:

ISDN – Integrated Services Digital Network was introduced in 1979, and is defined as per ITU (T) red book. Fascicle III.5, P.3

"An ISDN is a network, in general evolving from a telephony IDN, that provides end to end digital connectivity to support a wide range of services, including voice and non-voice services, to which users have access by a limited set of standard multipurpose user – network interfaces".

Network -Is a communication carrying system including medium, switching points and proper routing. Networks follow certain protocols for transmission.

Digital -The communication is digital upto subscriber's instrument. But it is also compatible to analog working instruments, though the transmission is in digital mode.

Services - Services to subscriber like transmission of speech, image and data.

Integrated - All the three services are transmitted simultaneously on a single pair of wires.

$$\begin{aligned}
\text{Speech: } & 64 \text{ kbps.} \\
\text{Image: } & 64 \text{ kbps (minimum.)} \\
\text{Data: } & \underline{16 \text{ kbps}} \\
& 144 \text{ kbps.}
\end{aligned}$$

For framing and other maintenance features = 48 kbps.

Total: 144 + 48 = 192 kbps are transmitted and received.

The transmission is possible on the existing copper wire pairs. Even though replacing the copper with fibre is more ideal, the copper cable network, which is already existing need not be immediately replaced as very high amount of expenditure is to be incurred at once which is unnecessary. The existing copper network can be made use upto

5.1 km – 0.5 mm gauge copper conductor cable.

4.0 km – 0.4 mm gauge copper conductor cable.

ISDN is intended to be a worldwide public telecommunications network to replace the existing telecommunications networks and deliver a wide variety of services. The ISDN is defined by the standardization of user interfaces and will be implemented as a set of digital switches and paths supporting a broad range of traffic types and providing value added processing services. In practice, there will be multiple networks, implemented within the national boundaries, but from the user's point of view, there will be a single, uniformly accessible, worldwide network.

ISDN has emerged as a powerful tool for provision of voice, data and image by means of the existing telephone network. ISDN is being viewed as a logical extension of the digitalization of the network, and most developing countries are in different stages of implementing ISDN. Even subscriber voice is sent in the digital form and so the phone is called a digital phone.

An ISDN subscriber can establish at least two independent simultaneous calls on the existing pair of telephone line (basic rate ISDN), where as only one call Is possible at present. The two simultaneous calls in ISDN can be of any type-speech, data, image or video.

The call setup time for a call between two ISDN subscribers will be very short, of the order of 1 to 2 seconds. ISDN will also support a whole new set of additional facilities called supplementary services. The ISDN subscriber will have full connectivity, both nationally and internationally, to other telephone subscribers.

1.2 Objective

The objective of the ISDN is to provide the user with easy access to a multiplicity of services over a single connection and digitalization upto sub's premises.

ISDN has spread as a powerful tool through out the world in providing different services mainly voice, data and Image transmission. High speed data transfer and video conferencing are among the main facilities of the ISDN. With the introduction of video conferencing the dream to see each other face to face during conversation has come true.

1.3 Advantages:

♦ High speed and high quality communication.
♦ Reliability and security.
♦ Better use of existing facility.
♦ International standardization.
♦ Simplified wiring.
♦ Efficiency of network usage.
♦ Standard data transport rate.

1.4 Tools:

The primary tools of ISDN systems are:

♦ Stored Program Control (SPC)
♦ Common Channel Signalling (CCS # 7)
♦ Digital Networks
♦ Open Systems Interconnection (OSI)

SPC was introduced into the telephone exchange with the introduction of the first electronically controlled switching system (in 1957 in Morris, Illionois, USA). In its present, fairly fully developed form SPC involves use of normally quite similar control machines (Computers) operating upon software programs that express diverse switching, signalling and administrative requirement. The software programs operate upon software data describing the configuration details of exchange to establish and control the network connections required.

CCS is a method of signalling that concentrates all the management and connection signals relating to each of a multiplicity of communication channels onto a single "**common channel**".

The introduction of digital transmission and digital exchanges was complemented by the introduction of common channel message based signalling systems, where messages relating to different connections are statistically interleaved on a common channel. ITU-T signalling system No. 7 is the system defined for use between switching nodes.

ITU-T signalling system No. 7 is an extremely powerful common channel signalling (CCS) system, which is fast, reliable, economical and flexible. It is known variously as CCS7, C7 or SS7. It uses variable length messages for communicating signalling information between digital exchange and switching nodes.

The CCS7 network architecture can be associated with the underlying voice / data network. The flexibility coupled with the large amount of signalling information that can be carried at 64 kbps, makes SS7 a sine qua non for most of the modern digital communication networks including ISDN, digital mobile systems. The provision of ISDN interface in the exchange presumes the availability of SS7 capability in the exchange for inter exchange signalling.

CCS is essential to the ISDN, as it has already provided the communication capacity, speed and protocols to deal with much more complex requirements of ISDN connections or between diverse services. Standardization is an essential tool for the ISDN signalling.

Digital Networks: Digitization of the telephone circuits is one of the tools for ISDN working, Which provides higher bandwidth, reliability, speed and flexibility.

OSI is an attempt to rationalize and compartmentalize the conversation between the various communicating processors that may be involved in communication activities. The basic idea is to define the communications administrations and improve conditions for compatibility. The ISO's seven layered OSI model is an important attempt in that direction.

1.5 Services:

Telecommunication services are offered by a network operator or service provider and are accessed by users either at an ISDN interface or within a terminal connected to the ISDN. At a general level, ISDN services can be classified into following three categories.

♦ Bearer Services
♦ Tele Services
♦ Supplementary Services

1.5.1 Bearer services:

Provide capability for transportation of information between ISDN user/network interfaces, describe the transportation between locations. At present, 10 bearer services are fully or partially defined in ISDN. For example, the transportation of a 64 kbps bit stream between specified locations and without modification is a bearer service.

The ISDN channel types are standardized as below:

A : Analogue Voice Channel at 4 KHz.
B : Digital bearer channel at 64 kbps for voice or data transmission.
C : 8 or 16 kbps digital channel.
D : 16 bit digital channel for common channel out of band signalling.
E : 64 kbps digital channel for internal ISDN signalling.
H_0 : 384 kbps digital channels.
H_1 : 1536 kbps digital channels.
H_2 : 1920 kbps digital channels.

ITU (T) has standardized the following combinations for ISDN working:

♦ Basic Rate : 2 B + 1 D
♦ Primary Rate : 30 B + 1 D (E1 system)
    23 B + 1D (T1 system)
♦ Hybrid : 1A + 1 C

1.5.2 Basic Rate Interface (BRI): 2 B + 1 D

It is already seen that ISDN system transmits 144 kbps user information and 48 kbps maintenance information.
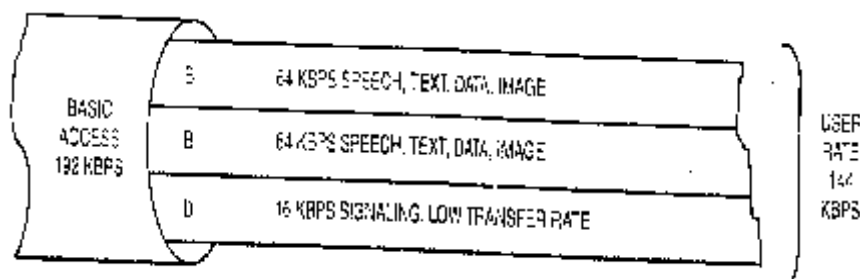
2B -Two bearer channels – 64 kbps + 64 kbps.

1D - One data channel – 16 kbps.

The 64 kbps transmission is normally known as basic rate transmission as it is the basic output from the telephone termination.   The two bearer channels can be used as any of the combinations as given below:

- ♦ Speech (64 kbps) + Image (64 kbps).
- ♦ Speech (64 kbps)   + Data (64 kbps)
- ♦ Image (64 kbps)   + Data (64 kbps)
- ♦ Speech (64 kbps)   + Speech (64 kbps)
- ♦ Image (64 kbps)   + Image (64 kbps)
- ♦ Data (64 kbps)   + Data (64 kbps)

The figure 1.1 shows one twisted copper pair carrying two bearer channels each of 64 kbps and 1 D channel of 16 kbps.

Fig. 1.1 Basic Rate Interface

As seen above the data transmitted by 'B' (bearer) channel is 64 kbps excluding that of 16 kbps transmitted by 'D' channel. So at any given time 2 B + 1 D – 3 channels can be transmitted.

- ♦ Speech (64) + Image (64) + Data (16)
- ♦ Speech (64) + Data (64) + Data (16)
- ♦ Image (64) + Data (64) + Data (16)
- ♦ Speech (64) + Speech (64) + Data (16)
- ♦ Image (64) + Image (64) + Data (16)
- ♦ Data (64) + Data (64) + Data (16)

Line Coding – The data rate is 192 kbps for trans and 192 kbps for receive. This data rate is reduced to half by using 2B1Q line coding. Hence, the total bit rate on line is 192 kbps including trans & receive. The full duplex is achieved by using 2B1Q code and echo cancellation.

There can be some incident that all the 3 channels are transmitting data at a time.

D Channel – Data channel normally known as 'D' channel, is very powerful. It is normally stated as "ISDN is D Channel and D channel is ISDN", which indicates the importance of 'D' channel for ISDN working. Without 'D' channel's power ISDN can never function.

The functions of 'D' channel are as below:

♦ Controlling the bearer channels.

♦ Common Channel Signalling as per ITU (T)'s CCS #7.

♦ Data transmission by packet mode.

   a) Controlling the bearer channels: The 1st priority function of 'D' channel is to control the transmission of two bearer channels simultaneous on a single copper pair. Again the transmission is full duplex working.

   b) Common channel signalling: ISDN signalling is by common channel as per ITU (T)'s recommendation of CCS# 7.This gives a great advantage of bearer channel transmission without any disturbance while signal is transmitted. D channel is always alert, even when 'B' channels disconnect, keeps security and protocol authentication alive enabling the next call in sequence not to be delayed.

   c) Data transmission by packet mode: The capacity of D channel is fully not utilized. Once call is set up it doesn't have much function other than call monitoring. It can be made available for user packet traffic when call control is needed it gets priority.

1.5.3 Primary rate interface (PRI):
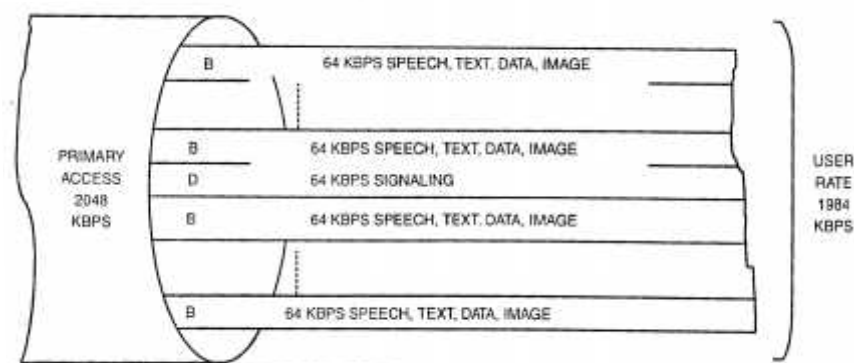
Fig. 1.2 Primary Rate Interface

E1: 30B+1D

T1: 23B+1D

30 B / 23B - Bearer channels. Each of 64 kbps.

♦ To carry data, voice, image, video.

1D - Data (D)channel of 64 kbps.

- To carry control information of 30 / 23 bearer channels.
- To carry common channel signal information of 30 / 23 bearer channels.
- To carry data in packet switching mode, when free.

1.5.2 Tele services:

♦ Combine this transportation function with other information processing functions. These additional information processing functions may be located within a network (public or private), or within user terminal equipment (such as PC).

♦ Provide full capability for communication by means of terminals, network functions and possibly functions provided by dedicated centers.
Example: Telephony, Telex, videotext, message handling, etc.,

1.5.3   Supplementary services:

♦ Bearer service and Tele service are basic services of telecommunications, which the subscriber gets when he asks for a communication capability. The supplementary service can only supplement the basic service and consequently cannot be offered as a stand alone service, can only be offered in association with a basic telecommunication service.

♦ As an objective, Supplementary service is defined and implemented in a manner independent from the associated Bearer services and Tele services. This allows each Supplementary service to be used in combination with many Bearer services and Tele services, without requiring a special implementation of that Supplementary service in each case. An example would be the methods of requesting and authorizing Reverse charging, which are intended to be the same for an electronic message and a simple voice call.
Example: Calling number identity presentation, call transferring etc.

1.6 Basic Structure of ISDN:

ISDN standards of structure for user equipment have following three important aspects of the standard.

♦ Functional groups - Functions that may be needed to support an user access arrangement.

♦ Reference Points – conceptual points driving functional groups and usually consist of physical interface and connectors.

♦ Access Points – Establish which of the seven OSI layer entities are used at the functional groups or reference points.

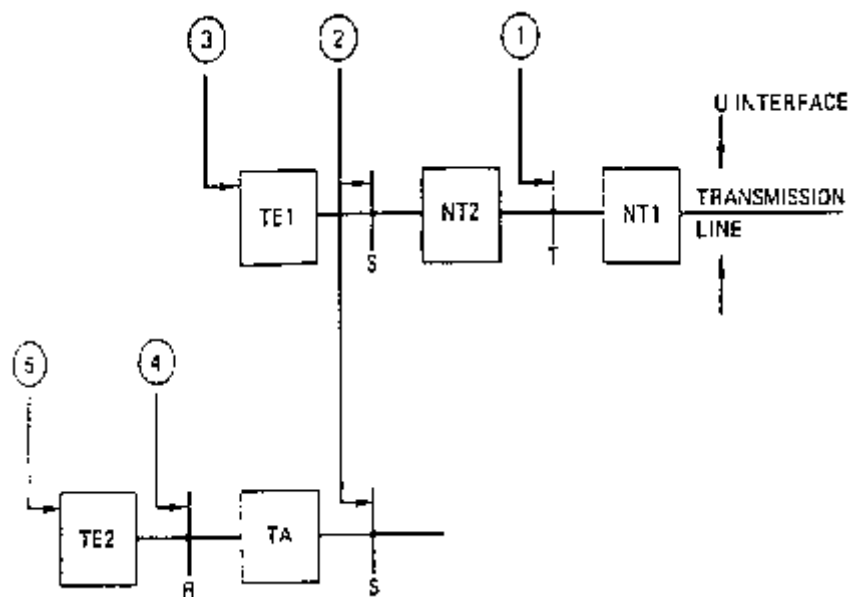## 1.7 ISDN Architecture: (Customer Premises Equipments) (fig 1.3)

Fig. 1.3 ISDN Architecture

The various components of User Network Interface from the network side are shown in Fig. 1.3. Network Termination 1 (NT1) and Network Termination 2 (NT2) are the equipments connected. These equipments have definite distinct functions and also it is not essential that there should be both NT1 and NT2, i.e. all the functions of both the NT1 and NT2 can be provided by a single NT. The various functional groups of an ISDN are as given below

Network Termination1 (NT1):

This is the group of functions that terminate the transmission line. As such, it is seen in the ITU-T's recommendations as belong to the network provider, the owner of the transmission line.

A terminal equipment on the subscriber's loop. Provided at each customer's premises, connects the subscriber to the ISDN exchange using twisted pair or any other medium. NT1 has a connection on it into which a bus cable can be inserted.

Functions of NT1:

- Line termination
- Line maintenance and performance monitoring
- Timing
- Power transfer, i.e., Extracting power from line to drive at least the "wake-up" portion of the terminal
- Parts of the multiplexing functions.

Network Termination2 (NT2)

This is the group of functions that give the terminal its particular "character". An NT2 is a functional block for switching and/or concentration of internal lines within the subscriber's premises, could be a PABX if access is primary, a LAN or a terminal controller. As simultaneous several conversations are needed in large business organization, the device NT2 is used prior to NT1 at customer's premises.

Functions of the NT2:
- Protocol handling or handling that part of the protocol associated with information transfer across a network
- The higher level parts of the multiplexing function
- Switching and concentration functions
- Maintenance functions
- Termination of the "S" interface, which may include multi drop termination and associated contention resolution functions
- Interface functions Is a common termination box, provided in sub' s premises. The below given can be terminated in this box:

1. The twisted pair from ISDN or NT1
2. Upto eight terminals of type TE1 or TE2 or combination of TE1 & TE2

Terminal Equipment – ISDN (TE1): This is the standard terminal of ISDN for digital telephone and G4 facsimile with ISDN function. An end user device that complies with ISDN recommendations.
a)   ISDN telephones
b)   *Video phone*
c)   Video conferencing equipment
d)   Voice mail equipment
e)   Personal computer with PC add on card for data Transfer at 64 kbps,

Terminal Equipment – Non ISDN (TE2):

This is an ISDN non-standard terminal, uses current technology, and is used for the analog terminals such as

a)   Decadic (dial, push button) telephones

b)   DTMF telephones

c)   Fax machines

d)   Modems

e)   Data port—any PC with RS 232C connection (serial port of the PC) can be connected. Data upto 9.6 kbps can be transmitted without using modem.

Terminal Adapter (TA):

This is used for the connectivity of non ISDN terminal to ISDN network. It converts a non ISDN interface to ISDN interface. To begin with, the existing terminals at the user end will be used for connecting it to the ISDN i.e. existing packet switching terminals which have X.25 protocol for signalling and not the D channel protocol as required for ISDN. The conversion of X.25 protocol to D channel protocol is done by the terminal Adapter (TA).

Reference Points:

U Reference Point: The side on the network side, identified as "U" reference point, is owned, administered and maintained by the network operating company, and the premises side owned, administered and maintained by the user. Connection from ISDN exchange to NT1 is either on twisted pair or any other medium.

T Reference Point: The point between NT1 and NT2 is known as "T" reference point and segregates the operator and user.

S Reference Point: The point between NT2 and TA or NT2 and TE1 is known as the "S" reference point. In case if the NT2 is not used i.e. functions like concentration etc are not needed, the S and T reference points coincide and is known as "S/T" reference point.

**R Reference Point:** The point between the TE2 and TA is called the "R" reference point.

1.8 Subscriber equipment that can be connected to the ISDN line:

The present day user is already a subscriber. Telephone through connection to the PSTN, telex through the telex network, data through private and public packet switched data network.

ISDN provides different services mainly voice, data and Image transmission over the same connection, the local telephone distribution network, to the subscriber. The concept of the ISDN is fundamentally a concept of integrated access

In the ISDN, the telephone line is terminated on a common box, called the network termination, provided at the subscriber premises. Beyond this box, on the internal wiring in the subscriber's premises, up to eight different types of ISDN / non ISDN terminals can be connected. ISDN terminal equipments like personal computer (PC) with add on ISDN card, video phone, video conferencing equipment etc., and non ISDN equipments like existing rotary and pushbutton telephones, fax machines, modems, PCs with RS 232 C connections can also be connected to the internal wiring with suitable adapters. **Fig 1.4** shows the ISDN subscriber premises installation
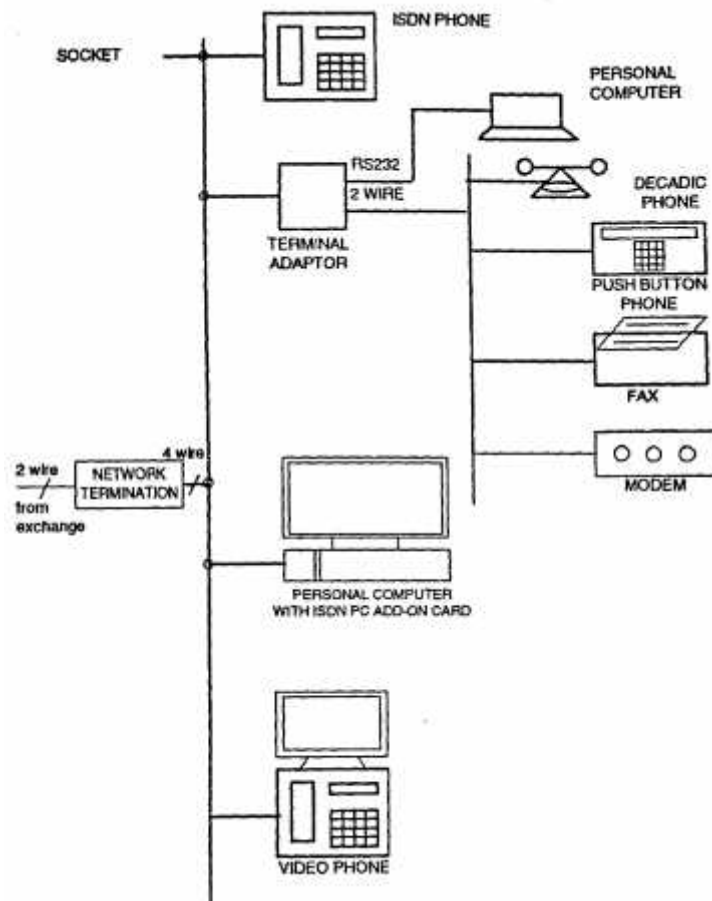
Fig. 1.4 ISDN Subscriber premises installation

The ISDN basic access can support upto 8 voice or data terminals so that the single ISDN access can perform the functions previously requiring a small PABX or key system and a small LAN. In many cases users will find this to be the most effective means to provide such facilities even without taking into account the facilities and service made available by the ISDN itself.

1.9 International standards for ISDN:

The initial series of ITU-T recommendations, the I –series, were first agreed and published at the end of the 1980-1984 plenary period. Further enhanced during 1984-88 plenary period. Full set of recommendations being published in the blue book. Further enhancements were made and published in 1992. The bulk of the information on the ISDN is contained in the Blue Books (1988 Recommendations) in three volumes, Volume III, Fascicles III.7, III.8 and III.9.

General Structure	:	I - 100 series.
Service capabilities	:	I - 200 series
Overall network aspects and functions	:	I - 300 series.
ISDN user / Network interfaces	:	I - 400 series.
Inter network interfaces	:	I - 500 series.
Maintenance principles	:	I - 600 series.

1.10 ISDN RECOMMENDATIONS FROM ITU – T

Title	Recommendation	Reference	Date	Fascicle
ISDN user – network interface data link layer – general aspects	1.440 [28]	Q.920[33]	1993	VI.10
ISDN user – network interface, data link layer specification	1.441[29]	Q.921[34]	1993	VI.10
ISDN user – network interface layer 3 – general aspects	1.450[30]	Q.930[35]	1993	VI.11
ISDN user – network interface layer 3 specification for basic call control	1.451[31]	Q.931[36]	1993	VI.11
Generic procedures for the control of ISDN supplementary services	1.452[32]	Q.932[37]	1993	VI.11

Objective:

1. ISDN uses <u>CCS7</u> signaling system.

2. BRI consist of <u>2B+D</u> channels

3. PRI consists of <u>30B+D</u> channels.

4. B channel data rate is <u>64 kbps</u>.

5. D channel data rate in BRI is <u>16 kbps.</u>

6. D channel data rate in PRI is <u>64 kbps.</u>

Subjective:

1. What are the advantages of ISDN exchange?

2. Explain BRI and PRI?

3. Draw BRI customer premises connectivity diagram?

4. What is the function of NT1?

5. What is the function of NT2?

6. What is meant by TE1, TE2, and TA?

CHAPTER 2

SERVICES OFFERED BY ISDN

A wide range of services catering for the needs of residential and business subscribers will be offered. Data files between PCs will be transmitted at a high rate of 64 kbps. This is more than six times the typical speeds possible at present.

2.1 Video Conferencing

An attractive service of ISDN being offered to customers is video conferencing, which has potential of curtailing travelling requirements of business executives. Videoconferencing can be achieved between any two ISDN customers on dial-up basis on existing telephone lines.

Two types of videoconferencing are being offered. For high quality video (384 / 512 kbps), three / four ISDN lines will be required by the customer. In this case, in addition to video image of the participants, still pictures of documents and drawings can also be transmitted. For ordinary videoconferencing (128 kbps), a single ISDN line will be sufficient.

2.1.1 Videoconferencing equipment: This equipment consists of a computer, TV monitor, camera and other control units.

This equipment will be connected to the network using three ISDN lines. The equipment establishes connection to a similar equipment on the other side by dialing through the network. Moving video images of the conference participants can be sent as well as received along with their conversation. It is possible to send diagrams and photographs by a still picture camera. Data transfer can also be done simultaneously. The equipment works at 384 / 512 kbps.

In addition, video images can be sent or received on auxiliary equipment, like VCR. Using the control panel, the video camera can be moved or zoomed on the required participant of the conference. The transmitted picture can be viewed along with the received picture.

2.1.2 Desk-top videoconferencing: This is a compact version of the video conferencing equipment, usually PC based. The PC is upgraded by one or two add-on cards. A camera is provided which can be appropriately placed. Only 128 kbps of transmission capacity is required and, therefore, a single basic access ISDN line is sufficient. In any models, it is also possible to transfer files and jointly edit documents.

2.2 Supplementary Services: ISDN will also support a new set of additional facilities, called supplementary services, for speech calls. The following services will be available for calls made between ISDN subscribers.

Calling line identification presentation (CLIP): When an ISDN subscriber receives a call, the calling subscriber number will be displayed on his ISDN telephone before the called subscriber answers the call. (The ISDN phone has a small LCD display resembling those available in calculators.) Thus, the subscriber knows the telephone number of the caller from the very beginning, even before answering the call. For example, when the subscriber is already in conversation, he may choose to attend the second incoming call depending on the caller's number displayed. This service will be provided free of cost of all ISDN subscribers.

Calling line identification restriction (CLIR): This service may be provided on subscription by one time payment. By means of this service, the calling subscriber will be able to prevent the disclosure of his number to the called subscriber (prevention of CLIP). However, this service will be overridden by certain agencies such as police and fire services, since they may need to know the identity of the caller in all cases.

Advice of charge (AOC): The amount charged for a call, in terms of call units, will be displayed on the calling subscriber's ISDN phone. In case of long distance calls, it is possible to see the count of metering pulses incremented for this call. This will be continuously updated as the call is in progress.

Multiple subscriber number (MSN): As up to eight terminals can be connected in parallel on the subscriber premises wiring, to call a specific terminal (PC to call a PC, and phone to call a phone), separate number can be allotted to each terminal. This will be particularly useful when the call is received from a normal (analogue) subscriber. In case call is received from an ISDN subscriber, the terminal selection will be automatically made.

Call forwarding services (CF): The call to a subscriber can be forwarded to another number under different criteria like, subscriber being busy or no answer. Calls can be forwarded unconditionally also (CFB, CFNR, CFU).

Call forwarding busy (CFB): If the called subscriber is busy, the incoming calls to his number can be diverted to another number specified by him.

Call forwarding no answer (CFNR): If the called subscriber is not available or does not answer the call, the incoming calls to his number can be diverted to another number specified by him after a few rings.

Call forwarding unconditional (CFU): All the incoming calls to a subscriber can be diverted to another number specified by him. The ring directly goes to the diverted number in this case.

Terminal portability (TP): In the subscriber premises up to eight terminals can be connected to a single ISDN line. These terminals can be in different rooms and also can be on different floors. The internal wiring in the subscriber premises is terminated on sockets. During conversation, it is possible to transfer the call from one terminal to another or even remove the terminal and connect it to another socket at a different location. This facility is available for calling as well as called subscriber.

Call hold (CH): During conversation, it is possible to hold at least two more calls. The subscriber can switch between these calls.

Closed user group (CUG): Companies with offices in different cities can have their ISDN number in a closed user group. The subscribers can call each other using short numbers as if they are connected to a PABX. This group enjoys certain calling privileges like selective call barring and additional level of security.

ISDN phone: This terminal, in addition to having a handset and dialing key pad, also has an LCD display, additional key for storing frequently dialed numbers and other function keys.

(i)   **Display:** The ISDN phone has an LCD display resembling those available in calculators. The number dialed is displayed, so that the caller can leisurely enter the digits without mistake. This reduces wrong calling. In case of CLIP services, the calling number is displayed. In case of AOC, the number of call units charged is displayed. This is also used for programming of MSN, CF, etc. In addition to providing tones on the status of the call (dial tone, busy tone, ringing tone, routing tone, etc), status is also displayed. This combined with speaker phone facility provides true hands-free operation.

(ii)   **Logging:** The logging facility provides for automatic storing of calling subscriber's number, when the call could not be answered. The calling number can be recalled using the log.

Other facilities like redialing, memory dialing and speaker phone are also available. The phone is also called digital phone, since signals are transmitted and received in digital form. So the phone provides clear and noise-free conversation. In ISDN, the line condition is always checked continuously, so that any fault in the line is immediately detected.

Terminal Adapter (TA): The existing analog terminals like rotary and push button telephones, modems, PCs, modems and fax machines can be connected to ISDN through terminal adapter.

This is a quick solution to extend ISDN features to non ISDN terminals. The TA provides ISDN line connectivity on one side and variety of connectors on the other side.

1. **Analogue connector:** Rotary & pushbutton telephones (pulse type or tone type), modems, fax, answering machines, cordless phones etc can be connected.
2. **Data port:** Any PC with RS232C connection (serial port of the PC) can be connected to this port. Data transfer using standard software packages like X - talk or Procomm is possible up to 9.6 kbps. Modem is not required.

PC Add on ISDN card: This card can be fitted in standard PCs and can be used for data transfer at 64 kbps. This card fits into vacant slot of any standard 386 / 486 / Pentium PC. A software is also provided, which will be installed in the PC. The connector from the PC is connected to the ISDN line. Using the software, files from the PC can be transmitted or received at 64 kbps. Using both the B channels, it is possible to send data at 128 kbps.

2.3 Other services:
- Negligible noise as digital working.
- Information of call in progress.
- Faster data rate.
- Full duplex working.

2.4 Features:

CTI – computer telephony integration link:

- This provides open architecture interface to the call processing and management circuitry.
- CTI effectively merges telephone and computer systems in single environment.
- This system is useful for IVRS working.

ACD – Automatic Call Distribution:

- ACD applications effectively handle high volume of incoming calls by a variety of sophisticated and customized routing, queuing and management features.

Cap – computer attendant position:

- This permits efficient access to station, trunk and features of ISDN system.
- Cap effectively reduces the time needed to perform routine attendant functions, such as transfer, hold etc.
- Cap incorporates universal directory which can contain both internal and external stations.

Additional PRI:

- No need of extra D channel.
- It can cater for one and more PRI interfaces.

Additional PRI can accommodate 31 bearer channels

Qsig:

- Qsig private networking features.
- Qsig specifications for private network features signalling between PABX systems enables two or more separate exchanges may be linked through ISDN facilities to form a single unified logic system.

Fiber link shelf

Air link and connectivity by WILL with DECT technology.

Voice mail

Remote shelf

Conferencing

Subjective:

1. What are the services offered by ISDN exchange?

CHAPTER 3

INTEGRATED SERVICES BUSINESS EXCHANGE (ISBX) – CORAL FLEXICOM SERIES

3.0 Technology

CORAL Flexicom developed by ECI Telecom of ISRAEL (formerly known as TADIRAN Telecommunication Ltd.) ECI Telecom is acknowledged in the military electronics and switching system industry by earning ISO 9001.

3.1 Features:

♦ Q SIG (International networking Protocol standard) features transparent networking.

♦ ISDN applications, which includes BRI, PRI

♦ Computer Telephony Integration (CTI)

♦ Hospitality Industry

♦ Automatic Call distribution (ACD)

♦ Automatic route selection

♦ Wireless, cellular communications

♦ Computerized Attendant Position (CAP)

♦ Fibre optic remote shelf

♦ Networking ability;

♦ Sophisticated Feature Transparencies

♦ Expansion into Broad band ISDN

♦ Coralink from external business center

♦ Voice mail

♦ Video conferencing

♦ Packet and DSO channelized data transport

3.2 System general description:

The Coral Flexicom operation is supervised by highly efficient, stimuli controlled call management Software with a 32 bit main processor INTEL 80386, hierarchical processor located in every peripheral card and in every digital telephone set. System of **distributed processing** is Utilized for efficient working. Operating software is stored in flash ROM, providing excellent long term stability and flexibility to update. Database stored in battery protected SRAM.

The system employs **Universal Card Slot** Concept, i.e., any peripheral interface card slot can accept any peripheral card without sacrifying the system capacity. The slots are self programmable by default as per the cord introduced. Even the ports are self programmable by default, according to the type of card kept in the slot. Dual Linear Serial bus design is used to carry the control, voice, data signals through out the system. Every signal is assured alternate route with in system.

Fully digital key telephone sets using a single station pair are available with 12 or 28 programmable buttons, digital signal processor (DSP), audio system, built in speaker phone, optional 48 or 80 character alphanumeric display. Programmable button expansion modules add 40 buttons each for upto 144 buttons per telephone set. With simple 12 button DSP, voice announcement, back ground music, voice / data features are available.

The system offers a selection of analog and digital trunk interfaces compatible with telephone facilities all over the world, central office grade single line telephone set interface, and proprietary electronic and digital multi button telephone sets. High speed data communications, transport data at rates upto 64 kbps over a DSO channel. Serial data interfaces are available on Voice / data telephone sets and as stand alone devices supporting RS 232 C, RS 449, RS 530, V.35, X.21 interfaces and coraLAN units bridge either Ethernet or token ring networks.

CoraLITE is a Fibre Optic Remote Shelf. Allows complete system integration with shelves of the system operating at distant places.

The automatic call distribution (ACD) application effectively handles high volume of incoming calls by customized routing, queuing and management features. ACD automatically routes calls to all agents in a CTI - Linked ACD or call centre environment.

The system employs PCM working with either A - law or Mu – Law. PCM encoding standards can work with North American T_1 (24 timeslots), and European E_1 (32 time slots) standards. Dial Signalling capabilities include Pulse, DTMF, MF, and MFC-R2. Primary Rate Interface accommodates digital interconnection to the emerging ISDN.

Automatic Number Identification (ANI) for both 1/l and o/g subs. (COLP / CLIP)

The standard generic features software provided with every coral Flexicom system is complete and self contained, with an extensive feature complement. Coral Flexicom system design is based on a principle of open architecture. The examples are CoraLINK, third party CTI link over an ETHERNET bus. CORALINK complies with ECMA standards 179 and 180 and is compatible with the Novell TSAPI.

The system incorporates the Q SIG international private network signalling standard.

Through this signalling format, Q SIG complaint systems, even those from different manufacturers, can be linked to form an uniform, cohesive, telecom network.

3.3 Q SIG Features:

♦ Calling number indication   CLIP / COLP

♦ Transmission of name   NA

♦ Automatic call back   CCBS / CCNR

♦ Call forwarding   CFB / CFNR / CFU

♦ Transferring a connection   CT

♦ Camp on busy A sub   CO

♦ Transmission of tariff units   AOC

♦ Path optimization   PR

♦ Transparent forwarding to external protocol   GF

♦ Private phone number plan   PTNA

   (The number list should be matched)

The Computerized Attendant Position (CAP) permits fast, efficient access to stations, trunks and features of the coral Flexicom system. The CAP can efficiently reduce the time needed to perform the routine attendant functions.

3.4 Coral Flexicom systems:

They are available in three cabinet variations.

3.4.1 Coral Flexicom SL: All features of any coral exchange are available, except remote shelf.

Specifications:

Microprocessor (Simplex)	:	32 bit Microprocessor INTEL 80386
Storage	:	Flash ROM
Max. Ports	:	200
Operating Temperature	:	0^0C to 50^0C
Storage temperature	:	- 10^0C to + 70^0C
Power Supply	:	Internal 110/230V AC 60/50 Hz
No. of Shelves	:	ONE

Features:

- Wall Mounting
- Main Software identical to large systems
- Non-blocking traffic
- Supports both analog and digital circuits
- Analog trunks
- Analog trunks with metering
- E & M tie lines
- ISDN : BRI + PRI
- Digital trunks T_1 & E_1
- Low Power consumption
- Battery back up support

3.4.2 CORAL FLEXICOM II:

All features of any coral Flexicom systems are available except Remote shelf Main.

Specifications:

Wall mounted

Microprocessor(Simplex)	:	32 bit Microprocessor INTEL 80836
Storage	:	flash ROM
Max Ports	:	384
Operating temperature	:	0^0C to 40^0C
Storage temperature	:	$- 10^0$C to $+ 70^0$C
Power Supply	:	230 V AC 60/50 Hz, 350W - 48 V DC
No. of Shelves	:	1

Features:

As in Coral Flexicom SL

Coral Flexicom –5000

Floor Standing

Microprocessor	:	32 bit Microprocessor Intel 80386. Duplex with Hot stand by
Storage	:	Flash ROM
Max ports	:	Can be extended upto 6144
Operating temperature	:	0 - 40^0C
Storage temperature	:	-10^0C to - 70^0C
Power Supply	:	- 48 V DC. 710W (3 shelf) 1060 W (4 shelf)
No. of Shelves	:	16 (Max)

Features:

All features as in Coral Flexicom SL and CORAL Flexicom II. Additional facility is it can house have remote shelf main.

Two sizes are in market

i)   3 shelf Cabinet
ii)   4 shelf cabinet.

The cards are interchangeable between CORAL Flexicom SL, CORAL Flexicom II and CORAL Flexicom 5000.The Remote interface shelf Main is kept in CORAL Flexicom 5000 and Remote interface shelf slave is kept in coral Flexicom II or coral Flexicom SL.

3.5   Coral Flexicom Remote Control Systems: (Fig. 3.1)

Coral Flexicom –5000 System is provided with Remote Control Interface Coral Flexicom –5000 is provided with RSIM Card - Remote Station Interface Main and distant exchanges are provided with RSIS – Remote Station Interface Slave Cards. By this arrangement Remote maintenance of distance exchanges can be done from Coral Flexicom –5000 exchange a typical arrangement is shown in figure.

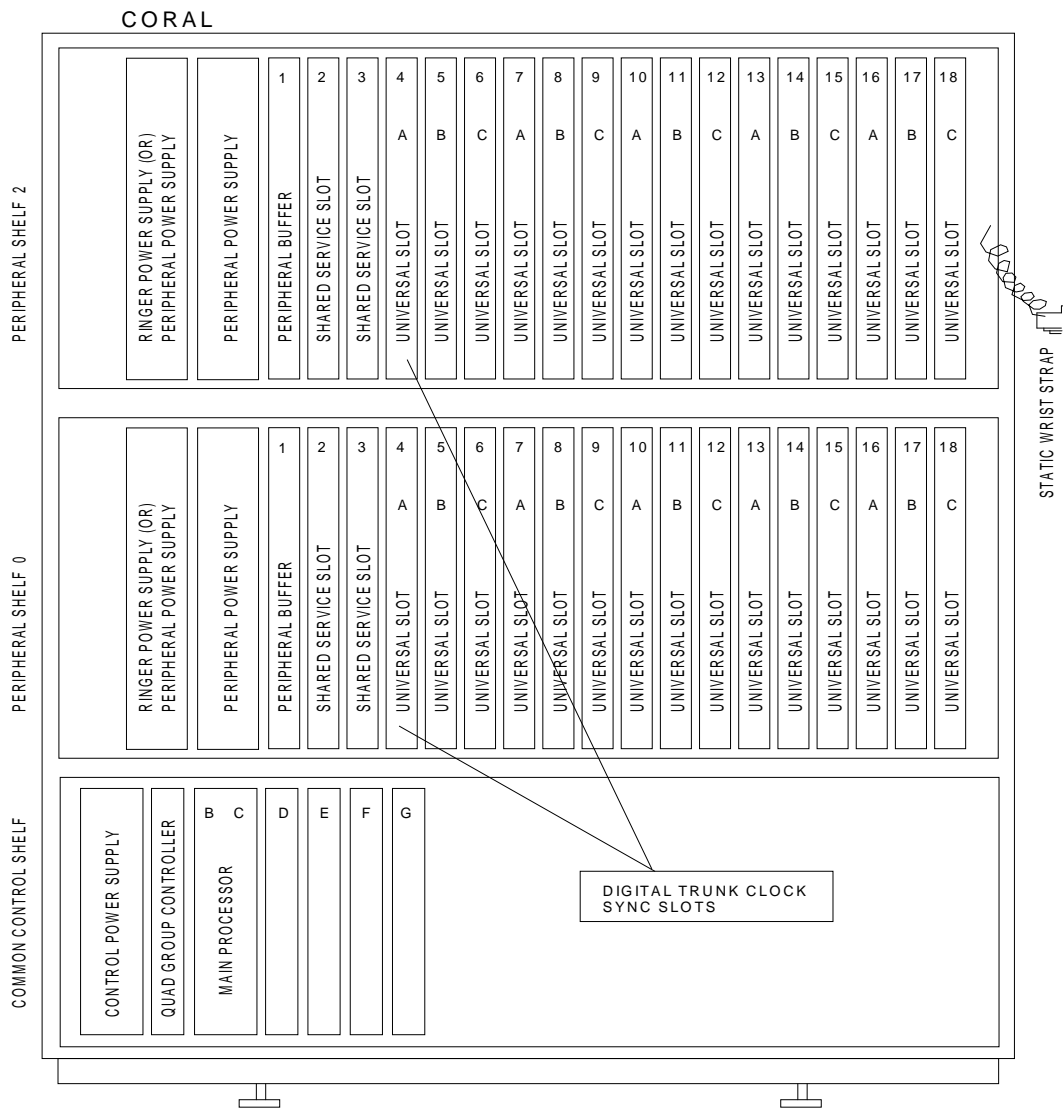CORAL exchanges are marketed in India by BPL and HCL
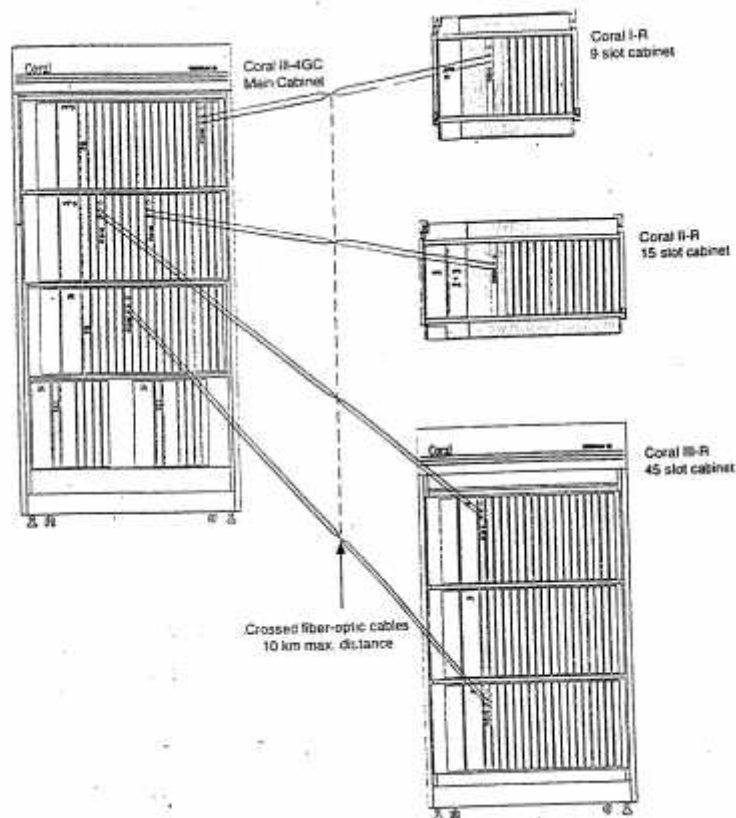
Fig. 3.1 Remote Interface Control of Coral Flexicom System.

CHAPTER 4

TADIRAN TECHNOLOGY ISDN EXCHANGE - CORAL FLEXICOM 5000

4.0 Coral Flexicom 5000:

Extendable up to 6144 ports with a maximum of 16 shelves. Coral Flexicom 5000 cabinet is a free standing floor mount configuration.

Fig. 4.1 Coral Flexicom 5000 3 shelf configuration Front View

There are 2 configurations.

♦ 3 shelf configuration in each cabinet. (Fig. 4.1 shows the 3 shelf configuration.)

♦ 4 shelf configuration in each cabinet.

The active circuitry of the system contains removable printed circuit assemblies or cards all of which may be used in any system in the Coral Flexicom family.

The active circuitry of the Coral Flexicom systems is divided into two major functions -common control and peripheral control. The common control circuitry directs call traffic through the system, establishing audio connections through peripheral parts. The peripheral circuitry provides the hardware necessary to establish those connections. Instructions from the common control circuitry to the peripheral control circuitry and status information from the peripheral to the common control are passed through the Group Controller, which considered neither as common control nor as peripheral. The peripheral circuitry is further divided into shared service and peripheral interface functions. The shared service circuitry provides the equipment necessary to establish calls between the peripheral interfaces. The peripheral interface circuitry provides standardised electrical connections to external telephone station equipments and network facilities.

Coral Flexicom 5000 operates on DC power supply -48v. The Coral Flexicom 5000, whether it is of 3 or 4 shelves, the bottom shelf contains control cards and known as **Common Control Shelf**, the remaining 2 or 3 shelves contain peripheral (line) cards and are known as **Peripheral Control Shelves.**

4.1 Common Control Shelf:

The cards are duplicated on hard stand by mode. 6 (3+3) cards are mounted In this shelf. The common control portion of the system provides the control mechanism for providing audio and data connections or calls via the PCM bus between peripheral I/O ports. Common control is divided into 5 different functions.

♦ Main Processor
♦ Generic Feature Memory
♦ Data Base Memory
♦ Peripheral Bus Interface
♦ Memory Management

4.2 Cards:

4.2.1 Main Processor Card (MEX): This is kept in the designated slot. This card is the heart of the common control. It contains the main processor, memory management circuitry, local bus interface and database memory protected against Power Off with a long life Lithium Battery back up. The clock functions are also protected by the back up battery.

MEX supervises the overall system operation by executing system wide processing. The program interface provides a test based facility, may be accessed via RS 232 C data terminal port provided on the MEX front panel. The main processor communicates through 4GC card over HDLC buses with card processors in each peripheral card.

The following special features are provided in this card:

Software Authorisation Unit (SAU): Provides an unique system for installation at site. During software installations, the SAU identification number is compared with the authorisation data. If SAU is removed the system shall work up to 14 days.

Database Storage Card (DBX): Incorporates 1 MB of SRAM used to store the configuration database of the system. This is a baby card of MEX, mounted on the MEX itself. There is provision for mounting 4 such baby cards in the MEX. DBX card is optional.

Flash ROM (FSH): Generic feature memory card. 4 more FSX cards also can be mounted in place of DBX cards, if DBX cards are not used. That is MEX can be mounted with 4 DBX or 5 FSX cards.

Specifications Of MEX Card:

Microprocessor	:	INTEL 80386 SX
CPU Clock rate	:	12.5 MHZ.
Memory Addressing	:	16 bit shared with DBX, FSX FDC, SVD, CLA, 4GC
RAM Storage capacity	:	786,432 Bytes.
Memory configuration	:	393,216 X 16 bits
Memory Device	:	128 Kb X 8 bit RAM
RAM Back up Battery	:	Lithium Battery 3.0 v, 250 mah

A LED indication and 7 segment display indication are provided in the front panel of the card.

LED Glowing ------- Card is working normally.

7Segment Display --- Card is faulty. Different Display configurations indicate different faults.

4.2.2 Group Controller And Peripheral Service Card (4GC):

This card acts as a communication link between MEX and PB24 card in peripheral card shelf. It contains clock circuitry to synchronise the peripheral portion of the system. Digital tone generation, dial tone, busy tone, ring back tone, ringing, DTMF, MFC and test, HDLC bus interface circuitry and PCM interface circuitry. 4 GC card supports 8 HDLC & 8 PCM highways.

The 4GC card is able to be interconnected to a companion 4GC card through a super link called duplicated common control. In systems equipped with duplicated common control, two sets of complete common control cards operate In Synchronous Duplication Mode

4.2.3 Control Power Supply Card (CPS):

Specifications:

Input   : -42 to - 58 v 6A Max.

output   : + 5v DC Nom. Regulated 30A Max

Indicators   : Power ON Test Jacks

Fuses   : Input -48v 8A S.B.

Control &Adjustments: Power On Switch +5v Adjust.

The CPC contains a Pulse Width Modulated Switch Mode DC-DC Converter, which converts -48v DC input power to +5v operating voltage. Voltage and current level monitoring circuitry checks the output of the CPS and produces alarm to the system main processor in the event of abnormality.
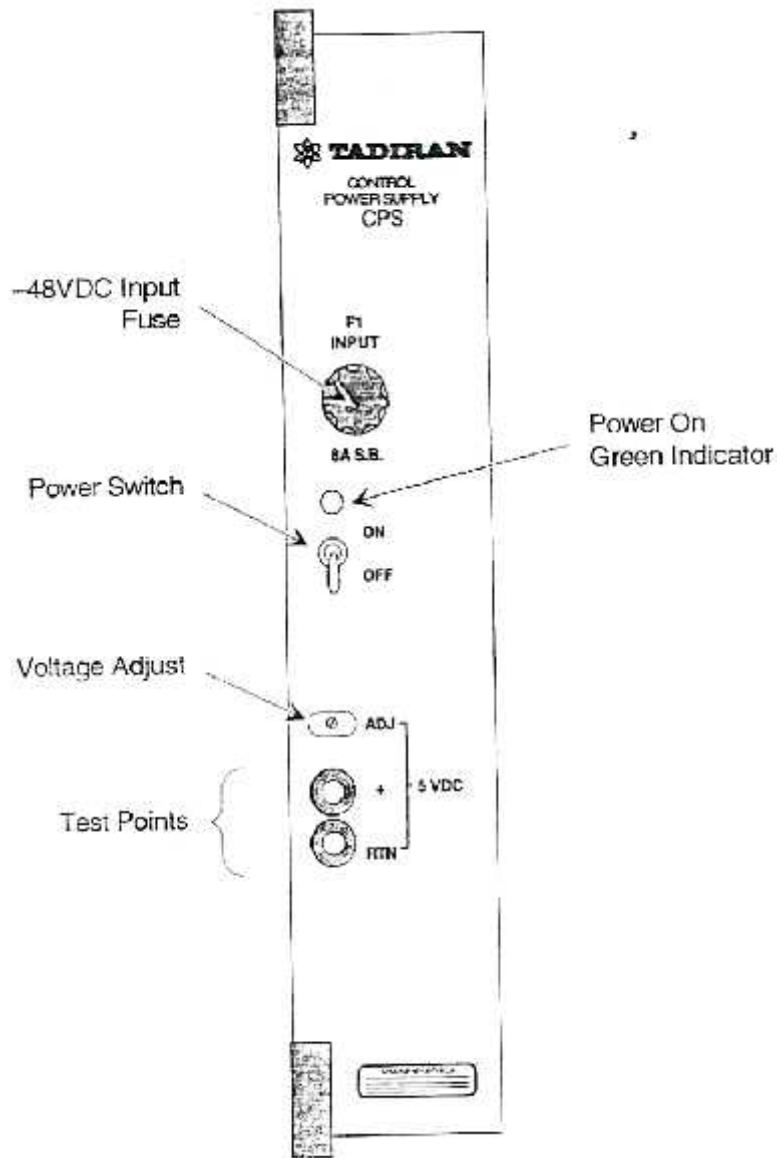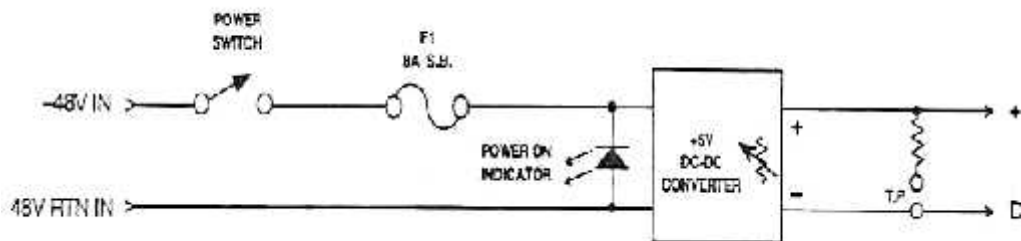
Fig. 4.2 Control Power Supply (CPS) Card

Fig. 4.3 CPS Block Diagram

4.3 Peripheral Control Shelf:

All the peripheral cards are provided in this shelf and interface with the control cards through PB24 card.
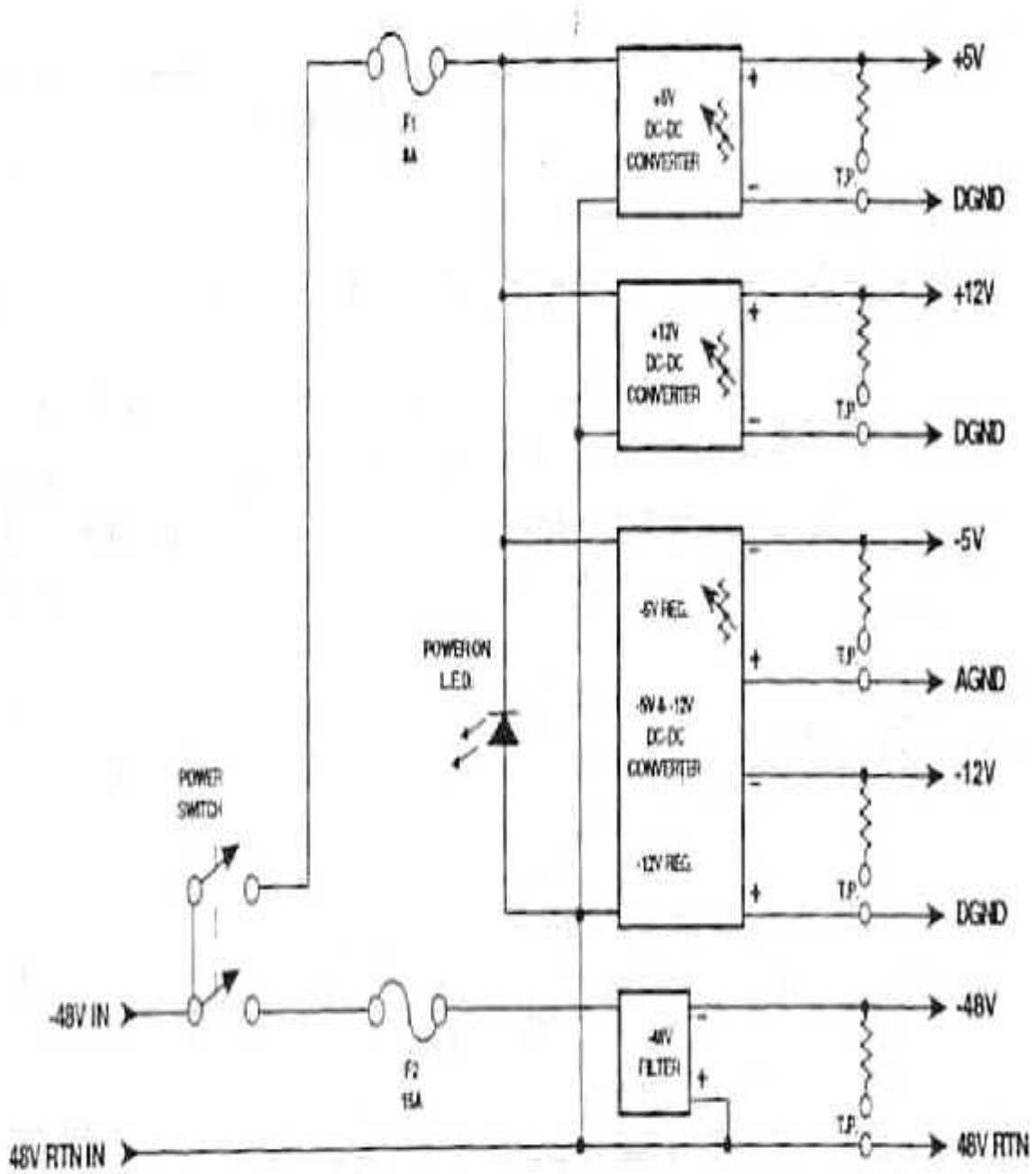
4.3.1 Peripheral Power Supply Unit (PPS):
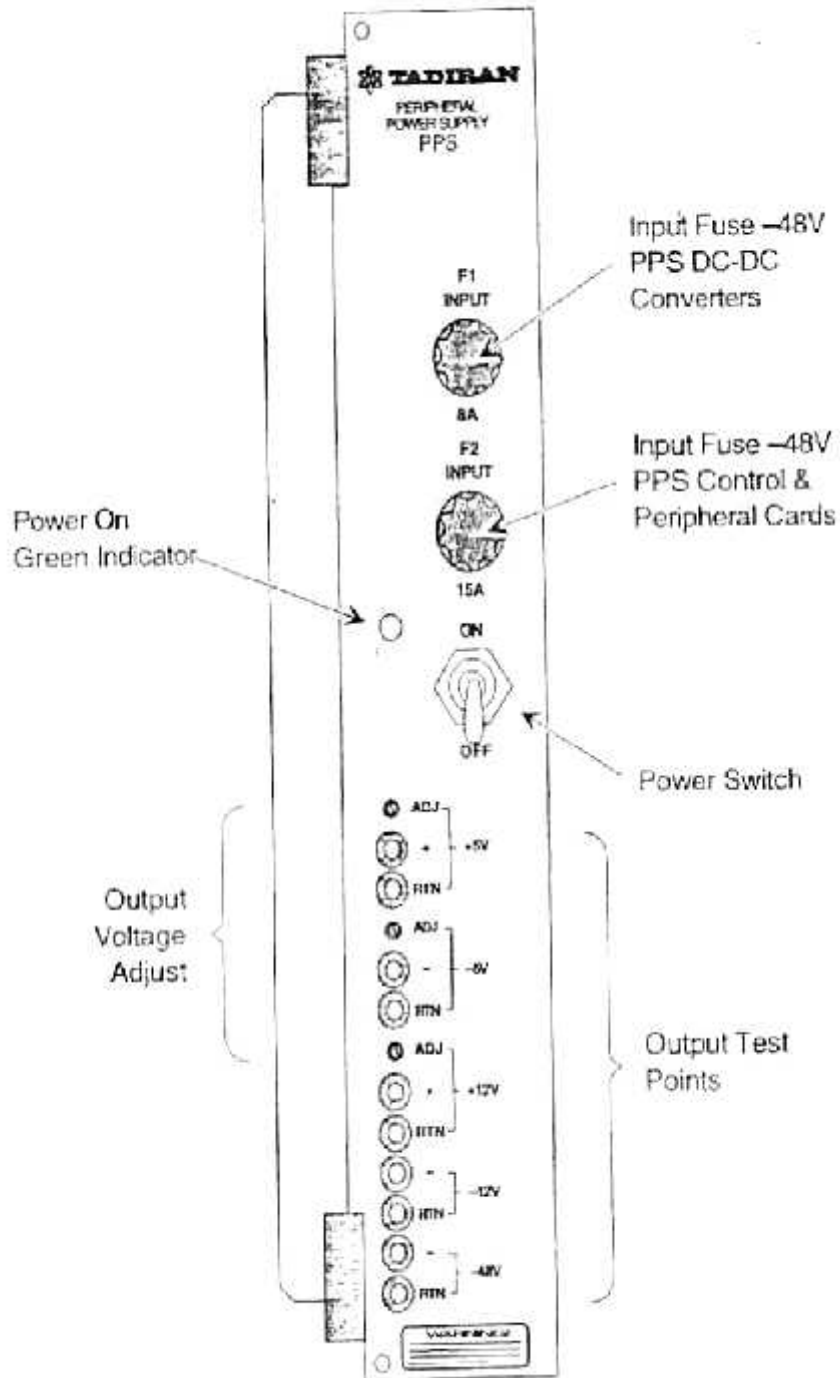

Fig. 4.4 PPS Block Diagram

Fig. 4.5 Peripheral Power Supply (PPS) Card

Specifications:

Input   : 42v to -58v DC, 20A Max.

Output   : +5v DC Nom. Regulated 15A Max

                             : -5v DC Nom. Regulated 3A Max

                             : +12v DC Nom. Regulated 8A Max

                             : -12v DC Nom. Regulated 0. 1 5A Max

                             : -48v DC Nom. Regulated 8A Max

Indications   : Power ON output voltage test jacks.

Fuses   : Input(Peripheral -48v) 15A.

                             : Input (DC-DC Converter) 8A

Controls & Adjustments: Power ON Switch

                             +5v Adjust

                             -5v Adjust

                             +12v Adjust

                             -12v Adjust

                             -48v Adjust

The PPS provides internal operating voltage for switching systems. It controls 3 pulse width modulated switch mode dc/dc converters, which convert -48v to +5v, -5v, +12v, -12v operating voltages for internal circuits. Each PPS can support 2 peripheral shelves. An ON/OFF switch, input fuses, power On LED indicator, Test points and adjustment terminals are provided on this card.

PPS card is provided in each shelf but it can supply to two shelves when the other card in 2nd shelf fails. Should be removed only in Power Off condition.

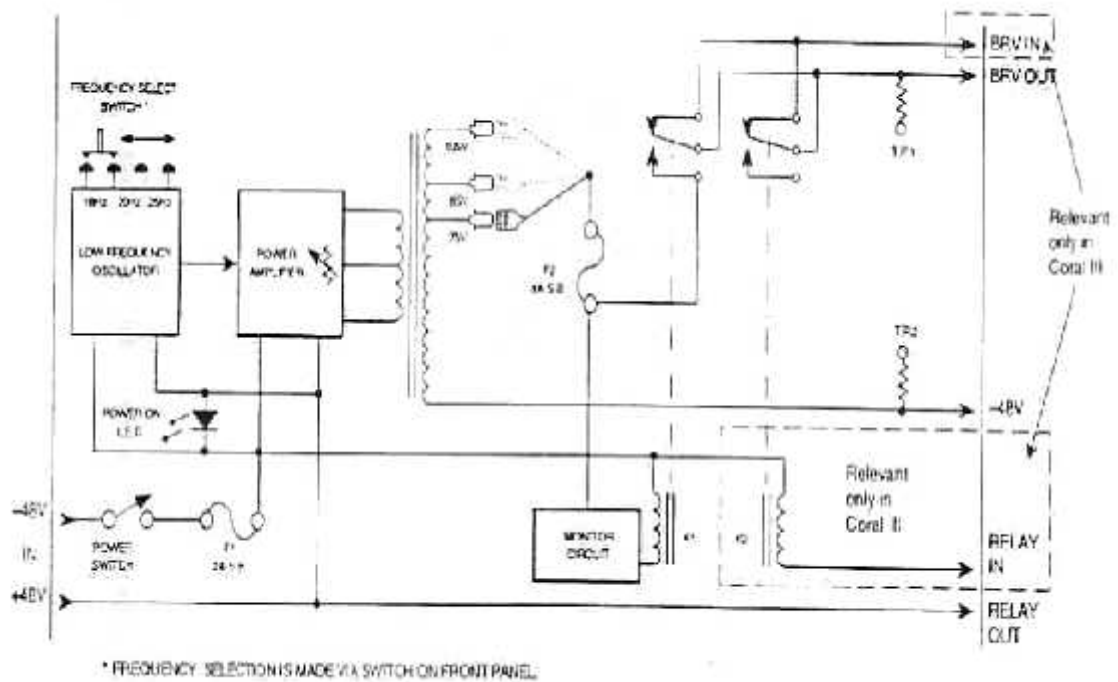### 4.3.2 Ringing Generator Power Supply Unit (RPS):

Fig. 4.6 RPS Block Diagram

Specifications:

Input   -42 to -60 V DC, I Amp max

Output Voltage   Fast on selectable 75, 85 or 105 V AC

Frequency :   Switch selectable 16, 20 or 25 Hz

Capacity   :20 VA max

Indicator   :POWER ON output voltage test jacks

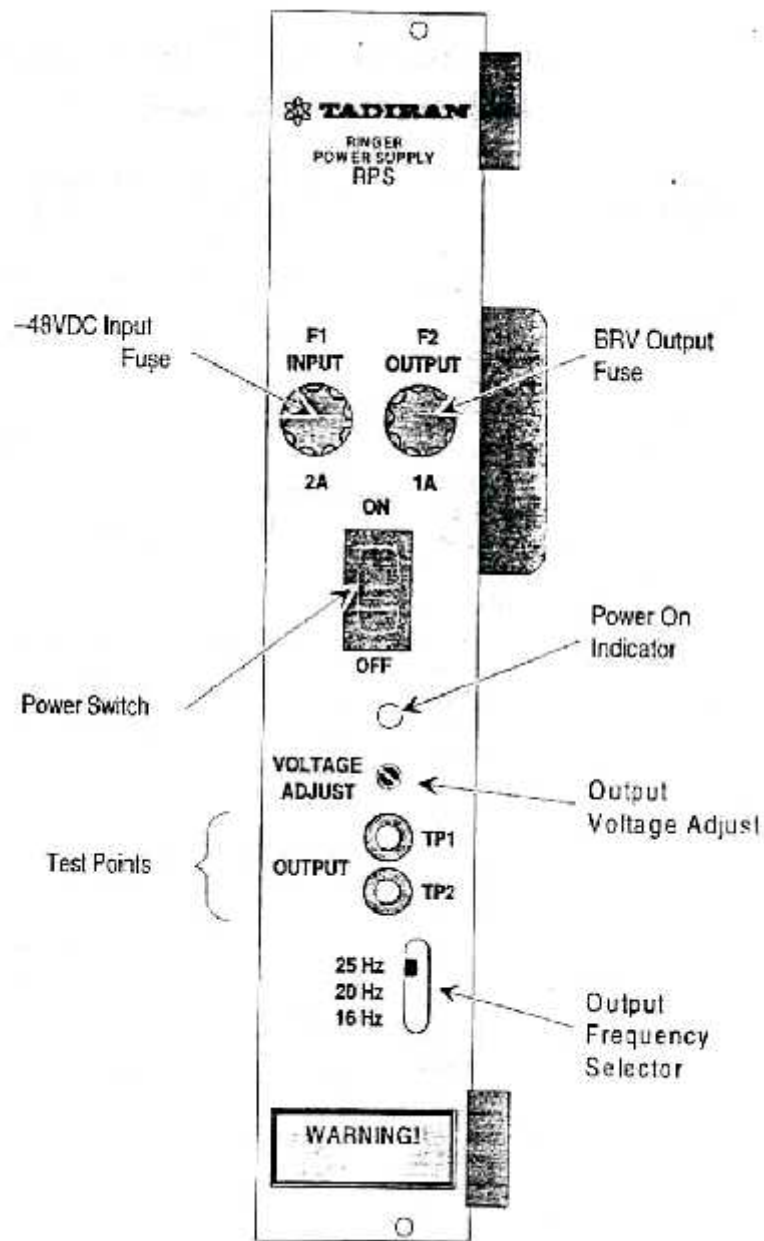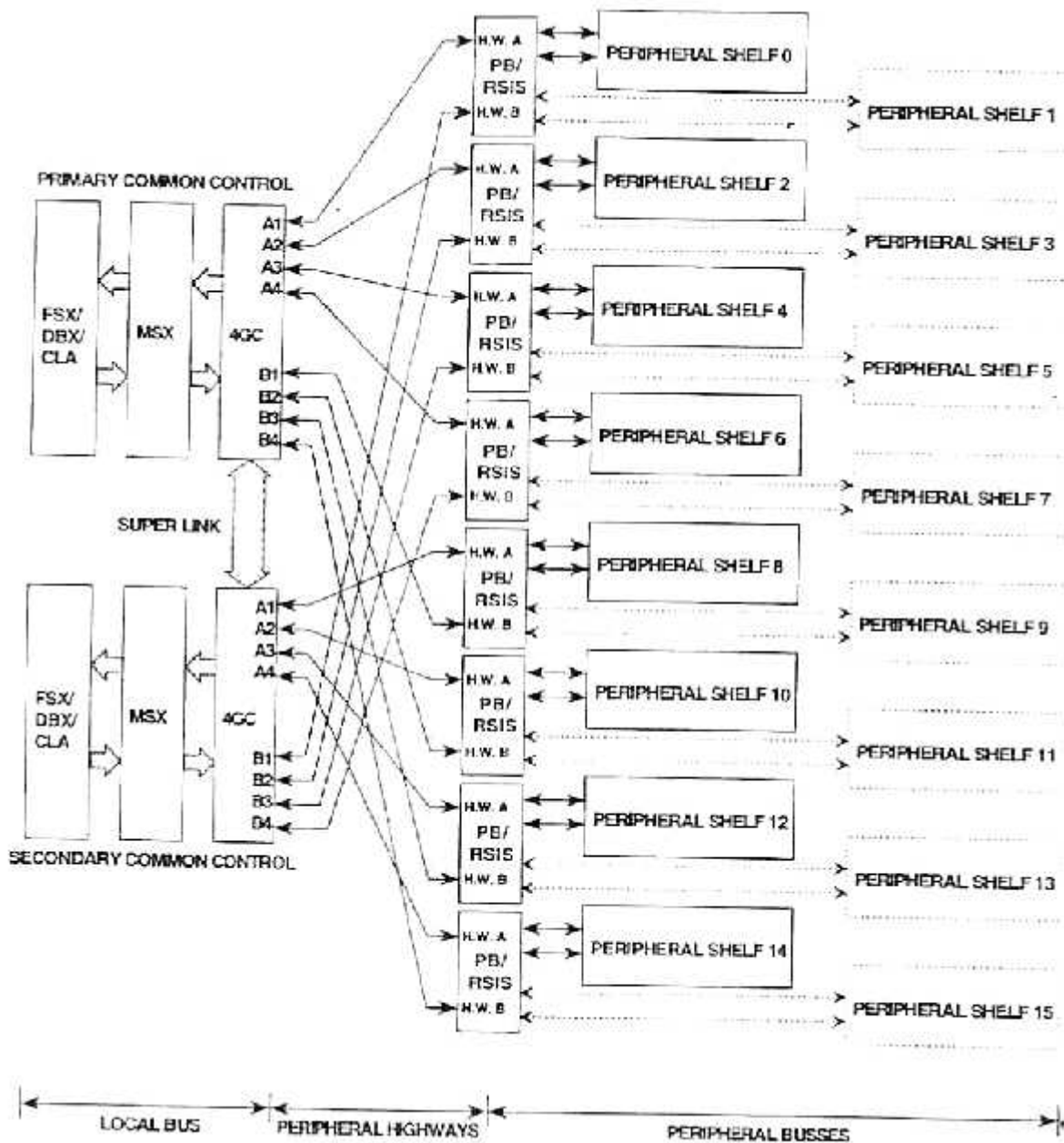Fuses   :Input (- 48 V) 2 Amp S.B   Output 1Amp S.B

Fig. 4.7 Ringing Power Supply (RPS) Card

Control adjustments   Power ON switch

Output voltage adjust

Output frequency adjust

Output voltage select

The RPS provides high voltage ring generator current required by line telephone station ports. It contains a low frequency oscillator and power amplifier, which converts -48 V DC into 75 / 85 / 105 V AC at 16 / 20 / 25 Hz for use as ringing voltage. An ON /OFF switch, input / output fuses, test points, voltage adjustment points, frequency select switch is provided on the front panel of the card. Each peripheral shelf is provided with independent RPS card, which Should be removed only in power OFF condition.

4.3.3 Peripheral Buffer Circuit (PB 24):

Fig. 4.8 Duplicated Common Control Highway Structure

4.3.8 30 Channel Digital Trunk Interface (30 T):

The 30T card provides E_1 digital interface which multiplexes 30 trunk channels into single 4 wire digital circuit operating at a data rate of 2 Mbps. It can also be configured as follows:

♦ DDO   Direct Dialling Outward.

♦ DDI   Direct Dialling Inward.

♦ E & M   Both ways.

4.3.9 2 / 4 Wire Inter-Exchange Tie Trunk Interface (4TEM/S):

The 4TEM/S card contains four identical circuits which provide E&M trunk circuits Each circuit individually configurable with two wire or four wire audio and flexible E&M leads.

4.3.10 2 Way Tie Line Card (4TWL):

This card is used for Tie line working.

4.3.11 8 DRCM:

This is a new card containing many features as follows:

♦ DTD - Dial Tone Detector.

♦ DTR - Dial Tone Receiver.

♦ RMI - Remote Maintenance interface.

♦ 3 Way Conference.

♦ 6 Way Conference.

♦ DTMF working

♦ Music on hold.

♦ Alarms.

♦ RS 232 C data ports for data base programming

♦ Station message details recording

♦ Call progress detection circuits

♦ Billing

♦ Paging and Talk back,

These cards are to be removed with Power off condition.

4.3.12 ISDN Primary Rate Interface Card (30 PRI):

This card is used for connecting with distant ISDN exchanges for extending full ISDN capability transmission to the distant exchange. It contains 3OB + 1 D channels.

4.4 Shared Service Cards:

The system may be equipped with one or more shared service cards, which provide functions such as dial, call progress detection, DTMF, MFC tone dialling reception, multi party conference etc. These cards reside on the peripheral bus, however they do not provide an interface to external devices.

4.4.1 DTMF Signalling Receiver Circuit (8DTR):

8DTR card provides 8 circuits which receive and decode dual tone multi frequency dialling tones. 8 DTR card is required to support telephone station apparatus or trunks, which send DTMF tones to the exchange.

4.4.2 Multi Party Conference Bridge Unit (CNF):

CNF card provides either multiparty conference or 3 way service but does not provide both. It provides,

♦ 8 circuits of 3 way conference
♦ 2 circuits of 15 way conference
♦ 1 circuit of 30 way conference

4.4.3 Voice Storage Unit New (4VSN):

4 VSN card provides voice announcement functions. It provides pre recorded voice messages which are played via 4 identical audio ports located on the card in programmable Flash ROM chips. Each message and VSN port is assigned with a dial number in the system number plan. Up to 28 different user defined messages can be stored per 4 VSN card. Each message can be up to 28 seconds long. Two messages can contain up to 55 sec. audio.

4.4.4 Multi Frequency Code Reliever Card (MFR):

Provides 16 circuits, which receive and decode multi frequency dialling tones. This card is required to support telephone equipment or to select other ports.

4.5 Wireless Features:

4.5.1 Coral flexicom 5000 ISBX:

ECI's Coral flexicom 5000 AIR wireless package is fully integrated component of the Coral flexicom 5000 ISBX. The Coral flexicom 5000 ISBX regards the wireless ports as key sets and provides the wireless user with virtually all of the key set user functions available with a Coral flexicom 5000 ISBX switch.

Coral flexicom 5000 AIR can be implemented on any of the Coral flexicom 5000 systems to meet user's wireless needs, from a few handsets and a single base station to 1,535 handsets and 128 base stations.

4.5.2 SKW wireless Interface Card:

The SKW Card is the wireless interface card that is installed in the Coral flexicom 5000 ISBX and is recognised by Coral flexicom 5000 as 16 (2 Port card) or 32 (4 port card) wireless channels, each functions as a virtual Coral flexicom 5000 Digital telephone. The SKW card serves the following major functions.

♦ The front half provides the 4 radio base interface, extends the control and audio channels to the base station, and translates the protocols between the base station and the coral flexicom 5000 ISDX back plane.

♦ The back half of the card is the Coral flexicom 5000 back plane interface containing all of the interface circuitry needed to communicate with the Coral flexicom 5000 software, via, the voice and control buses.

The SKW card is offered in a 2 port or 4 port version, with each port supporting one base station and 8 communications channels.

4.5.3 RF Radio Base Station:

The RF Radio Base (base station) is a small (wall or ceiling mounted) enclosure housing RF circuitry and four receive / transmit antennas. The base station also comes in a ruggedised case for installation in external application where weather proofing is required. The base station supports 8 RF channels, providing for 8 simultaneous wireless conversations, one of the channels serves as a control channel until a need arises for an eighth channel to handle call volume. When all 8 channels are used, nearby handsets attempting to register to a base station will "skip over' this busy base station and use the next nearest base station for call activity.

4.5.4 Wireless Handset:

The Coral flexicom 5000 AIR Handset is a mini-cellular handset designed to provide the user with most of the capabilities of a wired key set. The handset incorporates a detailed 2 line by 9 character alphanumeric LCD display, 2 bar graphs characters, 4 numeric characters and 10 icons. The handset is light weight. The antenna is enclosed within the handset, maintaining a smooth profile and protection from breaking or snaring on other objects. A rechargeable nickel metal hydride (NiMH) battery provides up to 4 hours of continuous talk time or 50 hours in standby operation.

4.5.5 Range and Capacity:

♦ Covers over 20 million square feet (with 50% area over lap)

♦ Coral flexicom 5000 systems support up to 2 wireless interface cards (each offered with 2 or 4 RF base station interfaces), supporting up to 128 radio base stations.

♦ Each base station supports 8 simultaneous conversations.

♦ Each base station allows upto 1553 handset IDs to be defined for access to Coral flexicom 5000, allowing for maximum roaming and hands off capability.

♦ Radio base stations support ranges upto 300 feet coverage radius in doors and 1,000 feet in a line-of-sight environment.

♦ Radio base stations can be installed up to 1 000 feet from the system when powered from Coral flexicom 5000, or up to 3000 feet when locally powered.

♦ Base stations may be collocated within 3 feet of each other to increase traffic capacity in high use areas.

4.6 Q SIG Private Network Features:

QSIG is a global signaling system for corporate networking. QSIG is a modern, powerful and intelligent inter exchange signaling system designed specifically to meet the requirements of Feature - transparency between exchange of varied makes and models. It is a harmonized method for interconnecting multiple PABXs on ISDN (essentially understood to be as PRI or Primary Rate Interface) in a heterogeneous environment. Other advantages of QSIG include reduced communication cost, ability to manage networks and services, improved security and confidentiality and above all an increased number of facilities.

The coral flexicom 5000 system complies with the international Q SIG specification for private network feature signalling between PABX systems. Using QSIG protocols, two or more separate exchanges may be linked together through Integrated Services Digital Network (ISDN) facilities to form a single unified logical system. The Coral flexicom 5000 QSIG implementation supports up to 250 switching nodes arranged in a star, mesh, or point-to-point configuration.

The Coral flexicom 5000 system supports the basic Call service as defined by ECMA 143, ETS 300172, And ISO DIS 11572 international standards. In addition, Bearer Capabilities such as audio / speech and 64 kbps data channels are also provided.

The Coral flexicom 5000 Page Queue feature also is available network wide over Q SIG networks. Because routing commands passed through a Q SIG network are digital, establishing a call, regardless of routing complexity, is extremely fast, compared to traditional network implementations.

4.7 Computer Telephony Interface (CTI):

Coral flexicom 5000 CTI solutions are offered: Coral flexicom 5000INK , ECMA-CSTA

♦ TAPI – Telephony Application Programming Interface
   Directly supports TCP/IP

   Tadiran provides the API to the Solaris environment.

TAPI functions independent of the telephone network that performs the switching analog, PBX, ISDN, wireless, etc., and the connectivity scheme used to link the PC to the telephony world. This independence, as a result of TAPI's programming model, lets TAPI to provide a layer that abstracts the physical phone system. Within it, service provider developers can define different models of the ways lines and phones are handled. Lines and phones can reflect a variety of physical arrangements or connectivity schemes between the desktop and the telephone network. Tadiran's Digital Set phone with the SPI (Service Provider Interface) software packages, allows TAPI based applications to integrate with Coral flexicom 5000 ISBX.

♦ TSAPI -Telephony Services Application Programming Interface.
   Coral flexicom 5000 Telephony Server for NetWare

Tadiran's NLM package for NetWare Telephone Servers enables TSAPI-based applications to run with the Coral flexicom 5000 ISBX platform.

4.8 Attendant Console:

The attendant console consists of colour monitor with key board and DKT telephone. It is operated on Windows '98. It can be operated on any other telecom software. It is connected to MEX card at KBO RS-232C programming port. The following programs can be performed.

Trunk Controls:

Trunk controls allow the attendant to define the operation of system trunks for special use.
Busy out.

Direct inline.
Drop on No Dial.
Hot Trunk Delay.
Hot Trunk Immediate.
In coming Only
Out Going Only
Reserved To.

System Controls:

System Control allows the attendant to programme certain features for system wide operations.

Alternate Attendant Destination.

Attended / Unattended.

Day / night transfer (Auto / Manual)

Day / night information.

Day / Night -2 Service Modes, Selecting.

Programming Public Library.

Time/ date set.

Station Controls:

Station Controls allow the attendant to define station for specific feature activation.

Call Forward All

Call Forward Busy

Call Forward No Answer.

Call Forward Timed.

Call charge Printout

Call charge Reset with Printout.

Check In / Out.

Do Not Disturb (DND)

Hot station delay,

Hot station Immediate

Malicious Call trace on / off.

Malicious call trace out.

Message waiting

Originating only.

Outgoing station restrictions

Room status

Station blocking

Terminating only

Wakeup request

Wakeup report

Objective:

1.   MEX card contains <u>80386</u> processor.

2.   4GC card supports <u>8</u> PCM highways.

Subjective:

1.   Explain control shelf of CORAL 5000 exchange?

2.   Draw the diagram of duplicated common control highways of CORAL 5000 exchange?

CHAPTER 5

TADIRAN TECHNOLOGY ISDN EXCHANGE –
CORAL FLEXICOM 6000

5.0   Technology:

Coral Flexicom6000 developed by Tadiran Telecom of ISRAEL with High traffic handling Processor (300,000 BHCA) for large businesses needing 6000 Ports.

5.1   Features:

♦ Q SIG (International networking Protocol standard) features transparent networking.

♦ ISDN applications, which includes BRI, PRI

♦ Computer Telephony Integration (CTI)

♦ Hospitality Industry

♦ Automatic Call distribution (ACD)

♦ Automatic route selection

♦ Wireless, cellular communications

♦ Computerized Attendant Position (CAP)

♦ Fibre optic remote shelf

♦ Networking ability;

♦ Sophisticated Feature Transparencies

♦ Expansion into Broad band ISDN

♦ Coralink from external business center

♦ Voice mail

♦ Video conferencing

♦ Packet and DSO channelized data transport

5.2   System general description:

The main elements in the Coral Flexicom 6000 system are as follows:

•   Two sets of control cards providing two fully functional sets of control systems

•   Proprietary Mirrored Memory and Switching Matrix technology built into the circuitry

•   Programming software

•   A motherboard supporting two sets of control systems

•   Dual peripheral buffer units

•   Dual power supply units

- The operating software stored in the CFD (Compact Flash memory Disk) of both control system sets, provides complete long-term stability.

- Database program is stored in battery-protected SRAM in the appropriate components of both control system sets.

- All generated data stored in the memory of the "Active" control system is automatically recreated in the corresponding component in the "Standby" control system, ensuring rapid and seamless system changeover, fail-safe storage, and database dependability

- In the event that the second or "Standby" control system must take over control, all communications activities continue unobstructed as if a single system has been in control all along.

5.3   Coral Flexicom 6000 Cabinet Structure

The Coral Flexicom 6000 builds on a proven free-standing, floor mount main cabinet, serving as the system's foundation. Each system consists of one Main cabinet, which houses the Coral Flexicom 6000 Control Shelf and Peripheral Shelves and one or more optional Expansion cabinets.

The Coral Flexicom 6000 Control Shelf is easily accommodated into a standard Coral Flexicom 5000 main cabinet. Its size and dimensions are interchangeable with the Coral Flexicom 5000 Common Control Shelf. **Figure 5.1** shows the Coral Flexicom 6000 system's floor mounted structure and card slot assignments for a 4-shelf cabinet.

5.4   The Control Shelf and Control Card Assignments

The Control Shelf is positioned at the bottom of the main cabinet. The Control Shelf is built to provide two sets of slots for the components required for the two common control systems. The Control Shelf is divided in half to provide corresponding slots on the Left and Right sides for each set of control system components to reside. A single motherboard, the MBC-ATS, serves both sets of common control systems. There are two sets of control cards standing side by side. Each set has seven slots. The control cards on the right side are duplicated on the left side in reverse and upside down order. Each side consists of the following card slots placed in the order from the middle outward:

- 16GC or 32GC (+SAU)
- CLA-ATS (Optional)
- FMSD (for CLA-ATS Optional)
- MCP-ATS
- FMSD (for MCP-ATS Optional)

Universal I/O slots

Shared service or PB-ATS slots

Peripheral & ringer power supplies

Left common control

Right common control

Fan tray
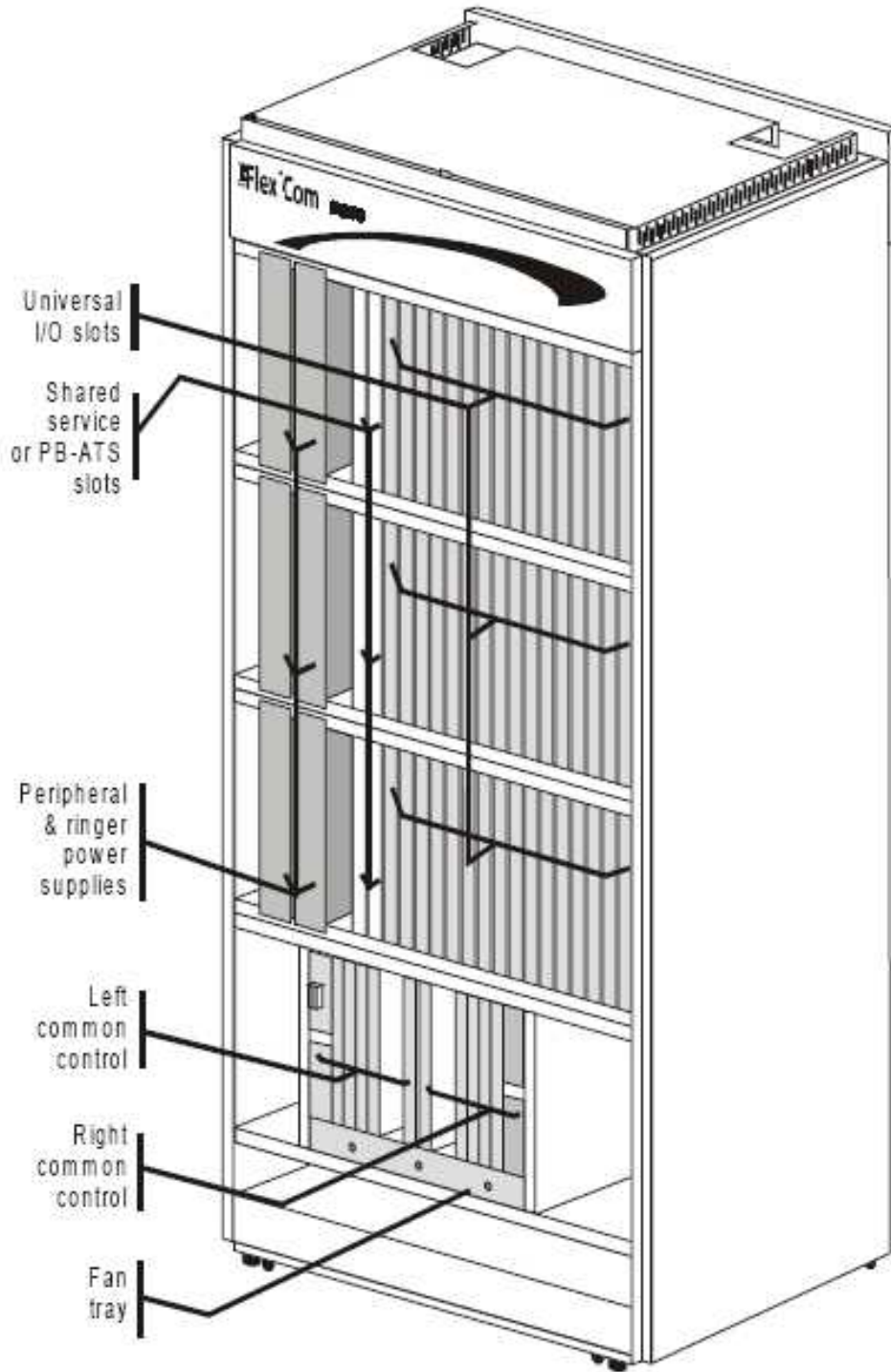
Fig 5.1 Coral Flexicom 6000 system 4 shelf configuration

Card types are marked over each of the card slots. Upon first initializing the system, the control system set on the right side is designated as the "Active" operational control system, and the control system set on the left is designated as the "Standby" control system. Three slots are provided for Power Supply units, indicated in the figure as PS1, PS2 and PS3. Power Supply fuses are located in the upper left corner. The Fan tray and three fan fuses are located at the bottom of the Control Shelf.
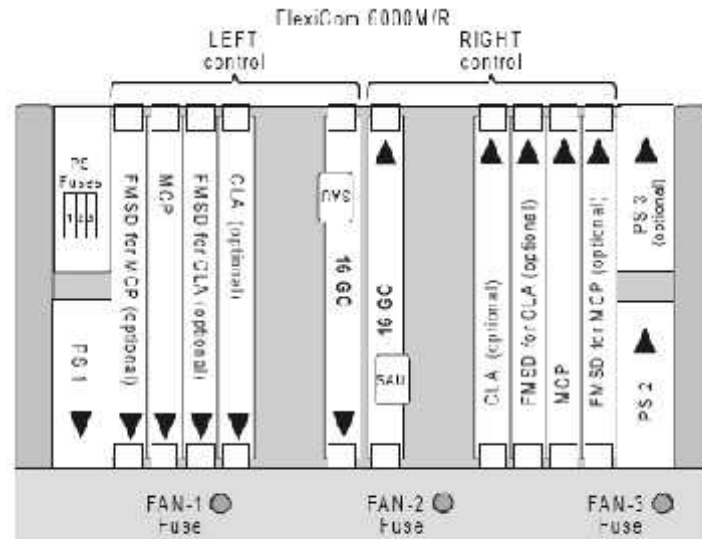
Fig 5.2 Coral Flexicom 6000M/R Dual Control Shelf – Front View

5.4.1 Slot Coded Keys

Each Control Shelf slot is built with coded keys, a mechanical feature designed to Permit correct card placement and to prevent the possibility of placing a card in the wrong position. These coded keys appear at top and bottom of the front of each slot. Corresponding matching coded keys appear on the top and bottom of each control card. The coded keys on the card are placed so that when the card is inserted, the coded keys must match for the card to insert fully into the slot. By not being able to insert the card without the coded keys matching, a card can not be inserted into the wrong slot.

5.5 Common Control Cards and Components

The common control card and control components installed in the control cage are MCP-ATS, 16/32GC, SAU, 4/8XMM, and CLA-ATS. The control components comply with Compact PCI bus. The 4/8XMM and CLA-ATS cards are optional features, supplied as per the configuration designed for the customer's needs.

5.5.1 MCP-ATS

The MCP-ATS is the main control processor of the Coral Flexicom 6000 system. It contains the main control processor circuitry and Memory Management circuitry, and utilizes a powerful Pentium microprocessor with PC architecture, which connects to a Compact PCI compliant backplane. The MCP-ATS includes 64 MB RAM. The MCP-ATS is designed to deliver a minimum traffic capacity of 250,000 Busy Hour Call Attempts (BHCA). Depending on the MCP-ATS type, the MCP-ATS card may be accompanied by a 64MB FMSD (Flash Memory Storage Device) card as an extension to the main MCP-ATS card. The FMSD card Contains the generic software of the Coral Flexicom 6000 and the system database resides in the control cage slot next to the MCP-ATS card. The FMSD card provides required I/O connectors and ports, as well as the PCMCIA socket to house the CFD (Compact Flash memory Disk) in the event that the main MCP-ATS card lacks any of these features. The MCP-ATS cards with FMSD cards function together as a single main processor unit.

The front panel of the MCP-ATS card (or together with the FMSD card) includes a programmable RS-232 serial programming and maintenance interfaces. The main processor receives status messages from ports in the system and determines the appropriate response based on programming entries contained in the system database.

As part of the Redundancy control system, two identical MCP-ATS cards (or pairs of MCP-ATS and FMSD card) are provided. Each provides the CPU functions for their respected control system sets. One MCP-ATS card controls the system in "Active" mode while the other one monitors the integrity of its system, all the time standing ready (in "Standby" mode) to take over the control functions should it become necessary.

5.5.2   Group Controller Card 32GC :

The 32GC Group Controller card is the heart of the Coral FlexiCom 6000 system.It serves as a communication link in the Coral FlexiCom 6000 system, between the control cards and the PB-ATS cards located in peripheral shelves. Each of the dual control system sets contains one 32GC card. Each 32GC card includes innovative proprietary mirrored memory and switching technology essential to the Hot Standby system.

The 32GC card supports 4K time slots, *eight* HDLC highways and *32* PCM streams, and up to 16 peripheral shelves (See *Figure 5.3.*). It is capable of establishing calls between up to 2K ports on its maximum peripheral shelf capacity to any other 2K ports. Each PCM stream includes 128 Time Slots. Each shelf unit (even and odd numbered peripheral shelf pairs) receives 512 Time Slots, divided into four groups of 128 Time Slots. (See *Figure 5.4*)

The 32GC card (32GC card) serves as a communication link, between the control cards and the PB-ATS cards located in peripheral shelves. The 32GC card contains:

- SAU (Software Authorization Unit)
- 4/8XMM expansion piggyback (optional card) utilizes its shared memory
- Digital tone generators (DTMF, MFC, test, dial, busy, ringing, ringback, etc.)
- 2 MB SRAM memory, incorporating back-up battery power protection
- Clock circuitry to synchronize the Coral peripheral clock to an external clock derived from one of two PRI30, 8TBR, 30T, digital trunk interface cards, designated the primary and secondary external clock source. This feature, called "slaved clock" or "loop-timed" operation, enables the system to integrate with any digital telephone network in the world. The 32GC monitors external clock signal integrity, and switches the system between the primary and secondary external clock sources, or internal 16/32GC clock, as necessary.
- Mirrored Memory and Switching Matrix technology essential for the Hot Standby control system. Each of the dual control system sets contains one 32GC card. The "Standby" control system set "snoops" relevant information from the "Active" control system set. With this information it readies its control card set for takeover of the control functions at any time it may become necessary.

  The front panel of the 32GC card includes:

    - Diagnostic indicators
    - RS-232 serial programming and maintenance interface
    - SAU interface

5.5.3 SAU

The Software Authorization Unit (SAU) plugs into the front panel connector of the 32GC card in each of the control card sets. Each SAU contains a unique system identification serial number.

Each SAU unit contains a set of permissions associated with its unique identification number. In order for the Coral FlexiCom 6000 system to function properly, the software detects and verifies the permission settings of each SAU unit on its corresponding 32GC card. Appropriately, both SAU units are set for the Hot Standby dual control system. The software detects the information embedded on both SAU units and verifies that both are matched and set for the Hot Standby dual control configuration. Loading unauthorized updates will cause the system to shut down after 14 days unless the proper authorization (SAU) is provided.

5.5.4   4/8XMM (Optional)

The 4/8XMM piggyback card expands the memory capacity of the 32GC card and is mounted on the 32GC card. It is an expansion memory module containing either 4MB or 8MB. It provides added data storage capacity. It includes backup battery power protection. The required memory capacity on the XMM card is determined by the configuration and size of the system. The CLA-ATS card uses 2MB of the 4/XMM card.

5.5.5   CLA-ATS (CoraLINK Adapter)   (Optional)

The CLA-ATS card incorporates the application processor and Ethernet interface Circuitry for the computer-telephony integration link. This is an optional feature. CoraLINK uses TCP/IP protocol, complies with the ECMA 179 and 180 standards.
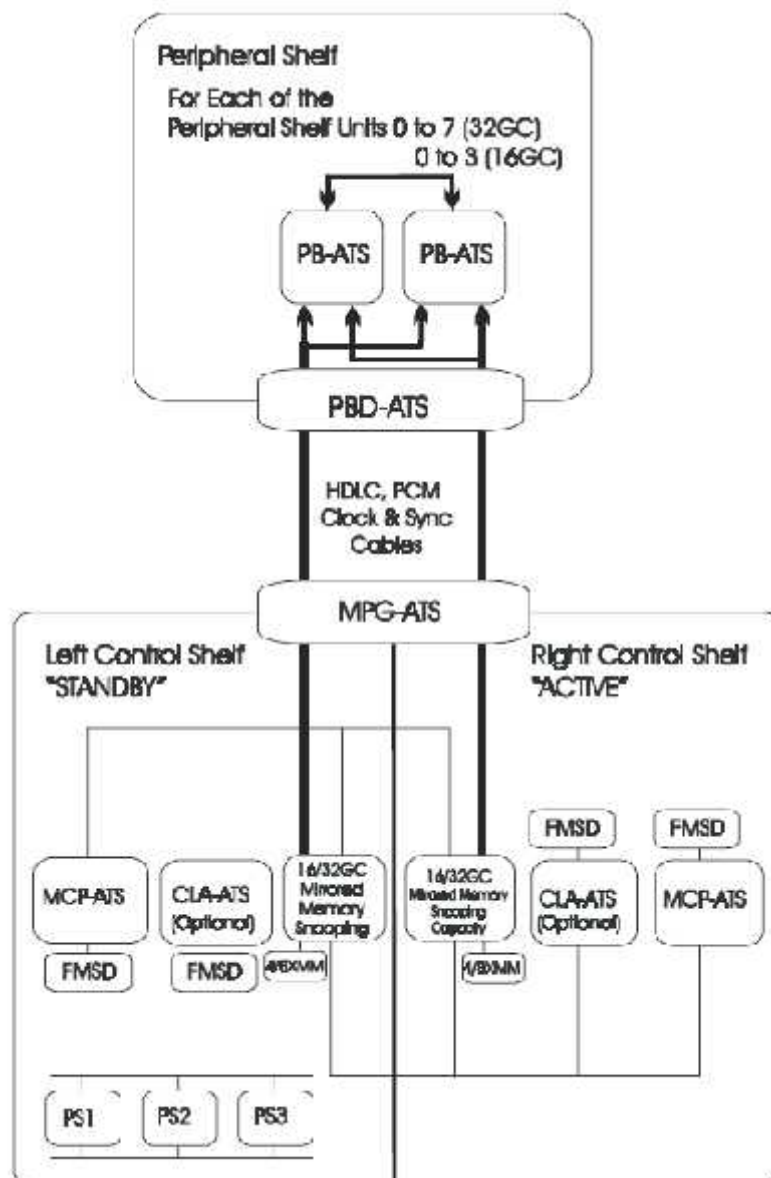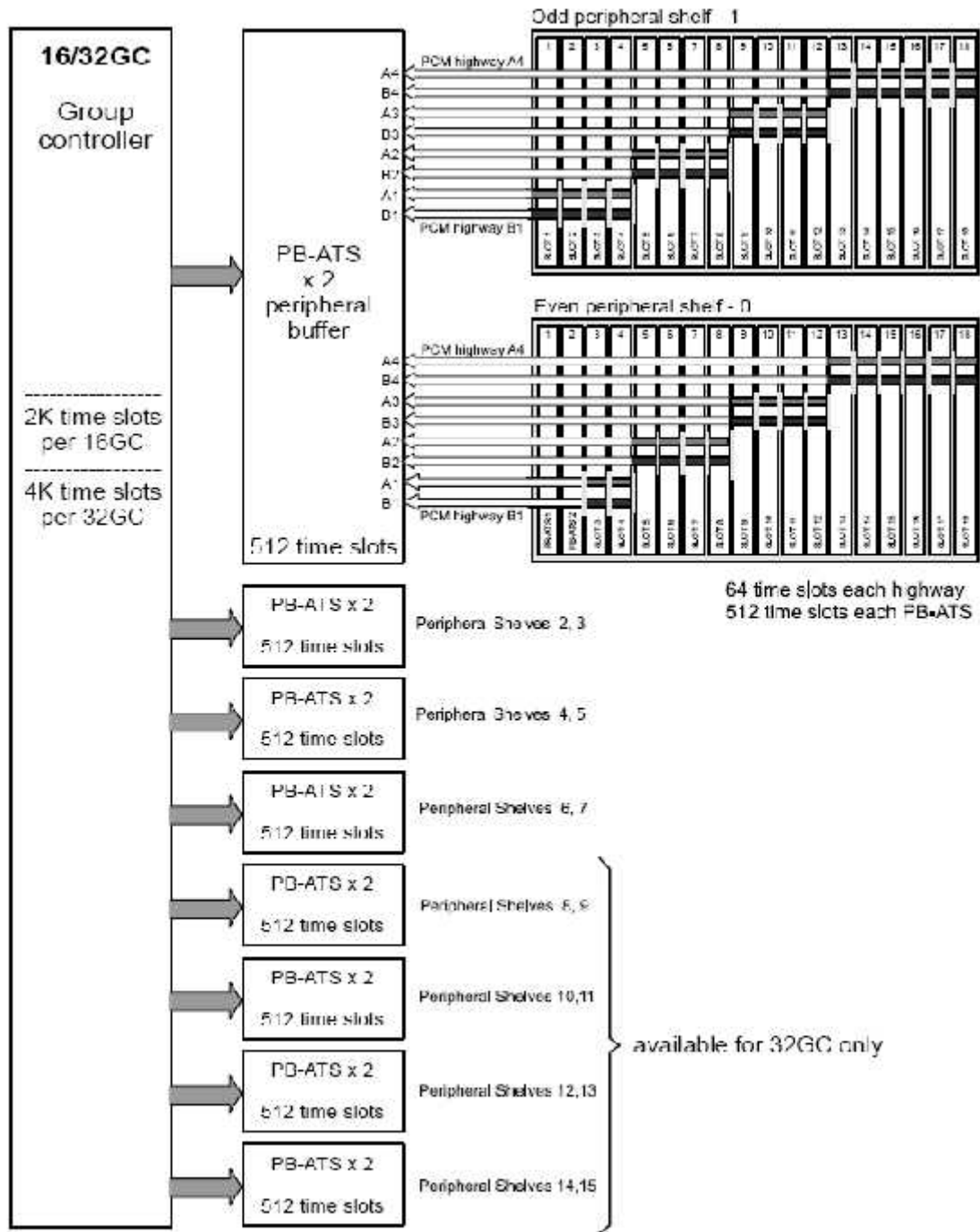

Fig 5.3 Coral Flexicom 6000 System Functional Redundancy Diagram

Fig : 5.3 a   Coral Flexicom 6000, PCM Highway Distribution
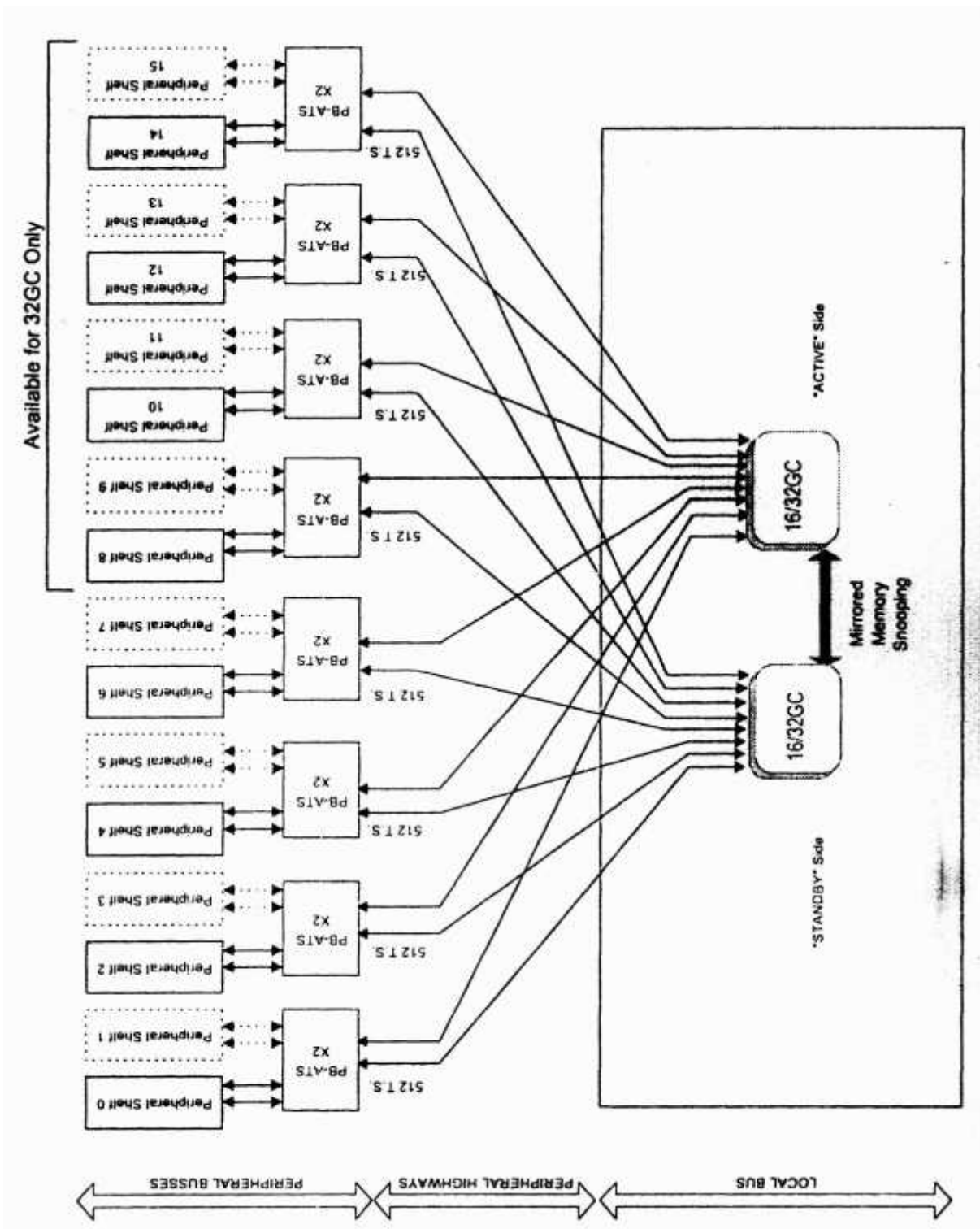

Fig 5.4 Coral Flexicom 6000 Dual Control Highway Structure

5.5.6 PB-ATS PB (Peripheral Buffer) card, for Coral FlexiCom 6000. Buffers PCM streams and HDLC highway, Clock and Sync signals to the Peripheral Shelves. Installed in even numbered Peripheral Shelf. It acts as a signal regenerator for the peripheral highways. A single

PB-ATS card provides the full range of exchanges between the 32GC card and the peripheral bus serving the peripheral shelves.

Dual System. Up to two PB-ATS cards may be installed side by side. The two PB-ATS cards occupy slots 1 and 2 of the even peripheral shelves. These two PB-ATS cards provide redundant peripheral buffer functions in which one of these PB-ATS cards is always functioning ("Active" LED on) while the second card stands by ("Active" LED off) ready to take over the PB functions at any time. In case of malfunction or maintenance need, the second PB-ATS card takes over and provides continuous operation.

Single System. The peripheral shelves may be used in a single PB-ATS configuration to provide high traffic, high call throughout the system, without using the PB-ATS redundancy option. This configuration allows the same call handling, BHCA, and thorough output capacity of a full fledged Coral FlexiCom 6000/R excluding the option of the concurrent sets of PB-ATS cards running side by side. The PB-ATS card occupies slot 1 of the even peripheral shelves, while slot 2 remains empty.

5.5.7 PBD-ATS PBD (Peripheral Bus Driver) piggyback card, for Coral FlexiCom 6000. Installed on the even numbered Peripheral Shelves' backplane. Provides the HDLC, PCM, Clock and Sync signaling interface via the dual cables connecting to it from the MPG-ATS card. One set of cables function together with the "Active" control set while the second set "stands by" together with the "Standby" control system set.

5.5.8 PS-ATS PS (Power Supply) for Coral FlexiCom 6000 Common Control Shelf. Operating from -48VDC input and capable of providing the power of the entire system. Up to three PS units can be installed.

Dual Power Supply. Supplying power is shared between two PS-ATS units. Either of the units is capable of providing the full power supply needs of the entire control system, in the event that one of the PS-ATS units malfunctions. Alarms indicate the fault and inform the administrator via the various alarm indication facilities. The faulty PS-ATS unit can be replaced while the system is live and operating (Hot Standby), without the need to shutdown any part of the system.

5.6 Shared Service and Auxiliary Cards

5.6.1 4VSN The 4VSN card provides four ports used to deliver prerecorded announcement messages. The 4VSN is typically used to announce call intercept and ACD overflow conditions. Messages are stored digitally in ADPCM format, allowing 26 messages of up to 28 seconds in length, 2 messages of up to 55 seconds in length, and a total of 180 seconds of recording time.

5.6.2 8DRCM resource card, provides:

- One (1) Internal or external music interface for music-on-hold and Coral FlexSet background music
- One (1) External music interface for music-on-hold and Coral FlexSet background music
- One (1) External voice paging interface (Public Address) and relay contacts
- One (1) Auxiliary or Major/Minor Alarm relay contacts
- One (1) UNA (Universal Night Answer) or Central Bell relay contacts
- Three (3) RS-232E programming/maintenance interfaces, support any asynchronous serial data terminal or printer, 7/8 data bits, all parity options, and data rates of 300 to 38,400 bps.
- One (1) Bell 103/212A or ITU V.21/V.22, 300/1200bps remote maintenance modem
- Six (6) 3-way conferences/Consultation/Broker service for digital trunks (3-way for stations and analog lines is standard), support for Silent Monitoring and the Coral Message Center's Silent Record feature
- One (1) Meet me bridge conference for six parties
- 8DTD (Eight circuit Dial Tone Detector and call progress tone analyzer). General purpose audio signal analysis circuits, use a self-contained table of call progress tone profiles to identify standard dial, busy, and ringback tone signals.
- 8DTR (Eight circuit DTMF signaling Receiver and decoders)

The card is generally used to allow the use of tone dial single-line telephone sets, DTMF signaling over E&M and Direct Inward Dial (DID) trunks, and Direct Inward System Access (DISA) over central office trunks.

5.6.3 CNF Dual 15 party or eight 3-way, lossless, digital Conference Bridge card. One card required for each mode (2 X 15-Party or 8 X 3-way). The CNF card consists of 32 PCM input/output circuits which may be configured into two 15-party conference bridges or eight 3-party conference bridges. Configured as eight 3-party bridges, the CNF card allows digital conferences to be established between channels of a T1, 30T, 30T/x,4TBR, 8TBR, PRI23, or PRI30 digital trunk interface. This configuration also enables the Silent Monitor feature, allowing supervisors and administrators to continuously monitor any Peripheral Interface port in the system for service observation and training purposes.

5.6.4   iCMC Up to 16 voice mail ports, iCMC (Integrated Coral Message Center), a simple yet powerful unified messaging system that can greet callers and record internal user messages.

The iCMC delivers messages — voice, fax and e-mail — into a universal mailbox, where the user can manage them from almost anywhere by phone or computer. The iCMC card provides all voice messaging system application functions and voice recording storage on its hard disk.

The number of available voice mail ports (2 to 16, incriminated by 2) is determined by the operating system software and hardware authorization. Five concurrent ViewMail and ViewCall Plus licenses are provided. One language authorization is included, the required language can be chosen upon setup from an available list.

5.6.4   iDSP 64 circuit FSK (Frequency Shift Keying) tone generator card. The card converts ASCII text information, received from the Coral main processor, into FSK tone:

The FSK tones are supplied for direct injection onto the Coral PCM highways. The card provides up to 64 individual FSK tones simultaneously, each on a different PCM channel and call.

The iDSP card is required for displaying CID (Caller ID) for SLT users.The CID display feature for SLT requires a 8/16/24SLS (software version 3.xx or higher) peripheral card, Authorization for SLT-CID, and an FSK compatible display unit installed on the SLT port.

The following information:

- Date,
- Time,
- Number (the last 10 digits),
- Name (the first 15 characters); enabled through programming in the configuration database.

Modulated in FSK is sent to an 8/16/24SLS interface by the iDSP card, between the 1st and 2nd ring. The CID display unit detects this information and transforms it back into ASCII codes. Up to 64 SLT sets can receive CID information simultaneously from a single iDSP card.

5.6.5   MFR 16 circuit Multi-Frequency Code (MF or MFC tone) Receiver and decoder card.

The MFR card provides 16 multi-frequency (MF or MFC) receiver circuits, which receive and decode MFC-R2 inter-office tone dial signaling. The card generally is used with 30T trunk cards, providing Direct Inward Dial (DID or DDI) service when connected to a central office or local exchange that delivers incoming call information via the MFC-R2 tone format.

5.7 Power Supply Cards

5.7.1 Control Power Supply Card (CPS):

Specifications:

Input	: -42 to - 58 v 6A Max.
output	: + 5v DC Nom. Regulated 30A Max
Indicators	: Power ON Test Jacks
Fuses	: Input -48v 8A S.B.

Control &Adjustments: Power On Switch +5v Adjust.

The CPC contains a Pulse Width Modulated Switch Mode DC-DC Converter, which converts -48v DC input power to +5v operating voltage. Voltage and current level monitoring circuitry checks the output of the CPS and produces alarm to the system main processor in the event of abnormality.

5.8 Peripheral Control Shelf:

All the peripheral cards are provided in this shelf and interface with the control cards through PBATS card.

5.8.1 Peripheral Power Supply Unit (PPS):

Specifications:

Input	: -42v to -58v DC, 20A Max.
Output	: +5v DC Nom. Regulated 15A Max
	: -5v DC Nom. Regulated 3A Max
	: +12v DC Nom. Regulated 8A Max
	: -12v DC Nom. Regulated 0. 1 5A Max
	: -48v DC Nom. Regulated 8A Max
Indications	: Power ON output voltage test jacks.
Fuses	: Input(Peripheral -48v) 15A.
	: Input (DC-DC Converter) 8A

Controls & Adjustments: Power ON Switch

+5v Adjust

 -5v Adjust

+12v Adjust

 -12v Adjust

 -48v Adjust

The PPS provides internal operating voltage for switching systems. It controls 3 pulse width modulated switch mode dc/dc converters, which convert -48v to +5v, -5v, +12v, -12v operating voltages for internal circuits. Each PPS can support 2 peripheral shelves. An ON/OFF switch, input fuses, power On LED indicator, Test points and adjustment terminals are provided on this card.

PPS card is provided in each shelf but it can supply to two shelves when the other card in 2nd shelf fails. Should be removed only in Power Off condition.

5.8.2   Ringing Generator Power Supply Unit (RPS):

Specifications:

Input	-42 to -60 V DC, I Amp max
Output Voltage	Fast on selectable 75, 85 or 105 V AC
Frequency :	Switch selectable 16, 20 or 25 Hz
Capacity	:20 VA max
Indicator	:POWER ON output voltage test jacks
Fuses	:Input (- 48 V) 2 Amp S.B
	Output 1Amp S.B
Control adjustments	Power ON switch
	Output voltage adjust
	Output frequency adjust
	Output voltage select

The RPS provides high voltage ring generator current required by line telephone station ports. It contains a low frequency oscillator and power amplifier, which converts -48 V DC into 75 / 85 / 105 V AC at 16 / 20 / 25 Hz for use as ringing voltage. An ON /OFF switch, input / output fuses, test points, voltage adjustment points, frequency select switch is provided on the front panel of the card. Each peripheral shelf is provided with independent RPS card, which Should be removed only in power OFF condition.

5.8.3   PB-ATS PB (Peripheral Buffer) card, for Coral FlexiCom 6000. Buffers PCM streams and HDLC highway, Clock and Sync signals to the Peripheral Shelves. Installed in even numbered Peripheral Shelf.It acts as a signal regenerator for the peripheral highways. A single PB-ATS card provides the full range of exchanges between the 32GC card and the peripheral bus serving the peripheral shelves.

Dual System. Up to two PB-ATS cards may be installed side by side. The two PB-ATS cards occupy slots 1 and 2 of the even peripheral shelves. These two PB-ATS cards provide redundant peripheral buffer functions in which one of these PB-ATS cards is always functioning ("Active" LED on) while the second card stands by ("Active" LED off) ready to take over the PB functions at any time. In case of malfunction or maintenance need, the second PB-ATS card takes over and provides continuous operation.

Single System. The peripheral shelves may be used in a single PB-ATS configuration to provide high traffic, high call throughout the system, without using the PB-ATS redundancy option. This configuration allows the same call handling, BHCA, and thorough output capacity of a full fledged Coral FlexiCom 6000/R or 6000M/R, excluding the option of the concurrent sets of PB-ATS cards running side by side. The PB-ATS card occupies slot 1 of the even peripheral shelves, while slot 2 remains empty.

5.8.4   Two Wire Standard Single Line Station Interface (24 SLS):

8, 16, or 24 port 2-wire SLT (Single-Line Telephone) interface card. Supports message waiting indicator, and display CID (Caller ID) information. 48V loop, 1200   loop limit (including set). Each circuit provides bridged talk battery, DC biased high-voltage/low-frequency ring generator, and bridged –110VDC message lamp battery. Each circuit accepts Pulse or DTMF in dialing. Pulse dialing characteristics are fully programmable per card. The CID display feature requires iDSP shared service card, Authorization for SLT-CID, and FSK compatible CID display unit installed on the SLT port. Each SLT port can be individually enabled through programming in the configuration database.

5.8.5   Two Wire Digital Station Interface (24 SDT):

8, 16 or 24 port, 2-wire SFT (Station FlexSet Terminal) interface card. Each of the circuits support Coral FlexSet key telephone sets; and CPA(Coral Paging Adapter), and APDL (Application Processor Data Links). may extend the operating range up to 7,300 feet (2,200m) from the system using local power.

5.8.6   30 Channel Digital Trunk Interface (30 T):

30 channel, E1 digital trunk interface card. Provides a 4-wire, digital multiplexed, CEPT compatible trunk interface at 2.048Mbps E1 rate. Each 30T channel may use E&M, DDI, or DDO signaling. 30T channels accept and use Pulse or DTMF dialing, or both. 30T/x cards also may use MFC-R2 signaling. Pulse dialing characteristics are fully programmable per card.. Front panel indicators show red alarm (span fault), yellow alarm (network fault), bipolar violations, and test mode, and an ISO 4903, DA-15S interface connector is provided. An interface adapter is available for coaxial E1 interface connections.

♦ DDO   Direct Dialling Outward.

♦ DDI   Direct Dialling Inward.

♦ E & M   Both ways.

5.8.7   ISDN Primary Rate Interface Card (30 PRI):

30 channel, PRI (Primary Rate Interface) digital trunk card. ISDN compatible digital interface, European ETSI standard (30B+D) at 2.048Mbps E1 rate. The PRI30 card provides a multiplexed, digital trunk interface with an integral control/data channel. The PRI30 card is designed to interconnect the Coral FlexiCom to a 4-wire T primary rate interface (PRI) from a digital ISDN PSTN (Public Switched Telephone Network). The PRI30 complies with the ETSI specification for the European implementation of ISDN and combines 30 B channels at 64kbps and one D channel at 64kbps into a 30B+D signal of 2.048Mbps. The front panel incorporates indicators for LOS (loss of signal), AIS (alarm indicator signal), RAI (remote alarm indicator), CRC (cyclic redundancy check error), DD (D channel error) and LBK (loopback test mode). An interface adapter is available for coaxial interface connections.

5.8.8   ISDN Basic Rate Digital Trunk Interface (4TBR, 8TBR):

4 or 8 port BRI (Basic Rate Interface) multiplexed, digital trunk card. ISDN compatible. Each port provides (2B+D), 4-wire digital interface at 144 Kbps rate. Supports European ETSI (Euro ISDN) ISDN signaling protocols. Each circuit provides a 144 Kbps 2B+D signal, consisting of two 64 Kbps B (voice) channels and a 16kbps D (data/control) channel. Thus, the 4TBR and 8TBR cards effectively support 8 and 16 voice channels respectively.

5.8.9   2 / 4 Wire Inter-Exchange Tie Trunk Interface (4TEM/S):

4TEM 4 port general purpose 2W/4W E&M trunk interface card. Each port may be individually adjusted and set for:

- Transmission: 2-wire or 4-wire
- Termination impedance: 600   or 900
- Signaling: Type I, Type II, Type III, Type IV, Type V, Reverse Type II, or CCS Direct
- Continuous signaling protocol: Immediate Start, Wink Start, or Delay (Stop/Go) Start
- Dialing accept/send: Pulse dialing, DTMF dialing, or Both (Pulse and DTMF dialing) Pulse dialing characteristics are fully programmable per card. Nominal signal levels are ITU-T standard –3.5dBr.

5.8.10 4 or 8 port Loop-Start/Ground-Start trunk interface card.

The 4TPF, 8TPFcards provide respectively four or eight general purpose, 2-wire, loop signaling central office trunk circuits. Each port presents a 600   (or complex programmable) termination impedance, and may be individually configured and set for:

- Signaling operation: Loop Start, or Ground Start
- Dialing accept/send: Pulse dialing, DTMF dialing, or Both
  (Pulse and DTMF dialing)

Pulse dialing characteristics are fully programmable per card. The 4TPF and 8TPF cards, each provide four (4) ports with power failure (PF) transfer. Under normal powered-up conditions, the transfer circuits connect the central office loops to their respective 4TPF/8TPF card interfaces, and four (or two) pre-designated telephone sets to their respective Coral FlexiCom system station circuits. Should the system lose power, the transfer circuits switch the central office loops to their respective telephone sets. The 4TPF and 8TPFcan utilize standard single-line telephone sets as power failure stations. Monitoring circuitry in the transfer circuits prevents a call made during power failure from being disconnected when power is restored to the system.

5.8.11 2 Way Tie Line Card (4TWL):

4TWL 4 port trunk for Two Way Loop. Supports DTMF and pulse dialing.This card is used for Tie line working.

5.9   Wireless Features: Coral Flexicom 6000 supports all Wireless Features, Q SIG Private Network Features, Computer Telephony Interface (CTI), Attendant Console Features mentioned in Chapter4

Objective:

1. SAU is available in <u>GC32</u> card.

2. Coral 6000 exchange peripheral shelf contains <u>18</u> nos. of slots.

3. Service slots are available in <u>even</u> numbered slots.

4. PB card is present in the slots <u>1 & 2.</u>

Subjective:

1. What are the features of Coral 6000 exchange?

2. Draw the Coral 6000 exchange control shelf?

3. Write the features of GC32 card?

4. Write short note on SAU.

5. What are the various peripheral cards in Coral 6000 exchange?

CHAPTER 6

Siemens Hipath 3800 Telephone Exchange

6.0 Introduction

Siemens Hipath 3800 is a small exchange with 500 ports capacity, suitable for small to medium business houses. It is equipped with all the modern communication features. It is an ISDN exchange with support for DECT (digital enhanced cordless telephony). It is widely used in ARTs (Accident Relief Trains) on Indian Railways. The exchange is housed in a comapact cabinet with ten slots.

6.1 Siemens Hipath 3000 Series Of Exchanges - Feature Comparison

S. No.	Model / Feature	HiPath 3300	HiPath 3350	HiPath 3500	HiPath 3550	HiPath 3800
1	Max. analog subscribers	20	36	44	96	384
2	Max. digital subscribers	24	24	48	72	384
3	IP users	96	96	96	96	500
4	Max. Cordless subscribers	16	16	32	64	250
5	Max. Cordless base stations	3	3	7	16	64
6	optiClient Attendant	4	4	4	4	6
7	Key modules	30	30	30	96	250
8	Integrated voicemail	24	24	24	24	–

6.2 Siemens Hipath 3800 Exchange Features

- Self standing cabinet
- Modular construction
- Occupies minimum space, suitable for ARTs
- Works on -48V DC or 230V AC
- Support for analog and digital phones
- Support for analog and digital trunks
- Support for PRI, QSig
- Support for DECT (digital enhanced cordless telephony)
- 256 DECT handsets can be operated in the system
- Auto detection of user cards by the system
- GUI (graphical user interface) programming interface
- Menu driven , user friendly programming feature
- Remote login feature, through dialup modem
- SDRAM for core program and user database storage

6.3 Siemens Hipath 3800 Telephony Features

- Advisory messages
- Intercept position/attendant console
- Camp-on/call waiting tone
- Missed calls list
- Do Not Disturb/"ringer cutoff"
- Call pickup
- Call forwarding from extensions
- Call source and call destination display
- Call intrusion on call forwarding and call pickup
- Classes of service
- Executive/secretary function
- Display languages (can be specified individually)
- Paging (internal announcement)
- Call charge recording
- Group call
- Internal texts for feature handset
- Internal telephone directory
- Speed dialing (individual/central)
- Automatic line seizure
- Trunk keys Toggle
- Text messages
- Music-on-hold with system-driven announcements
- External music source (optional)
- Night service/day service
- Park
- Account code
- Relay (actuators/sensors)
- Consultation
- Callback on busy and no answer (automatic)
- Call number suppression
- Call signaling
- Call forwarding after timeout on RNA, immediately on busy
- Group ringing
- Hunt group (linear/cyclic)
- Changeover on (individual code lock)
- Telephone book, central
- Entrance telephone and door opener functions
- Transferring a call (internal/external)
- Number redial (enhanced)
- Automatic recall from public network carrier

6.4 Hardware Description

Siemens Hipath 3800 Telephone Exchange is a free standing cabinet with 10 slots. All slots are universal type except slot No. 6, which is nominated for main control card. Power supply is built into this unit. This exchange is operated from -48V DC or 230V AC. The various cards are explained below. Every slot is wired for 24 pairs.

- **CBSAP**

  Central Board System Application Program - This is the main control card in Hipath 3800 system, it is in the dedicated slot No. 6. This card facilitates in programming the exchange. A PC can be connected to the COM port of this card. Hipath Manager software is used for the programming. The core operating system, user database is stored on a SDRAM on this card. Core exchange requirements of switching, monitoring, programming and feature authorizations are designed on this card.

- **SLMO-8**

  Single Line Module Digital - This is a digital subscriber line card with 8 ports. Digital telephones are connected to this card.

- **SLMA-8**

  Single Line Module Analog - This is an analog subscriber line card with 8 ports. Analog telephones are connected to this card.

- **TMEW-4**

  Trunk Module E&M - This is an analog trunk E&M card with 4 ports. Other exchanges can be connected through this card.

- **TMANI-8**

  Trunk Module Analog Network Interface - This is an analog trunk CO card with 8 ports.
  Other exchanges can be connected through this card.

- **DIUN**

  Digital Interface Unit Network - This is a PRI digital trunk card with 30 ports. Other exchanges can be connected through this card.

- **STMD**

  Single Trunk Module Digital - This is a BRI digital trunk card with 8 ports. Other exchanges can be connected through this card.

- **DIUT**

  Digital Interface Unit Trunk - This is a E1 digital trunk card with 30 ports. Other exchanges can be connected through this card.

- **SLCN**

  Single Line Cordless Network - This is a DECT card with 16 ports. Radio base stations are connected to this card with single pair. The power required for the base station is supplied on the connected pair. The base station works up to one km distance on 0.5mm dia copper pair from the exchange.

6.5 DECT - Digital Enhanced Cordless Telephony

This is an ITU standard radio communication system. This is well supported in this exchange. A radio base station is connected to **SLCN** card with a single copper pair. It works up to 1 km distance from the exchange. The power required to operated radio base station is drawn from the line itself. The DECT handsets look like mobile phones and communicate with radio base station. The DECT handsets work about 300 meters from base station in clear visibility. One SLCN card supports 16 radio base stations. In a Hipath 3800 system a maximum of four SLCN cards can be used. That is a total of 256 base stations can be connected in a system. One radio base station supports 16 simultaneous voice circuits. Smooth handing over from one radio base station to other radio base station takes place while a DECT handset is in motion.

DECT Handsets communicate with the base stations. The radius of operation is 300 meters from the nearby base station. Smooth handing over from one base station to other facilitates uninterrupted communication for DECT handsets while in motion.

1	2	3	4	5	6	7	8	9	10
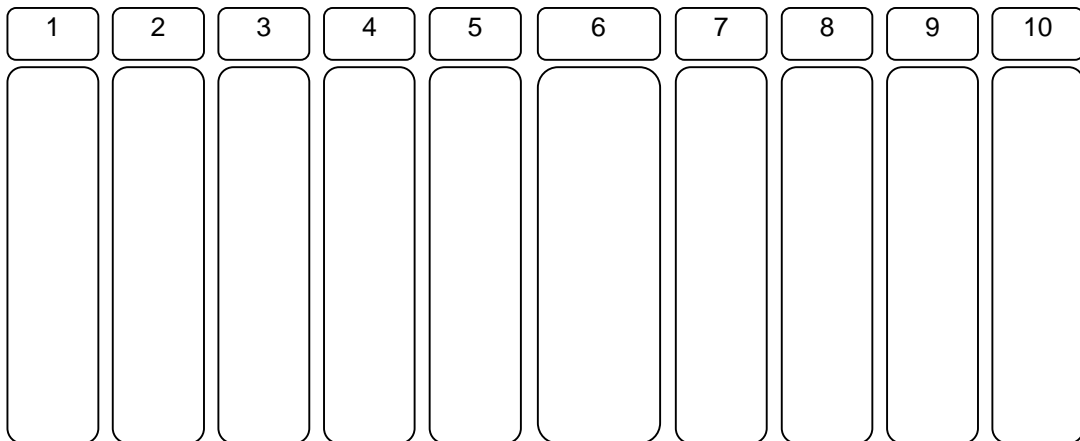
Fig. 6.1 Siemens Hipath 3800 Exchange

6.6 Programming

The various methods of accessing the Hipath 3800 system are

- Direct connection through COM port
- LAN interface
- Dialup modem

With Hipath Manager software the exchange is programmed. This software comes with the exchange. It is a GUI (graphical user interface) based software. This software is to be installed onto a PC. Through this Hipath Manager software, the user database from the exchange is downloaded onto the PC.

The required modifications are to be applied in the program. The changes are to be saved accordingly. To effect the changes in the exchange, the user database from the PC is to be uploaded back to the exchange.

The user database can be saved to a file for future backups. And this backup can be used to restore the system in case of any malfunction, erratic operation or crash of the exchange.
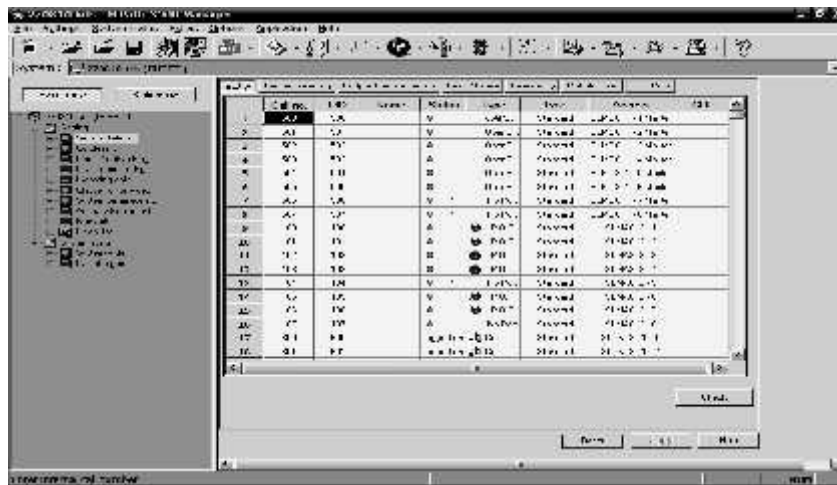
Siemens Hipath 3800 Telehpone Exchange

Fig. 6.2 Telephone Nos. window
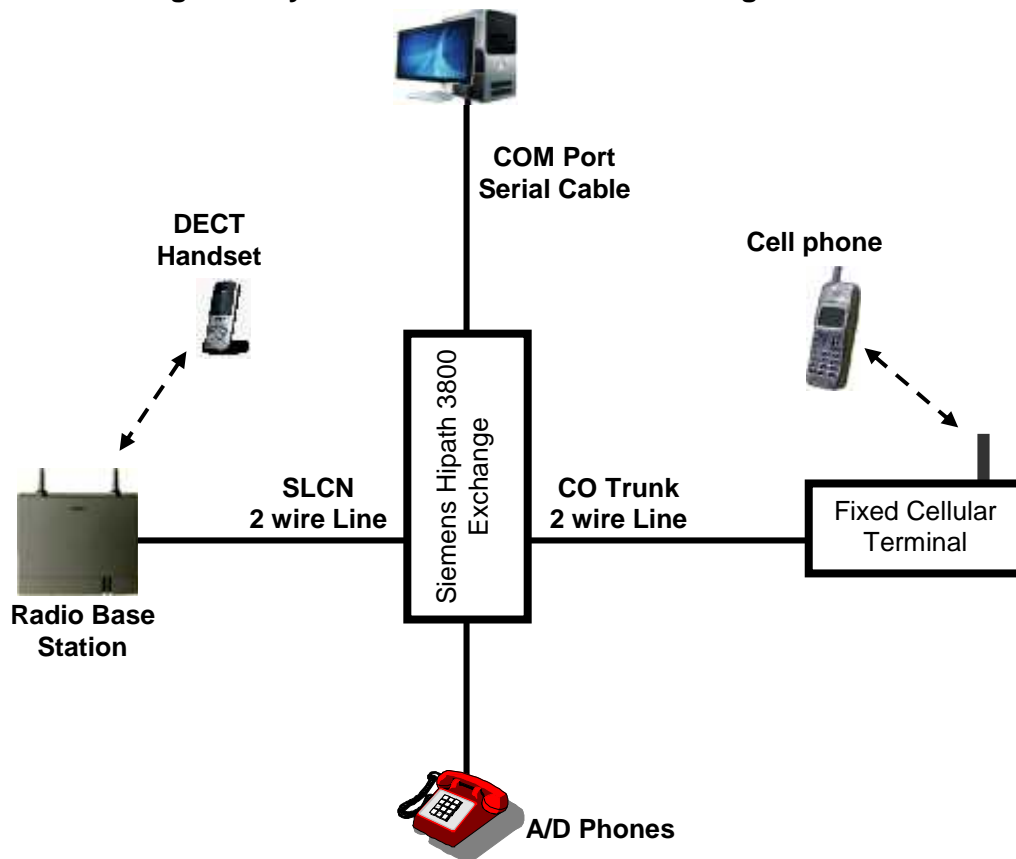

Fig. 6.3   System Wide Window For Exchange Hardware

Fig. 6.4 Siemens Hipath 3800 Exchange Peripherals

Review Questions

Objective

1. Hipath 3800 consists of the following No. of slots?   [   ]

    a.   b.   c.   d.

2. Which is the main control card slot in Hipath 3800 ?   [   ]

    a.   b.   c.   d.

3. Which of the following is the main control card ?   [   ]

    a.   b.   c.   d.

4. Which of the following is the DECT card ?   [   ]

    a.   b.   c.   d.

5. How many base stations are supported by one DECT card ?   [   ]

    a.   b.   c.   d.

6. How many voice channels are supported by one base station at a time ?   [   ]

Subjective

1. What are the cards available in Hipath 3800 ?
2. Write short notes on Siemens Hipath 3800 DECT interface ?
3. What are the various methods of access to Hipath 3800 ?