INTERNSHIP REPORT SUBMISSION

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Acceptance

This internship report is submitted to the Department of Electronics &Communications Engineering East West University, Dhaka in partial fulfillment of the requirement for the degree of B.Sc in Electronics & Telecommunications Engineering under complete supervision of undersigned.

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Introduction

Telecommunication is the transmission of information, over significant distances, for the purpose of communication. Today the globe is a village and telecommunication has become a necessity to people's life. Moreover, telecommunication has started introducing some diversified areas with the help of its mobile network. Nowadays, people cannot think without mobile phone. Many people depend on it for their ultimate connectivity. It has become a part of people's day to day life. Mobile technology is presently providing various cheap solutions in people's daily life. Information technology enables telecom companies to provide economic solutions with a very cheap and easily available access, which was costly earlier and not accessible to some extent. Using a mobile phone has become a common measure of communication in our country. From a rickshaw puller to a higher official, everyone owns a mobile phone. The number of mobile phone user is increasing day by day. So our country has become an attractive market for mobile operators. Grameenphone is one of the leading mobile operators in our country who have seen this great potential.

1.1 Origin of the Report

Internships provide an opportunity for students to link theory with practice and further serve as a temporary labor pool for those organizations that have committed to participate in the internship program. The internship program has following purposes:

- It provides a student with a practical real world experience in the public or nonprofit sector before entering into a job market. Such experience not only increases students‟ job prospects, but also teaches what is expected in terms of professional behavior.
- It enables a student to develop important skills which cannot be taught in the classroom.
- It enables a student to compare theoretical ideas learned in the classroom within the world of work.
- It permits a student to apply the technical skills learned in the classroom to real world problems.
- I have prepared this report after the three months internship program in Grameenphone ltd. This report is based on "Base Transceiver station(BTS) at Grameenphone. I have also covered information regarding the organizational overview and what I did and learned everyday in Grameenphone Ltd.

1.2 Objective of the Report

There are two kinds of objectives of the report. They are:

- Broad Objective

 Specific Objective

1.2.1 Broad Objective

The main objective of the report has been done to show the total working procedure of Base Transceiver Station, fibber, etc at Grameenphone Ltd.

1.2.2 Specific Objective

The specific objectives of this internship report are:

 Tofocus on the overview of Grameenphone Ltd

 Tofocus on the work environment, employee behavior and have a quick glimpse of the corporate culture of Grameenphone Ltd.

 To focus on the recruitment and selection process of Grameenphone and learn how this process takes place in reality

1.3 Scope of the Report

This study was undertaken aiming to know about the operation and maintenance of Base Transceiver station(BTS). The scope of this study includes reviewing the technical, commercial and customer service quality of Grameenphone and identifying tolls and techniques used by Grameenphone to achieve remarkable performance level. Moreover, I have been worked under system operation and system protection unit in Grameenphone and thus provide me the way to get myself familiarized with the official environment for the first time. I had an experience by working in the department. I had the opportunity to have close view of their activities. The area of concentration of this report is confined in investigating different aspect of implementation technical division

1.4 Methodology

This report was prepared in a systematic manner. My academic supervisor assigned the topic of the report. All the information was collected from two sources:

1.4.1 Primary Sources

My supervisor in Grameenphone Ltd helped me a lot in preparing the report. I interview him face to face, he gave me all the necessary information that I needed. In addition I have also gathered information by observing and by participating in recruitment and selection process.

1.4.2 **Secondary Sources**

I browsed the internet for as much information I could get. From the internet I got the background information of the company

1.5 Limitation

Disclosing of much information is confidential. For that reason I was unable to disclose forms that they use in the time of joining or what kind of information they keep in their personnel file. In the following chapter I have given a glimpse of GP - their mission, vision, principles, purpose, products, shareholders etc. This will help us to know about Grameenphone in a broader way.

Chapter-02

Background of the Organization

2.1 An Overview of the Organization

Grameenphone Ltd., the largest telecommunications service provider in Bangladesh, received its operating license in November 1996 and started its operation from March 26, 1997, the Independence Day of Bangladesh.Grameenphone provides services to rural and urban customers across Bangladesh, where mobile telephony is acknowledged as a significant driver of socio-economic development, both for individual and the nation.

Grameenphone launched a new, refreshed logo in November 2006. The logo expresses the values Grameenphone is known for: trust, reliability, quality and constant progress. It also signals the company's continued focus on securing the best possible communications services for its customers. It reflects the continuous efforts to evolve the organization and its dynamics to serve the customers even better in the future.Now, after 18 years of successful operations, Grameenphone is the largest mobile phone service provider in Bangladesh, with more than 55 million subscribers as June 2015. The Company was successfully listed on the stock exchanges in November 2009- after completion of the largest IPO in the history of the Bangladesh capital market.

2.2 Share Holders

The shareholding structure comprises of mainly two sponsor Shareholders namely Telenor Mobile Communications AS (55.80%) and Grameen Telecom (34.20%). The rest 10.00% shareholding includes General Public & other Institutions.

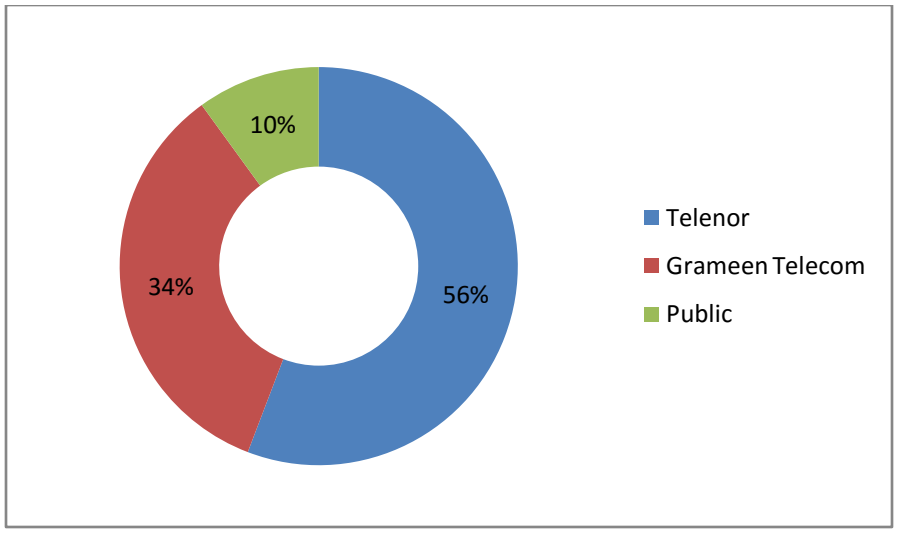


Figure 2.1. GP Share Holder

2.3 Telenor Mobile Communications AS (TMC)

TMC, a company established under the laws of the Kingdom of Norway, seeks to develop and invest in telecommunication solutions through direct and indirect ownership of companies and to enter into national and international alliances relating to telecommunications. It is a subsidiary of Telenor Mobile Holdings AS and an affiliate of Telenor. Telenor ASA is the leading Telecommunications Company of Norway listed on the Oslo Stock Exchange. It owns 55.80% shares of Grameenphone Ltd.

Telenor's strong international expansion in recent years has been based on leading-edge expertise, acquired in the Norwegian and Nordic markets, which are among the most highly developed technology markets in the world. It has substantial International operations in mobile telephony, satellite operations and pay Television services. In addition to Norway and Bangladesh, Telenor owns mobile telephony companies in Sweden, Denmark, Hungary, Serbia, Montenegro, Thailand, Malaysia, Pakistan and India. Including its 31.7% ownership stake in VimpelCom, Telenor has more than 330 million mobile subscriptions worldwide as of December

31, 2011.Telenor uses the expertise it has gained in its home and international markets for the development of emerging markets like Bangladesh.As part of the conversion of Grameenphone from a private limited to a public limited company, Telenor Mobile Communications AS transferred 10 shares each on May 31, 2007 to its three (3) affiliate organizations namely Nye Telenor Mobile Communications II AS, Norway; Telenor Asia Pte. Ltd., Singapore; and Nye Telenor Mobile Communications III AS, Norway.

2.4 Grameen Telecom (GTC)

Grameen Telecom, which owns 34.20% of the shares of Grameenphone, is a not-for-profit company in Bangladesh established by Professor Muhammad Yunus, winner of the Nobel Peace Prize 2006.GTC's mandate is to provide easy access to GSM cellular services in rural Bangladesh and create new opportunities for income generation through self-employment by providing villagers, mostly to the poor rural women with access to modern information and communication-based technologies.Grameen Telecom, with its field network, administers the Village Phone Program, through which Grameenphone provides its services to the fast growing rural customers, Grameen Telecom trains the operators and handles all service-related issues.GTC has been acclaimed for the innovative Village Phone Program. GTC & its Chairman Nobel Peace prize laureate Professor Muhammad Yunus have received several awards which include; First ITU World information Society Award in 2005; PetersburgPrize for Use of the IT to improve Poor People's Lives" in 2004; GSM Association Award for "GSM in Community Service" in 2000.As part of the conversion of Grameenphone from a private limited to a public limited company, Grameen Telecom transferred share each on May 31, 2007 to its two affiliate organizations namely GrameenKalyan and Grameen Shakti.

2.4 Grameen Telecom

Grameenphone's vision is ***"We're here to help."*** That means Grameenphone Ltd. is always there to help the customers get the full assistance of communications services in their daily lives. They want to make it simple for the customers to get what and when they want it.

2.5 Company Mission

The mission of Grameenphone Ltd is to deliver reliable, widespread, convenient mobile and cost effective telephone services to the people in Bangladesh irrespective of where they live .They are providing a total communication solution to its customers. To do this, the service advance of Grameenphone has extensively developed over the last few years. Grameenphone
subscribers now enjoy all the modern data communication and content services. Mobile office, internet access, MMS and modern music and download services are available through the nationwide EDGE enabled network

2.6 Company's Objectives

Grameenphone (GP) has been established to provide high-quality GSM cellular service at affordable prices. Grameenphone has a dual purpose: To receive an economic return on its investment
To contribute to the economic development of Bangladesh where
telecommunications can play a critical role The Company has developed its strategies so that it earns healthy returns for its share holdersand at the same time, contributes to genuine development of the country. This is why Grameenphone, in collaboration with Grameen Bank and Grameen Telecom, is aiming to place one phone in each village to contribute significantly to the economic benefit of the poor. It is on the way to get a total uprising in the telecommunication field.

2.7 Company's strategy

Grameenphone Limited's strategy was to effectively become the second national operator in Bangladesh. Instead of focusing on a high-end, niche market; it pursued a low tariff strategy designed to compete directly with BTTB

2.8 Company's Value

2.9.1 Make it Easy

Grameenphone believes that they are sensible. Everything they create is easy to appreciate and use as they never fail to remember that they are trying to make their customers' lives easier.

2.9.2 Be Inspiring

Grameenphone believes that they are imaginative. They convey energy and thoughts to their network. Grameenphone wants to be a collaborator in the progress of our society. They are passionate about our business, customers and country.

2.9.3 Keep Promise

Everything Grameenphone set out to do should work. If it does not, they are there to putting right. They are about delivery, not over promising - actions not words.

2.9.4 Be Respectful

Grameenphone shows acknowledgement and admiration the local culture. They are courteous and professional in regard to all interactions, both internally and externally. They are open, helpful and friendly.

Chapter -3

Microwave link PNMS (Paso link Network Management System)

3.1 System description

This chapter gives the detailed description of the equipment features and subsystems that have not been given in the previous part. Information given in the following is:

1. Functional description and components
2. Control subsystem hardware architecture
3. IDU functional description
4. Protection schemes
5. ODU functional description

3.2 Functional description and components

This paragraph sums–up the equipment functions and defines its components from the SW point of view:

1. Functions and configurations
2. IDU and ODU Components:
    a. IDU
    b. ODU
    c. Allowed Equipment Types
    d. Remote Inventory Management

3.2.1 Functions and configurations

ULS NE has the aim to multiplexer/demultiplexer the main tributaries (up to 16 E1 or 1 E3) with different modulation format.

Table: Market, tributaries and modulations forecasted

Market	Tributary	Modulation
ETSI	2xE1	4QAM
	4xE1	4QAM / 16QAM
	8xE1	4QAM /16QAM
	16xE1	4QAM / 16QAM
	1xE3	4QAM / 16QAM

The main functions performed by IDU and ODU of ULS equipment are the following:

Multiplexer/Demultiplexer The multiplexer function receives main tributaries and generates a PDH frame. The demultiplexer function receives a PDH frame and generates main tributaries.

3.2.2 IDU and ODU Components

The ULS NE is composed by two different parts: the indoor and the outdoor part. In the following they are described from physical and management point of view.

3.2.2.a IDU

The indoor part is composed by one or two units/shelves: IDU Main and Extension units. The IDU Main Unitprovides the external interfaces for the 8xE1 tributaries, user service channel, housekeeping and summarizing alarms, NMS V11 and G703 interfaces and a telephone jack. It contains the MONOM, the PQECRC and the Power Supply units. The MONOM unit manages 8E1 tributaries, the Mux/Demux and the cable interface functions. The PQECRC unit implements the Equipment and IDU Controller functions.

Fig 3.1: IDU in a BTS room.

The Main unit is used both in 1+0 and 1+1 configurations. Software Key (Flash Card) is plugged onto the Main board allowing flexibility in choosing user interfaces. The IDU Extension Unit contains the MONOE (including the Hitless Switch function) and the Power Supply units. Optional 8xE1 or E3 unit (alternative between them) can be plugged onto this Extension unit. The Extension unit is used only in 1+1 configurations.

3.2.2.ODU

According to the configuration type, one or two electrical ODU are managed in the Outdoor part. Each ODU contains a PQECRC unit. It implements the ODU controller functions.

Fig 3.2: ODU with MW antenna in a BTS tower.

3.3 ODU Supervisory Unit

The ODUC has in charge the PMMF/U–ODU. This function requires a real time processing of the data coming from the ODU ASIC. The ODUC has the aim to provide a uniform interface towards the EC avoiding an EC dependency from the ODU HW.

Inside the IDU there is one single internal communication interface: the IDU SPI interface.

3.4 IDU functional description

3.4.1 Introduction

The Indoor Unit (IDU) performs all customer interface requirements both as voice and data:

I. NxE1/E3 for ETSI market
II. NxDS1/DS3 for ANSI market
III. EOW
IV. Service channels
V. OS–TMN

And feeds the Outdoor Unit (ODU) via a single coaxial cable carrying:

VI. Base Band Transmission Signal (from IDU to ODU)
VII. Base Band Receiver Signal (from ODU to IDU)
VIII. ODU Supply Voltage

The IDU is available in 2 configurations:

- 1+0 IDU

3.4.2 IDU Main Unit

As shown in Figurer, the components of the IDU Main unit are:

- The MONOM unit (the motherboard), which includes:
- The interface for 8E1 tributaries and for all the other channels whose connectors are present on its front plate

- The Mux/Demux (block diagram), which carries out the following functions:

Network Management System

- Multiplexing/Demultiplexing of the signal toward the ODU interface as framed unframed implementing the following processes:

Scrambler/Descrambler

- Coding/Decoding (Reed–Solomon) + Interleaving
- Cable interface functions: cable Interface circuit adds to this signal the ODU supply voltage and ODU connector management information, feeding the "N" connector available on the front panel of the board.
- The microprocessor platform (PQ/ECRC).
- DC/DC converter plug–in board (PSU). It is a module including DC/DC converters and filters. The power distribution for 1+1 systems is described (in 1+0 systems the IDU extension board is not equipped).
- The connector for the flash Card, which stores the SW of the terminal,
- The connectors for an optional tributary plug–in.

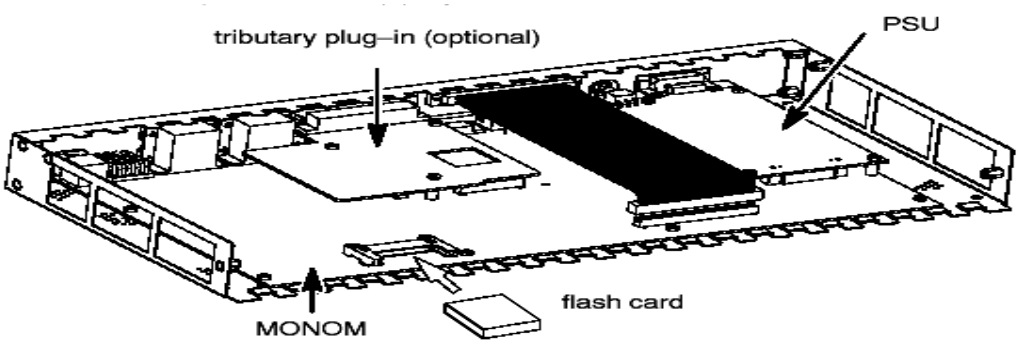


Fig 3.3: Components of the IDU Main unit

- Multiplexing/Demultiplexing of the Tributary signals, and the insertion/extraction from the main stream of the following signals:
- EOW
- Service Channel

3.4.3 IDU Power Supply Unit

The PSU is a plug–in of the Main mono–board and Extension mono–board. The PSU is functionally made up of three main blocks Input Section (IS): common to both LVS and HVS

- Low Voltage Section (LVS): for internal IDU power supply
- High Voltage Section (HVS): for external ODU power supply

And two auxiliary blocks:

- Alarm generation: for external supervision
- Remote Inventory: for factory identification

The following versions are foreseen:

a. Floating (48–60) V nom. ±20%;
b. Floating 24V nom. ±20%

Input is designed as floating, meaning that either plus or minus of battery input could be externally connected to ground input, without affecting any required characteristic or functionality. Following alarms are provided by the PSU Unit and connected to spider's pins:

- Fail IS: IS not working properly or standing input voltage outside the normal service range
- Fail_LVS: Low Voltage Section (+3,3V and 1,5V) not working properly

3.5 ODU Functional Description

The Outdoor unit is produced of the following sections:

1. Modem and IF section
2. Local Oscillator
3. Tx IF section
4. Rx IF section
5. RF section
6. Diplexer
7. DC/DC converter

:

3.5.1 Modem and IF Section

Cable interface:

The cable interface between IDU and ODU allows carrying over the coaxial cable:

- The transmit and receive data streams (and interface these streams to the modem on ODU side),
- The control signals and service channel.
- The DC power supply from the IDU to the ODU

3.5.2 Modem section

The modem section performs the 4 QAM or 16 QAM modulation and demodulation functions, with embedded digital filtering and equalization. It also incorporates the analog to digital and digital to analog conversions.

3.5.3 IF section

The IF section incorporates the quadrature modulator (respectively the quadrature demodulator) for the up–conversion (respectively down–conversion) to a transmit IF (respectively from a receive IF). It performs base–band filtering and AGC. IF frequencies are variable in order to cope with all frequency spacing.

3.5.4 Local Oscillator

There is one single Local Oscillator both for transmit and receive RF units.It is electronically tuned, by software, to the requested frequency, providing frequency agility over a quarter of the frequency plan.

3.5.5 Diplexer

The Diplexer separates transmit and receive signals at the RF antenna port.

3.5.6 DC/DC Converter

The DC/DC Converter provides the DC/DC conversion to generate the secondary voltages from the remote supply voltage. It interfaces with all active modules of the transceiver.

3.6 IDU (Indoor Unit)

The IDU incorporates the base–band processing and offers tributaries interfaces as well as service channel and supervision. The IDU is frequency–independent.

As shown in figure up to 2 sub–racks (each of them being 1U high) are used as basic elements to build the following configurations:

- 1+0 this configurations: includes one main IDU unit (height 1U)
- 1+1 this configurations: includes one main IDU unit (height 1U) and one Extension IDU unit (height 1U).

3.7 900 MRFU

In any site of this tower in Grameenphone are used in 900 MRFU module. It is used for 1G Network.In primary level of network this Module are used**.**

Fig 3.4: 900 MRFU

3.8. 1800 MRFU

In 1800 MRFU Module are used for 2G Network. For adding this kinds of module the network are increasing from 1G Network.

3.9. 2100 MRFU

In 2100 MRFU are used for 3G.Maximum location of our country are coverage of 3G Network**.**

3.10 DVS

DC ventilation system (DVS) is used in every BTS room. It is used for controlling the room temperature .some times in our country the temperature are increased so much. For this reason it is used so that the temperature are decrease .For protected this equipments of BTS room this DVS contribute lot of work.

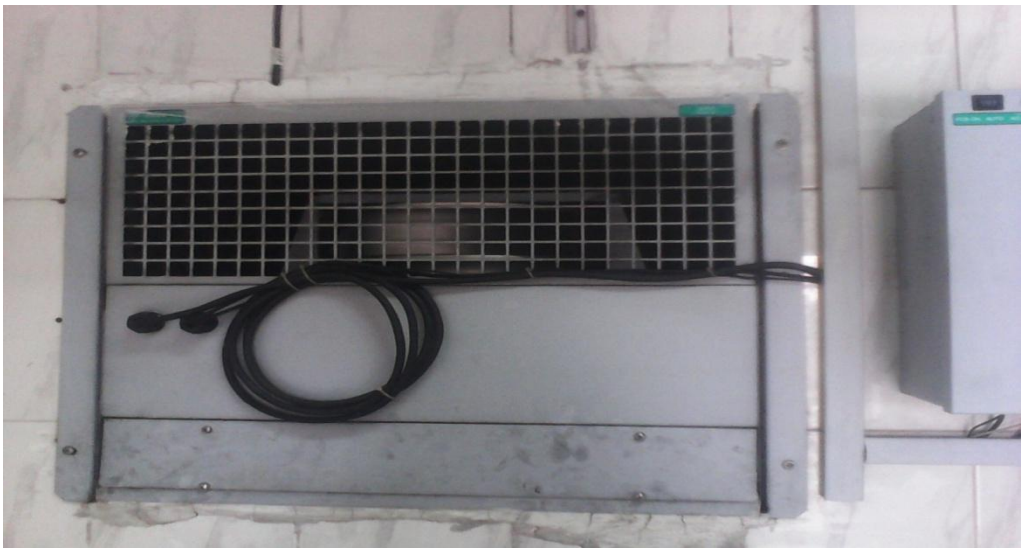


Fig 3.4: DVS at BTS room

3.11 Antenna Configurations

The ODU can be connected to:

- An integrated antenna of 30 cm (1FT) or 60 cm (2FT) diameter
- If larger diameters are necessary from a separated antenna, the antenna is interconnected by a flex twist directly to the ODU, or the coupler, depending on the protection used. For the outdoor section different 1+1 configuration can be implemented:

Fig3.5: ODU with antennas

- Basic HSB with a 1 dB/10 dB asymmetrical coupler and 1 antenna: this configuration optimizes the infrastructure using only one antenna; a 10 dB coupling has been chosen to minimize the losses on the normal path (1 dB only).
- HSB configuration is also available with a 3 dB symmetrical coupler and 1 antenna

3.12 Microwave link PNMS software upload

- After installing the antenna ODU, IDU it is required to install the software indoor unit. This software is called PNMS (Paso link Network Management System) software.

Chapter -04

3G Network

4.1 3G services

3G refers to the third generation of wireless technology.

The 3G network enabled you to make video calls, watch live TV, access high speed internet and enjoy live streaming for an enhanced mobile internet experience

4.2 Benefit of 3G

With 3G you should be able to do the following

- Multimedia streaming & download
- High speed mobile broadband
- Video calling
- Live streaming TV
- Download of large email attachments very fast
- Video call conference

4.3 3G Different from 2G

Grameenphone 3G is different from 2G. Grameenphone 3G network will run on best in class HSPA technology to give you access to high speed internet, video call and richer multimedia experience within 3G coverage area.

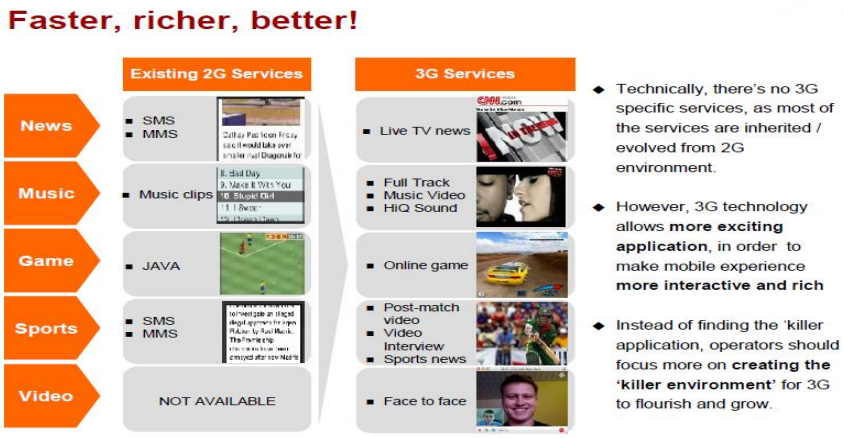
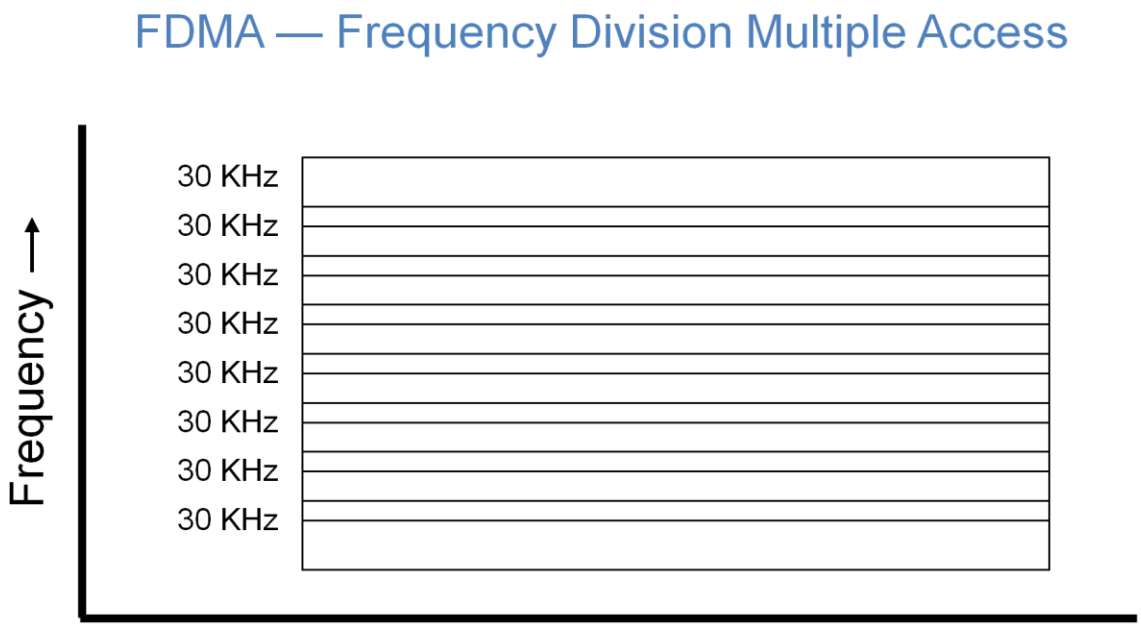


fig 4.1

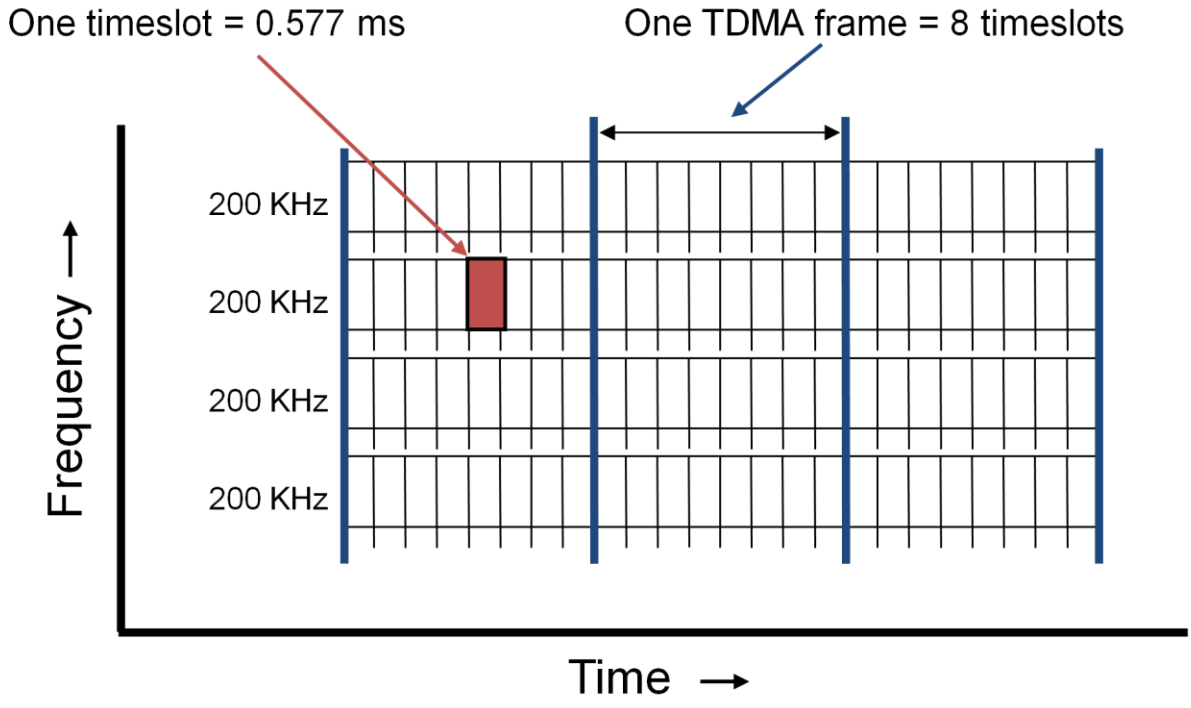
4.4 Technological Evaluation of Modulation Systems:

4.4.1 1G — Separate Frequencies:



4.4.2 2G — TDMA:

Time Division Multiple Access:



4.5 2G & 3G — CDMA

Code Division Multiple Access:

- Spread spectrum modulation
  - Originally developed for the military
  - Resists jamming and many kinds of interference
  - Coded modulation hidden from those w/o the code
- All users share same (large) block of spectrum
  - One for one frequency reuse
  - Soft handoffs possible
- Almost all accepted 3G radio standards are based on CDMA
  - CDMA2000, W-CDMA and TD-SCDMA

4.6 Universal Mobile Telecommunication System(UMTS)

• ETSI/ARIB Proposal of deploying WCDMA is largely accepted by vendors like Ericsson and operators like NTTDoCoMO

• It uses GSM Mobile Application Part(MAP) which is a SS7 protocol communicating between 3G and 2G service

• It enables that 2G operation will not be hampered for deployment of 3G

• This proposal is called UMTS and the radio part is called UTRAN(UMTS Territorial Radio Access Network).

• Later a global umbrella for UMTS and CDMA was developed which is called IMT-2000

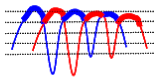
√ IMT-direct spread/ UMTS-FDD

√ IMT-Multicarrier/CDMA 2000

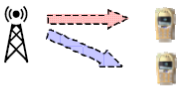
4.7 Introduction to HSDPA

4.7.1 HSDPA Concept:

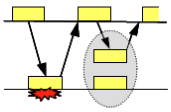
- Max Throughput – 14.4 Mbps
- HS-DSCH
- SF-16
- QPSK, 16QAM
- TTI=2 ms
- HARQ
- New Channel: HS-SCCH, HS-DPCCH
- No Fast Power Control



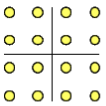
Fast Radio Channel Dependent Scheduling
Scheduling of users on 2 ms time basis



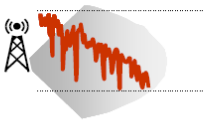
Shared Channel Transmission
Dynamically shared in time & code domain



Fast Hybrid ARQ with Soft Combining
Reduced round trip delay

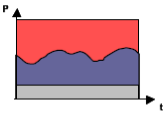


Higher-order Modulation
16QAM in complement to QPSK for higher peak bit rates



Fast Link Adaptation
Data rate adapted to radio conditions on 2 ms time basis

Short TTI (2 ms)
Reduced round trip delay



Dynamic Power Allocation
Effecient power & spectrum utilisation

HSDPA

HSDPA stands for "High Speed Downlink Packet Access". As the name suggests, this is a piece of UMTS functionality designed to deliver downlink packet data at very high data rates. It is a release 5 feature. It achieves its aim by using the following techniques:

- Use of shared channel concept
  Rather than constantly allocating and reallocating dedicated channels to individual users, users share a high bandwidthchannel – the HS-DSCH (High Speed Downlink Shared Channel). This allows the system to operate with a "fat pipe"

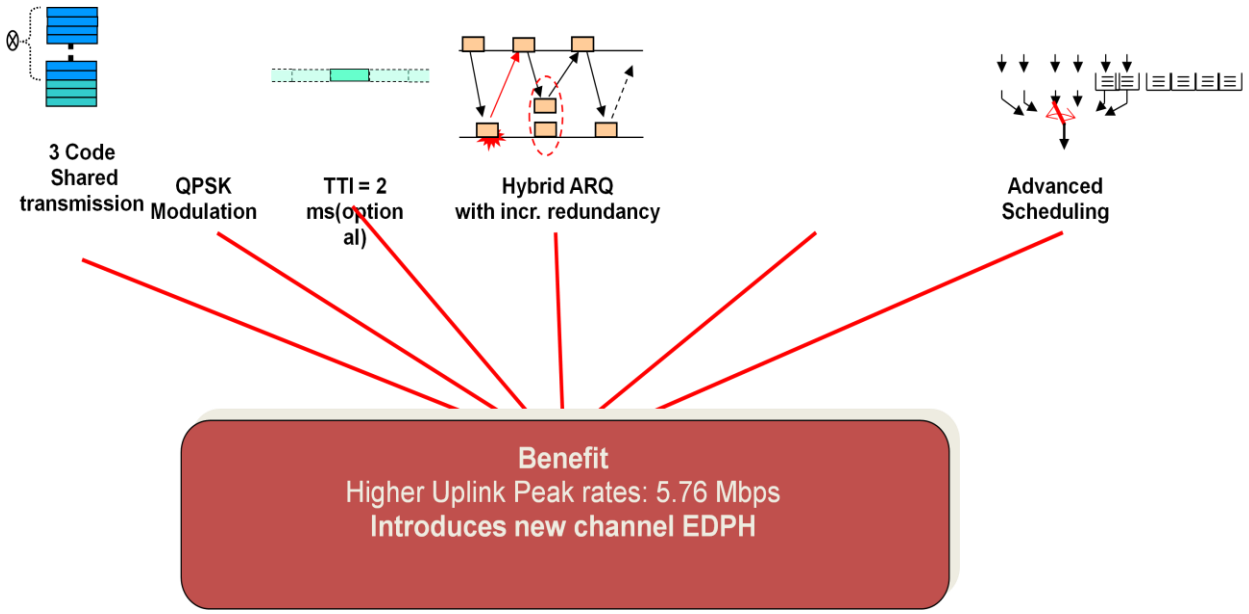


fig 4.2

4.7.2 HSPA+ Overview:

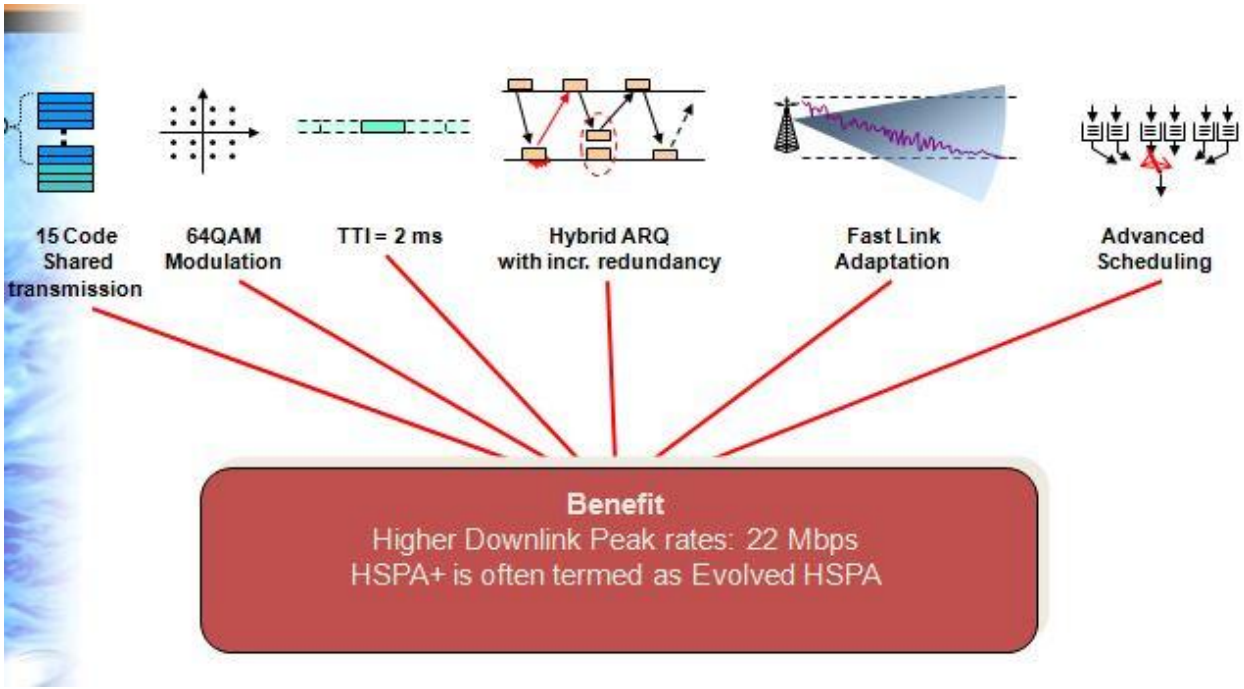


fig 4.3

4.8 Transmission Media

4.8.1 Air (Microwave Radio)

- Flexibility +
- Quick installation +
- Sensitive to ambient disturbance. (Rain and Multipath fading).-
- Time and frequency dependent.+
- Modulation /Demodulation.+
- Low bit error (BER) in bursts.+

4.8.2 Optical Fiber

High transmission quality. (minimum attenuation). +

High transmission capacity. +

Resistance to ambient disturbance. +

Long Implementation time

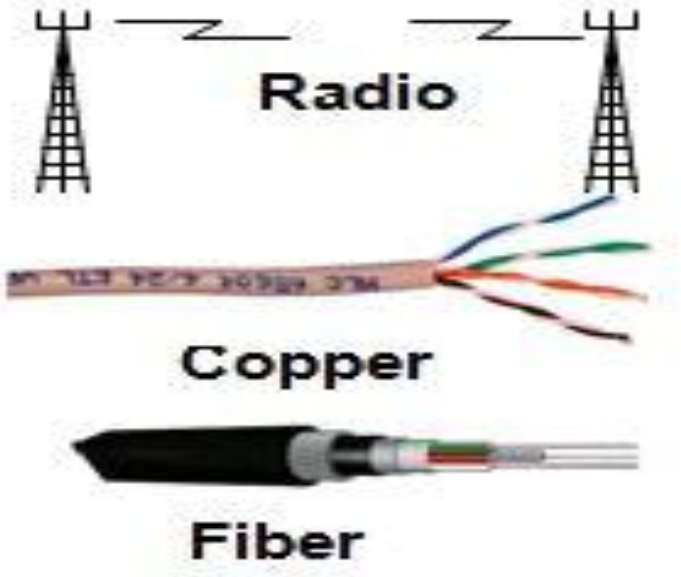
4.8.3 Copper cable:

Low bandwidth (-)

Sensitive to crosstalk and noise(-)

Attenuation per Km depends on wire diameter (0.4-1.1mm) and frequency.

Reliable(+)



Chapter -5

Global System for Mobile communication

5.1 Base transceiver station (BTS)

5.1 Introduction:

A **base transceiver station** (**BTS**) is a piece of equipment that facilitates, wire-less , communication between user equipments (UE) and a network. UEs are devices like mobile phone (handsets), WLL phones, Computers with, wireless connectivity. The network can be that of any of the wireless communication technologies like GSM, CDMA, Wi-Fi, Wi-max technology.

BTS is also referred to as the *radio base station* (RBS), *node B* (in 3G Networks) or, simply, the *base station* (BS). For discussion of the LTE standard the abbreviation *e NB* for evolved node B is widely used.

Though the term BTS can be applicable to any of the wireless communication standards, it is generally associated with mobile communication technologies like GSM and CDMA. In this regard, a BTS forms part of the base station subsystem (BSS) developments for system management. It may also have equipment for encrypting and decrypting communications, spectrum filtering tools (band pass filters), etc. Antennas may also be considered as components of BTS in general sense as they facilitate the functioning of BTS. Typically a BTS will have several transceivers (TRXs) which allow it to serve several different frequencies and different sectors of the cell (in the case of sectorised (base stations). A BTS is controlled by a parent base station controller via the base station control function (BCF). The BCF is implemented as a discrete unit or even incorporated in a TRX in compact base stations. The BCF provides an operations and maintenance (O&M) connection to the network management system (NMS), and manages operational states of each TRX, as well as software handling and alarm collection. The basic structure and functions of the BTS remains the same regardless of the wireless technologies.

5.2 General architecture

A BTS it has the following parts:

5.2.1 Transceiver (TRX)

Quite widely referred to as the driver receiver (DRX), DRX are either in form of single , double or a composite double radio unit (DRU). It basically does transmission and

reception of signals. It also does sending and reception of signals to and from higher network entities (like the base station controller in mobile telephony)

.

5.2.2 Power amplifier (PA)

Amplifies the signal from DRX for transmission through antenna may be integrated with DRX.

5.2.3 Combiner

Combines feeds from several DRXs so that they could be sent out through a single antenna. Allows for a reduction in the number of antenna used.

5.2.4 Multiplexer

For separating sending and receiving signals to /from antenna. Does sending and receiving signals through the same antenna ports (cables to antenna).

5.2.5 Antenna

This is the structure that the BTS lies underneath; it can be installed as it is or disguised in some way.

5.2.6 Alarm extension system

Collects working status alarms of various units in the BTS and extends them to operations and maintenance (O&M) monitoring Station.

5.2.7 Control function

Controls and manages the various units of BTS, including any Software .On-the-spot configurations, status changes, software Upgrades, etc. are done through the control function

5.3 Terms regarding a mobile BTS

To improve the quality of the received signal, often two receiving antennas are used, placed at an equal distance to an uneven multiple of a quarter of wavelength (for 900 MHz the wavelength it is 30 cm). This technique, known as antenna diversity or space diversity, avoids interruption

caused by path fading. The antennas can be spaced horizontally or vertically. Horizontal spacing requires more complex installation, but brings better performance.Other than antenna or space diversity, there are other diversity techniques such as frequency/time diversity, antenna pattern diversity, and polarization diversity. Splitting refers to the flow of power within a particular area of the cell, known as a sector. Every field can therefore be considered like one new cell. Directional antennas reduce LORA interference. If not the cell will be served by an directional antenna,Which radiates in all directions? A typical structure is the tri sector, also known as clover, in which there are three sectors served by separate antennas. Each sector has a separate direction of tracking, typically of 120° with respect to the adjacent ones. Other orientations may be used to suit the local conditions. Bi sectored sell are also implemented. These are most often oriented with the antennas serving sectors of 180° separation to one another, but again, local variations do exist.

5.4 GSM Network Architecture

5.4.1Definition Global system for mobile communication (GSM) is a globally accepted standard for digital cellular communication. GSM is the name of a standardization group established in 1982 to create a common European mobile telephone standard that would formulate specifications for a pan-European mobile cellular radio system operating at 900 MHz. It is estimated that many countries outside of Europe will join the GSM partnership.

5.4.2 Overview

This tutorial provides an introduction to basic GSM concepts, specifications, networks, and services. A short history of network evolution is provided in order set the context for understanding GSM.

5.5 Topics

1. Introduction: The Evolution of Mobile Telephone Systems

2. GSM

3. The GSM Network

4. GSM Network Areas

5.5.1 Introduction: The Evolution of Mobile Telephone Systems

Cellular is one of the fastest growing and most demanding telecommunications applications. Today, it represents a continuously increasing percentage of all new Telephone subscriptions around the world. Currently there are more than 45million cellular subscribers worldwide, and nearly 50 percent of those subscribers are located in the United States. It is forecasted that cellular systems Using a digital technology will become the universal method of telecommunications. By the year 2005, forecasters predict that there will be more than 100 million cellular subscribers worldwide. It has even been estimated that some countries may have more mobile phones than fixed phones by the year2000 .The concept of cellular service is the use of low-power transmitters where frequencies can be reused within a geographic area. The idea of cell-based mobileradio service was formulated in the United States at Bell Labs in the early 1970s.However, the Nordic countries were the first to introduce cellular services forCommercial use with the introduction of the Nordic Mobile Telephone (NMT) in 1981 Cellular systems began in the United States with the release of the advanced mobile phone service (AMPS) system in 1983. The AMPS standard was adopted by Asia, Latin America, and Oceanic countries, creating the largest potential market in the world for cellular.In the early 1980s, most mobile telephone systems were analog rather than digital, like today's newer systems. One challenge facing analog systems was the inability to handle the growing capacity needs in a cost-efficient manner. As aResult, digital technology was welcomed. The advantages of digital systems over analog systems include ease of signaling, lower levels of interference, integration of transmission and switching, and increased ability to meet capacity demands.

5.5.2 GSM

Throughout the evolution of cellular telecommunications, various systems have been developed without the benefit of standardized specifications. This presented many problems directly related to compatibility, especially with the development of digital radio technology. The GSM standard is intended to address these problems. From 1982 to 1985 discussions were held to decidebetween building an analog or digital system. After multiple field tests, a digital system was adopted for GSM. The next task was to decide between a narrow or broadband solution. In May 1987, the narrowband time division multiple access (TDMA) solution was chosen.

5.5.3. The GSM Network

GSM provides recommendations, not requirements. The GSM specifications define the functions and interface requirements in detail but do not address the hardware. The reason for this is to limit the designers as little as possible but still to make it possible for the operators to buy equipment from different suppliers.

The GSM network is divided into three major systems: the switching system (SS), the base station system (BSS), and the operation and support system (OSS). The basic GSMnetwork elements are shown in

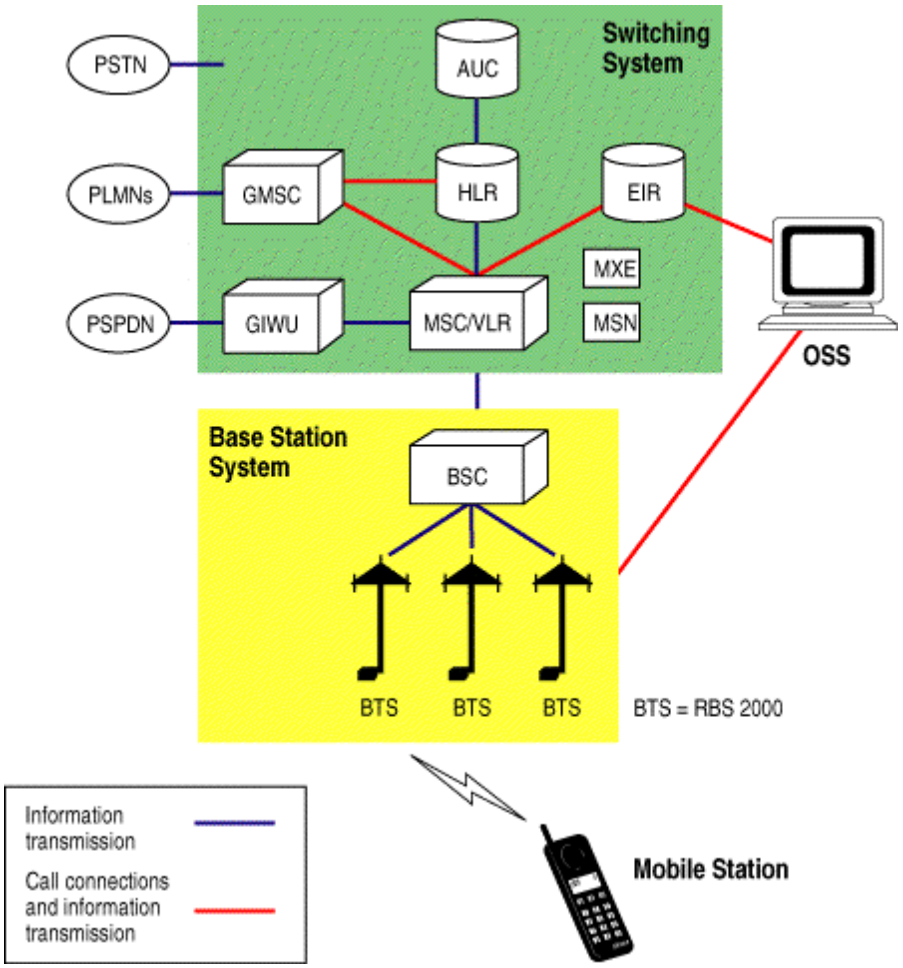


Fig 5.1 GSM Network Elements

5.6 The Switching System

The switching system (SS) is responsible for performing call processing and subscriber-related functions. The switching system includes the following functional units:

5.6.1 **Home location registers (HLR)**

The HLR is a database used for storage and management of subscriptions. The HLR is considered the most important database, as it stores permanent data about subscribers, including

a subscriber's service profile, location information, and activity status. When an individual buys a subscription from one of the PCS operators, he or she is registered in the HLR of that operator

5.6.2 **Mobile services switching center (MSC)**

The MSC performs the telephony switching functions of the system. It controls calls to and from other telephone and data systems. It also performs such functions as toll ticketing, network interfacing, common channel signaling, and others.

5.6.3 **Visitor location registers (VLR)**

The VLR is a database that contains temporary information about subscribers that is needed by the MSC in order to service visiting subscribers. The VLR is always integrated with the MSC. When a mobile station roams into a new MSC.Area, the VLR connected to that MSC will request data about the mobile station from the HLR. Later, if the mobile station makes a call, the VLR will have the information needed for call setup without having to interrogate the HLR each time.

5.6.4 **Authentication center (AUC)**

A unit called the AUC provides authentication and encryption parameters that verify the user's identity and ensure the confidentiality of each call. The AUC protects network operators from different types of fraud found in today's cellular world.

5.6.5 **Equipment identity registers (EIR)**

The EIR is a database that contains information about the identity of mobile equipment that prevents calls from stolen, unauthorized, or defective mobile stations. The AUC and EIR are implemented as stand-alone nodes or as a combined AUC/EIR node.

5.6.6 The Base Station System (BSS)

All radio-related functions are performed in the BSS, which consists of base station controllers (BSCs) and the base transceiver stations (BTS)

BSC

The BSC provides all the control functions and physical links between the MSC and BTS. It is a high-capacity switch that provides functions such as handover, cell configuration data, and control of radio frequency (RF) power levels in base transceiver stations. A number of BSCs are served by an MSC.

BTS

The BTS handles the radio interface to the mobile station. The BTS is the radio equipment (transceivers and antennas) needed to service each cell in the network. A group of BTSs are controlled by a BSC.

5.7 TRANSMISSION NETWORK

In Telecommunication, Transmissionnetwork is divided in to two main parts.

(a) Access Network

(b) Backbone network.

5.7.1 Access Network

Access network is mostly spar links connecting terminal station to an access point of the Backbone Transmission Network. Mostly low capacity Transmission Equipment are used in the Access Network.

5.7.2 Backbone network

Back Bone Network is mainly the Core t transmission Network connecting the Main Nodes TAX, Gateway MSC etc of the Network and in which Access Network can merge in.

5.8 DIAGRAM

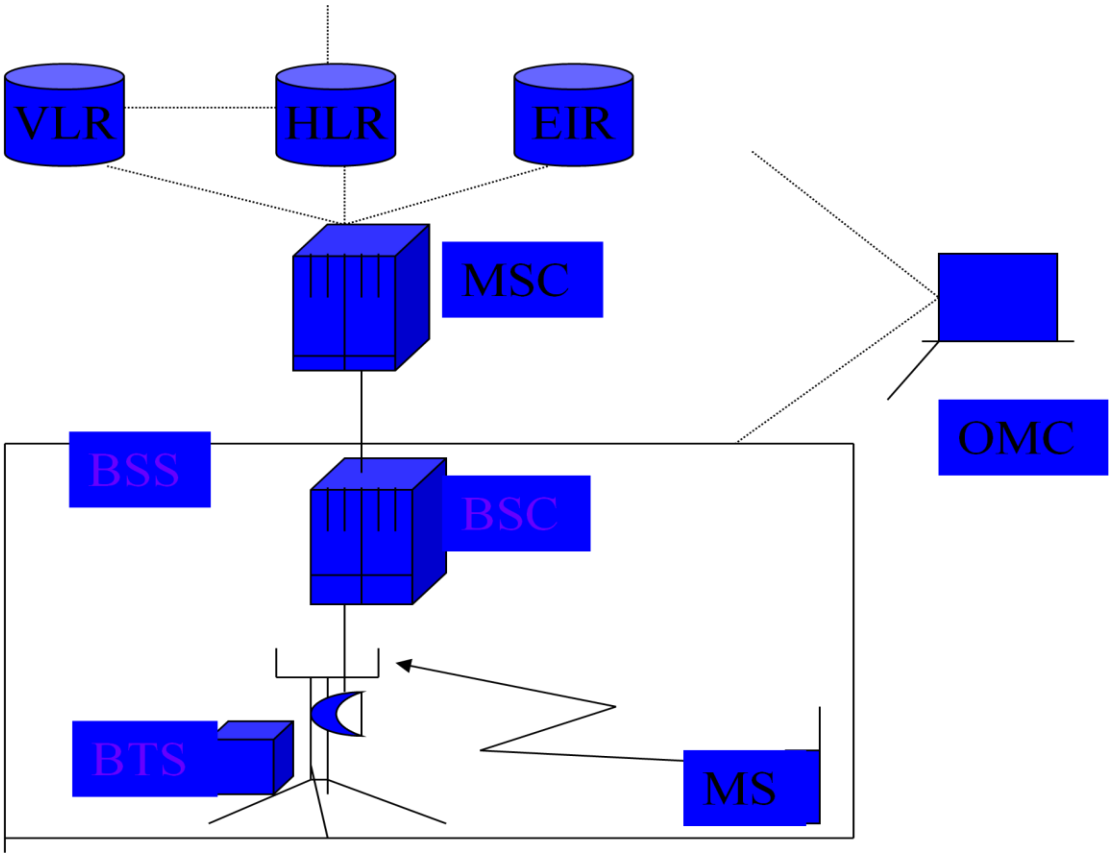


fig 5.2 :BTS diagram

5.9 Base Station System (BSS)

- The BSS is mainly responsible for all radio–based functions in the system.
- It manages radio communication with the mobile units.
- It also handles the handover of calls in progress between cells controlled by the BSC.
- The BSS is responsible for the management of all radio network resources and cell configuration data. The BSS consists of two or three nodes depending on how the functions are implemented, they are
- The BSC (Base Station Controller),
- Transcoder Controller (TRC)

5.10 The BSC (Base Station Controller)

The basic functional responsibilities assigned to the BSC are –

- Radio network management
- Radio network performance monitoring
- Operation, maintenance and administration of BTS
- Speech coding and rate adaptation
- Transmission management towards RBS
- Handling of the radio resources during mobile station connection

5.11 Transcoder Controller (TRC)

- The primary functions of a TRC are to perform transcoding and to perform rate adaptation.
- Transcoding: The function of converting from the PCM coder information (following A/D conversion) to the GSM speech coder information is called transcoding. This function is present in both the MS and BSS

.

Rate Adaptation: Rate adaptation involves the conversion of information arriving from the MSC/VLR at a rate of 64 kb/s to a rate of 16 kb/s for transmission to a BSC (for Full Rate call). This 16 kb/s contains 13 kb/s of traffic and 3 kb/s of in band signaling information

5.12 BSS

BSS is comprised of standard two or three types of nodes depending on the preferred configuration. These are –

- Option-1:
  Combined BSC/TRC and

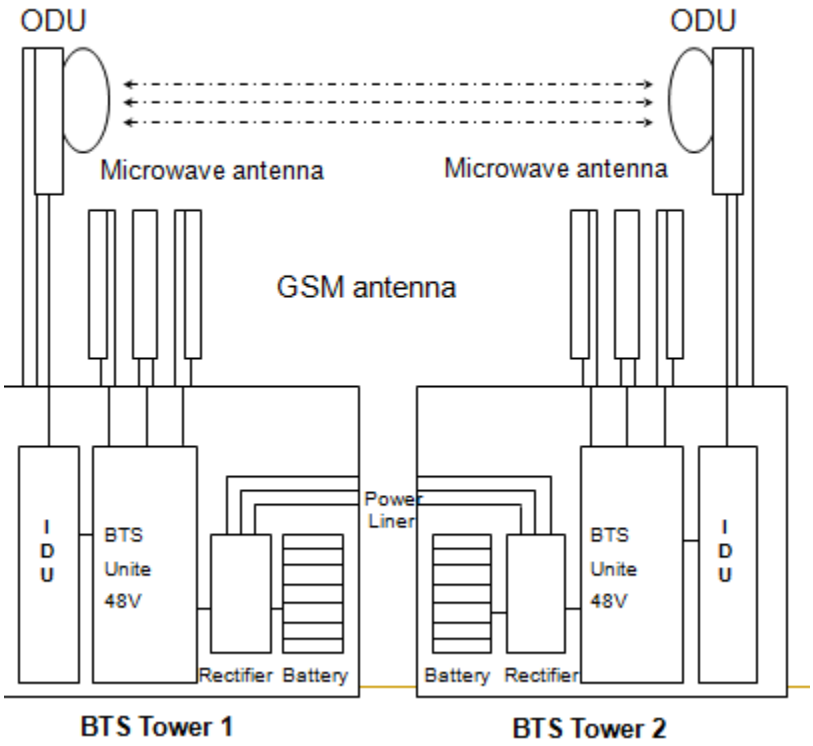
  RBS

- Option-2:
  Stand Alone BSC,

  Stand Alone TRC, and

  RBS

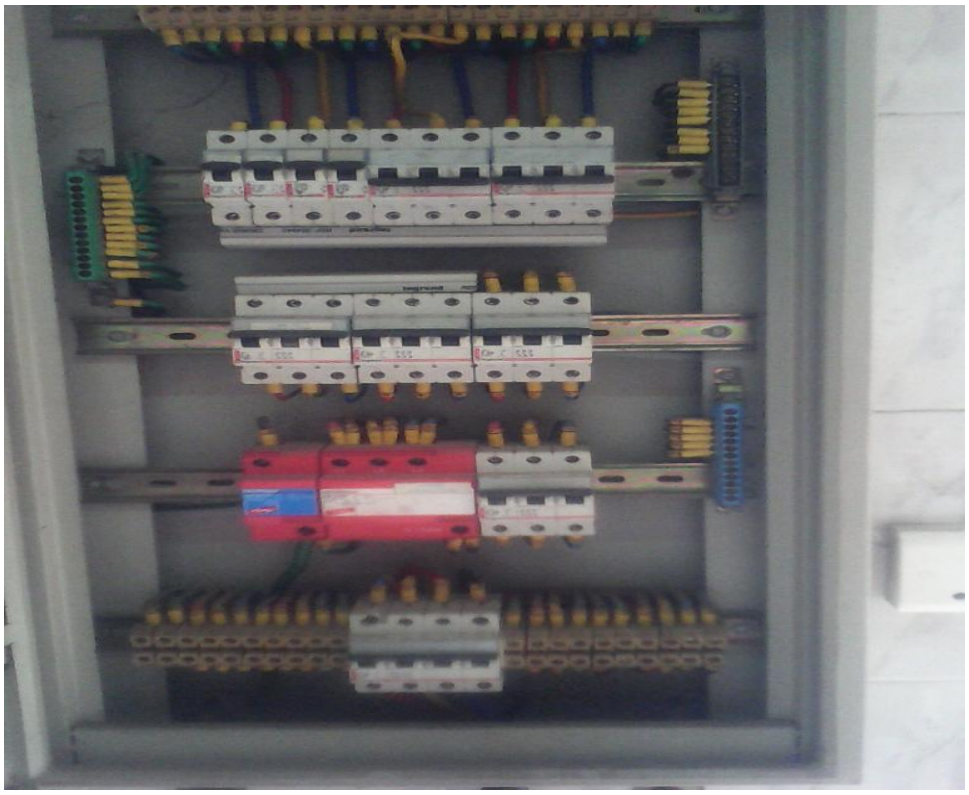
5.13 Microwave link from one to another BTS tower



5.14 Important features

- AC Power Distribution Cabinet
- Battery
- BTS Cabinet
- Connecting Cable
- Feeder Window
- Grounding Bus Bar
- Grounding Clips
- Lighting Arrestor for Power Supply
- Cable Rack

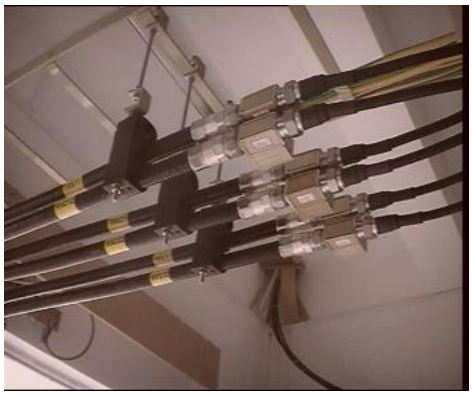
5.14.1 AC Power Distribution Cabinet



5.14.2Battery

5.14.3 BTS Ca

5.14.4 Connecting Cable

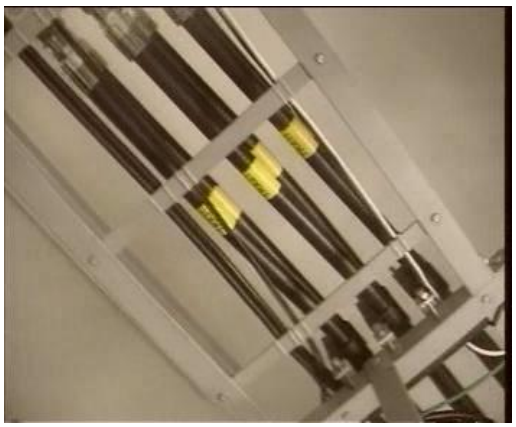


5.14.5 Grounding Bus Bar

5.14.6 Lighting Arrestor for Power Supply

5.14.7 Grounding Clips

5.14.8 Cable Rack



5.15 Radio Base Station (RBS)

- The Radio Base Station is part of the BSS of CME 20 and is Ericsson's product name for the GSM Base Transceiver Station (BTS).
- The RBS includes all radio and transmission interface equipment needed on the site to provide radio transmission for one or several cells.
- Today Ericsson offers two different generations of Radio Base Stations: RBS 200 and RBS 2000 which though can coexist in a network under the same BSC.

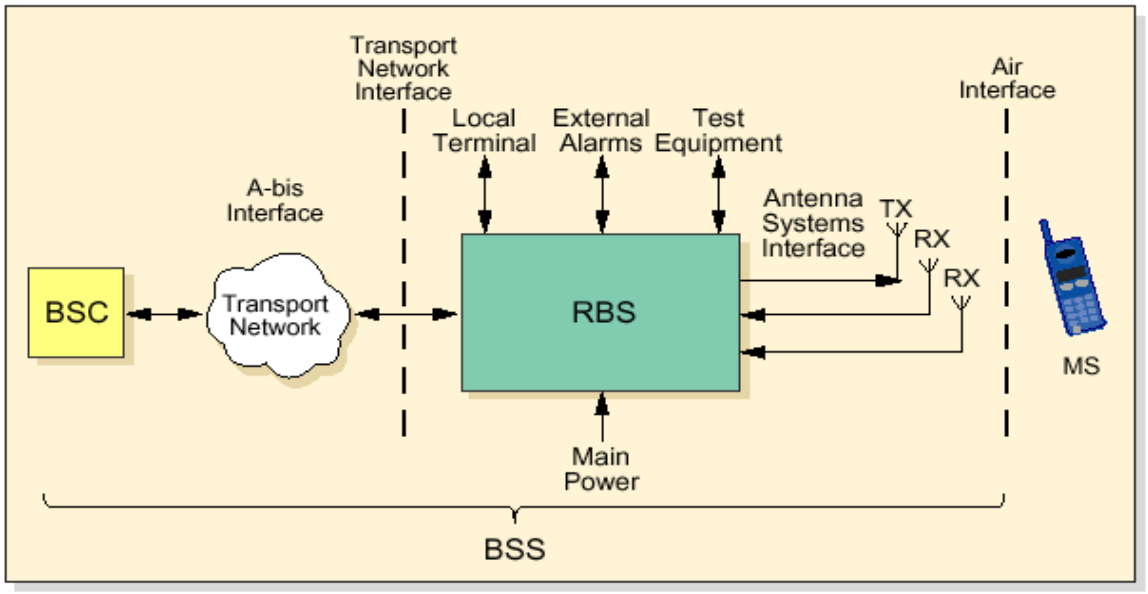


Fig 5.4: RBS system environment

5.16 Radio Base Station (RBS)

5.16.1 Functionality of RBS

- The Radio Base Station's main function is to provide connection with the Mobile Station (MS) over the air interface.
- Radio transmitting and receiving, thus providing the physical channels used in the radio network, is the main task of the RBS.
- These major activities in the transceivers are most often ordered by the BSC who is in charge of the radio resources provided by the RBS.
- The system is built up of a few standardized hardware units, so called Replaceable Units (RU) .The major RUs are:
- Distribution Switch Unit (DXU)
- Transceiver Unit (TRU)
- Combining and Distribution Unit (CDU)
- Power supply Unit (PSU)

Energy Control Unit (ECU)

5.17 BSS Interfaces

There are four primary interfaces within the BSS where traffic and signaling information is received and transmitted. These interfaces are:

- A Interface.
- A-ter Interface (Ericsson Proprietary)
- A-bis Interface, and
- Air or Um Interface.
- The A interface exchanges information between the MSC/VLR and the TRC.
- The A-ter interface between the BSC and TRC.
- The A-bis interface transmits information between BSC and BTS, and
- The Air or Um interface operates between BTS and MS.

5.18 PDS: Plesiochronous Digital Hierarchy.

5.19 SDH: Synchronous Digital Hierarchy.

5.20 Comparison of SDH/PDH:

PDH	**SDH**
The reference clock is not synchronized throughout the network	The reference clock is synchronized throughout the network.
Multiplexing / Demultiplexing operations have to be performed from one level to the next level step by step.	The synchronous multiplexing results in simple access to SDH system has consistent frame structures throughout the hierarchy.

PDH system has different frame structures at different hierarchy levels.	SDH system has consistent frame structures throughout the hierarchy.
Physical cross-connections on the same level on DDF are forced if any	Digital cross- connections are provided at different signal levels and in different ways on NMS
G.702 specifies maximum 45Mpbs & 140Mpbs & no higher order (faster) signal structure is not specified	G.707 specified the first level of SDH.That is, STM-1, Synchronous Transport Module 1st Order & higher. (STM-1,STM-4,STM-16,STM-64)
Bit - by - bit stuff multiplexing	Byte interleaved synchronous multiplexing.

5.21 Principles of PDH Multiplexing

PDH signals with a higher transmission rate are obtained by multiplexing several lower-rate signals.

CHAPTER-06

AC Power and Alarming System

6.1 Introduction

Alternating current is important for running the BTS system. If it is possible to supply the AC power then the telecom companies are using the commercial power. Otherwise the companies are used diesel generator. Generally in a BTS system 45KVA diesel generator are used.

There are some important parts of the power system:

♣GENERATOR
♣MDB
♣AVR
♣CB
♣ SDB
♣Battery

6.1.1Generator

Adiesel generator is the combination of a diesel engine with an electrical generator to produce electric energy. The diesel generator openly called alternator. The diesel generators are directly connected to the any system as emergency power if the grid power is fails. Small transportable diesel generators range from about 1 kVA to 10 kVA may be used as power supplies on construction sites.

Fig 6.1: 45KVA Generator

6.1.2 Main Distribution Board (MDB)

A main distribution board is a component of an electricity supply system which divides an electrical power feed into auxiliary circuits, while providing a protective fuse or circuit breaker for each circuit.

Normally, a main switch, and in recent boards, one or more Residual-current devices (RCD) or Residual Current Breakers with Over current protection (RCBO), will also be incorporated.

Fig 6.2: Main Distribution Board in BTS room.

6.1.3 AVR (Automatic Voltage Regulator)

A voltage regulator is an electricalregulator designed to automatically maintain a constant voltage level. A voltage regulator is an example of a negativefeedbackcontrolloop. It may use an electromechanical mechanism, or electronic components. Depending on the design, it may be used to regulate one or more AC or DC voltages.

Electronic voltage regulators are found in devices such as computer powersupplies where they stabilize the DC voltages used by the processor and other elements. In automobile alternators and central powerstation generator plants, voltage regulators control the output of the plant. In an electricpowerdistribution system, voltage regulators may be installed at a substation or along distribution lines so that all customers receive steady voltage independent of how much power is drawn from the line. With the exception of passive shunt regulators, all modern electronic voltage regulators operate by comparing the actual output voltage to some internal fixed reference voltage. Any difference is amplified and used to control the regulation element in such a way as to reduce the voltage error. This forms a negative feedback control loop; increasing the open-loop gain tends to increase regulation accuracy but reduce stability (avoidance of oscillation, or ringing during step changes).

6.1.4 Circuit Breaker (CB)

A **circuit breaker** is an automatically-operated electrical switch designed to protect an electricalcircuit from damage caused by overload or shortcircuit. Its basic function is to detect a fault condition and, by interrupting continuity, to immediately discontinue electrical flow. Unlike a fuse, which operates once and then has to be replaced, a circuit breaker can be reset (either manually or automatically) to resume normal operation. Circuit breakers are made in varying sizes, from small devices that protect an individual household appliance up to large switchgear designed to protect high voltage circuits feeding an entire city.

Detect a fault condition and, by interrupting continuity, to immediately discontinue electrical flow.

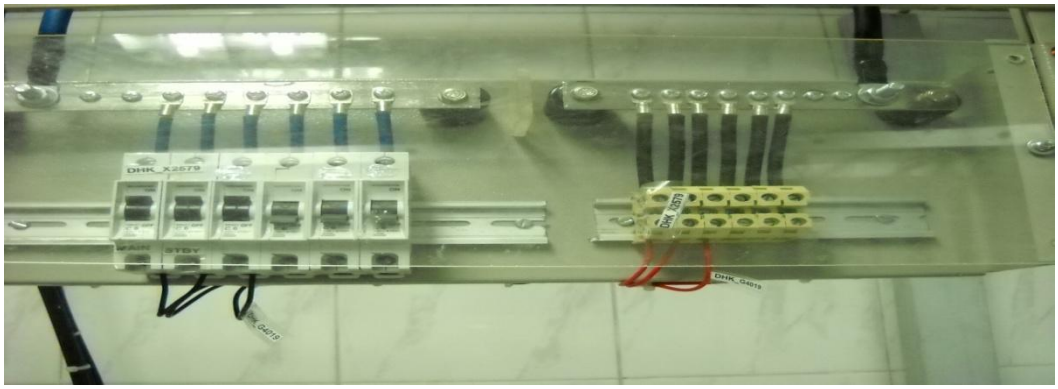


Fig 6.3: Circuit Breakers in BTS room

Unlike a fuse, which operates once and then has to be replaced, a circuit breaker can be reset (either manually or automatically) to resume normal operation. An early form of circuit breaker was described by ThomasEdison in an 1879 patent application, although his commercial power distribution system used fusesits purpose was to protect lighting circuit wiring from accidental short-circuits and overloads.

6.1.5 Battery

An electrical battery is a combination of two or more electrochemical cells used to convert stored chemical energy into electrical energy. Since the invention of the first battery (or "voltaic pile") in 1800 by Alessandro Volta, batteries have become a common power source

for many household and industrial applications. According to a 2005 estimate, the worldwide battery industry generates US$48 billion in sales each year, with 6% annual growth.

Fig 6.4: A unit dry cells which is used in BTS room

6.1 AC Settings

1. The configuration interface is shown below:

Over Volt 280V

Low Volt: 180V

Under Volt: 80V AC Input: 3-phase

Use "↓" or "↑" to select one page or one of the parameters, and "←" or "→" to select the parameter value. Press "ENT" to confirm and save.

2. The value description of the parameters is listed below:

Table: AC Setting parameter description

Parameter	Range	Default	Value description	
Over Volt	50V -300V	280V	The monitoring module will raise an alarm when the AC input voltage is higher than the "Over Volt"	The "Over Volt" must be higher than the "Low Volt". To avoid alarm disorder, it is suggested to use the default values
Low Volt	50V -300V	180V	The monitoring module will raise an alarm when the AC input voltage is lower than the "Low Volt"	
Under Volt	50V - 300V	80V	The monitoring module will raise an alarm when the AC voltage of an operating route is lower than the AC voltage of the standby route is lower than the "Under Volt"	The "Under Volt" must be lower than the "Low Volt"

6.2 DC Settings

There are three related pages, as shown below:

DC VOLT ALARM Over: 58.5V Low: 45.OV Under 45-OV	AMB.TEMP ALARM. High: 50°C Low: 0°C	Load Shunt: A None Shunt 50OA/ 75mV

Use "↑" or "↑" to select one page or one of the parameters, and " t " or to select the parameter value. Press "ENT" to confirm and save.

6.3 Rectifier Setting

1. There are three related pages, as shown below:

Use "↓" or "↑" to select one page or one of the parameters, and "←" or →" to select the parameter value. Press "ENT" to confirm and save.

2. The value description of the parameters is listed below:

Table:DC rectifier parameter description

Parameter	Range	Default	Value description	
Rect Over Volt	56V - 59V	59V	The rectifier over voltage alarm will be raised when the rectifier output voltage is higher than the "Rect Over Volt"	The "Default Volt" must be lower than the "Recto Over Volt"
Default Volt	48V - 58V	53.5V	When the communication between the rectifier and the monitoring module is interrupted, the output voltage of the rectifier is the default voltage	
Walk in Enabled	Y, N	N	The output soft start function means the rectifier voltage will rise from OV to the "Default Volt" after the "Welkin Time"	
Walk in Time	8s - 128s	8s		
Rectifier input current limit	1A - 50A	30A	The monitoring module limits the rectifier input current within the limit value	
Fan Speed	Full Speed, Half Speed	Half speed	When set to "Half Speed", the rectifier will regulate the fan speed according to the Temperature. When set to "Full Speed", the fan will operate at full speed	
HVSD Time	50s - 300s	300s	The rectifier will shut off automatically upon over-voltage, the parameter "HVSD Time". If the rectifier's output voltage is normal within the delay, the rectifier is regarded normal; otherwise, the rectifier will be locked out and auto-restart function will be disabled	

6.4 Electrical Installation

6.5.1 Connecting Power Cables

6.5.2 Danger:

Switch off all MCBs and pull out all fuses before the electrical connection.
Only the qualified personnel can do the mains cable connection.

6.5.3 Connecting grounding cable

Connect one end of the grounding cable to the grounding bus bar of the machine room, and the other end to thegrounding bus bar of the system.

6.5.4 Connecting AC cables

Take PS48300/1800-X1 system for example. Feed the AC cables into the cabinet from the top. Connect them to theinput MCB.

6.5.5 Connection of load cables

Connect the negative cable of the load to the upper terminal of "negative DC output MCB". Connect the positive cableof the load to the "positive DC output bus bar", as shown in Figure the batteries may have dangerous current. Before connecting the battery cables, the corresponding battery input muss or the battery cell connector must be disconnected to avoid live state of the power system after installation.

6.5.6 Connecting Signal Cables

All the signal cables are connected to the signal transfer board. The position of the signal transfer board is shown in
The temperature sensor (cable) is an optional accessory.
Operating voltage: 5V
Measurement range: -5°C - 100°C
Measurement precision: ± 2°C
Installation procedures:
Connect the 3-core plug of the temperature sensor cable to the J10 or J11 socket on board
Put the temperature probe in the battery room where best represents the ambient temperature of the battery. Do not connect it to other heat-generating equipment

6.5.7 Safety Regulation

Certain components in this power system have hazardous voltage and current. Always follow the instructions below:

1. Only the adequately trained personnel with satisfactory knowledge **of** the power system can carry out the installation. The most recent revision of these safety rules and local safety rules in force shall be adhered to during the installation.

2. All external circuits that are below 48V and connected to the power systemmust comply with the requirements of SELV as defined in IEC 60950

3. Make sure that the power (mains and battery) to the system is cut off before any operations can be carried out within the system cabinet.

6.6. Alarming system

6.6.1 Setting Operation Level

♥ When “Control Enable” lock points to ‘0”, the panel is at level 1, and it can be silenced.

♥When “Control Enable” locks points to “I”, the panel is at level 2,

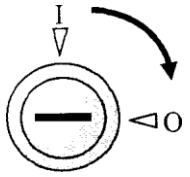


Fig: 1-109 Control enables

6.6.2 Door-magnet switch

C 1: contact point output end 1
C2: contact point output end2
When door-magnet alarm occurs, contact point will be open.

Recommended is to use door-magnet switch PS-156113(W) for iron door and door magnetic switch PS-164113(W) for wooden door. HO-03A for iron door or wooden door

6.7 Installation of Sensor

For easy connecting, terminals must be swappable, and can avoid wrong-insertion, according to terminal numbers and distance between pins. 10 meters of standard cable has been made for the sensor before out of factory. When on-site operation, connection is not required. The only thing is to insert terminals correspondingly. If longer cable is neededfor sonic sensors, prolonging the cable is available. 30 meters of 4 pin cable is in the accessory list before out of factory. Meanwhile on-site operators can decide the length of cable.

All terminals must be hot swappable, and please do not operate heavily, so as to avoid damages to PCB. Before the first energizing, all wires must be connected well and carefulcheck must be done.

Table: Show the sensor description

Sensor	Mounting position	Terminal	Cable description	Re
Smoke sensor	Roof of machine room	3PIN little	3 pin cable, red :P+.-yellow:S	
T & H	Height. 1.5 meters from wall of machine room, checking point temperature and humidity should be	3PIN wide	3 pin cable, red:P+; yellow :T;black :H	
Infrared moving sensor	Height: about 1.5 meters from wall of machine room,	4PIN big,	4 pin cable, red :P+black:P-yellow :Cl;-reen :C2	

6.8 Smoke sensor

The connection of two-wire smoke sensor, as follows:
P+: positive power; S: Negative power
When smoke alarm occurs, the sensor is conducted

Fig 6.5: Smoke Sensors
(The conductive resistance is about 2 0).
As long as the smoke sensor detects smoke and alarms, the sensor will be locked at alarm state, except dip recovery operation is conducted, or the alarm state will not be removed

6.9 Operations

6.9.1 Silence of Fault and Fire Alarm

1. When "Control Enable" locks points to "0", the panel is in operation level 1; Pressing Silence/Resound, the speaker of the panel can be silenced

2. When "Control Enable" locks points to "I", the panel is in operation level 2; Pressing Silence/Resound, SilenceLED illuminates, the sounders are silenced and the panel's speaker is also silenced. Pressing Silence/Resoundagain, the sounders will sound again and SilenceLED goes out

6.9.2 Self Test

In monitoring state, the panel is in operation level 2. Pressing and holding *Reset* for 1 second, it will self-test the sound and LEDs.

6.9.3 Clearance of alarm state

Clearance of fault and fire alarm is under operation level 2. Pressing and holding *Reset* for 1 second in fire alarm state, we can clear the fire alarm and all outputs.

6.9.4 Alarm Check and System Operation Status

♣ Pull out one rectifier. The "Rect N Com Failure" alarm should be triggered. Insert the rectifier in. The alarm should disappear. Repeat the same procedures on other rectifiers

♣ Remove battery fuse 1. The "Baal Failure" alarm should be triggered. Put on the fuse. The alarm should be cleared. Repeat the same on battery fuse 2

♣Switch off a load MCB connected to a load route. The alarm "Load Fuse N Failure" should betriggered. Switch on the MCB, and the alarm should be cleared. Repeat the same on the other loadMCBs

♣ Remove all the battery input fuses. Keep only one rectifier in operation. Through the monitoring module, adjust the rectifier FC voltage to make it lower than the alarm point. The alarm "DC VoltageLow" should be triggered.

6.10 Alarm Handling

6.10.1 Indicator of the Cabinet

The two indicators of the cabinet are at the top right corner of the cabinet. The indicator descriptions are given in
Table Cabinet indicator description

Indicator	Normal state	Fault state	Fault cause	Handling method
Run	On	Off	No AC input	Check if there is AC input voltage with a
Alarm indicator	Off	On	System fault or alarm	Check alarms generated by the monitoring module,

6.10.2 Module Alarms

The monitoring module alarms are classified in four types: critical alarm, major alarm, observation and no alarm.

Critical alarm, major alarm: these two types of alarms have strong impacts on the system performance. Whenever these alarms are generated, users are supposed to handle them immediately. The alarm indicators will be on and audible indication will be given.

Observation: when this type of alarm is raised, the system maintains normal output for a while. If the alarm occurs during watch time, it should be handled immediately. If the alarm occurs during non- watch- time, handle it during watch time. The alarm indicators will be on when observation alarm occurs.

Table: System setting parameter description

No.	Alarm	Handling method
1	Mains Failure	If the failure does not last long, the battery will power the load. If the cause is unknown or the failure lasts too long, a diesel generator is needed. Before using the generator's power, it is suggested to run the generator 5 minutes to stabilize
2	AC Voltage High	Check if the AC Over-voltage point is too low. Reset the value if too low A mild over-voltage does not affect the system operation. However, the rectifier will stop operation when the mains voltage is more than 305V. Therefore, if the power supply is constantly over-voltage, the mains
3	AC Voltage Low	Check if the AC Under- voltage point is too high. Reset the value if too high When the mains voltage is lower than 176V, the output power of the rectifiers will be Berated. If the power supply is constantly under-voltage, the main power network should be improved

6.11 CONCLUSION

From our attachment program we have advanced knowledge on 3 Generation GSM technologies. In Europe already 3.5 generation technology has been launched, in Bangladesh various mobile operators are trying to launch 3.5G. We are very much indebted to grameenphone for this attachment program. We wish more success of grameenphone ltd.

CHAPTER-07

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