BROADCAST ORGANIZATION AND OPERATION OF A SATELLITE TELEVISION CHANNEL

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An Internship Report Submitted to the Daffodil International University in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Electronics and Telecommunication Engineering

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APPROVAL

This Internship report entitled “Broadcast Organization And operation of a Satellite television Channel” by Tamanna Ferdousy has been submitted to the Dept. of Electronics and Telecommunication Engineering, Daffodil International University in the partial fulfillment of the requirements for the degree of Bachelor of Science in Electronics and Telecommunication Engineering. This internship report has been accepted as satisfactory by the honorable members of the board examiners of the following after its presentation that was held on 18 July, 2012.

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DECLARATION

I, hereby declare that, this internship report has been done by me under the supervision of **Md. Mirza Golam Rashed, Assistant Professor Dept. of ETE** Daffodil International University in partial fulfillment of the requirements for the degree of Bachelor of Science in Electronics and Telecommunication Engineering . I also declare that neither this internship report nor any part of this paper has been submitted elsewhere for award of any degree or diploma.

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Finally, I must acknowledge with due respect the constant support and patients of my parents.

ABSTRACT

The television channel industries are growing and become a center of attraction now-a-days. As the days pass the more television station are seem to open but the demand for this industry is still remains upwards. With the passage of time the broadcasting standards and operation are getting more updated and improved. The prevalent analog transmission broadcast schemes have already became replaced by DVB(Digital Video Broadcasting) and SMPTE (Society of Motion Picture and Television Engineers) standards in Bangladesh. The new pratice of live telecasting with DSNG van (Digital Satellite News Gathering) has added a new dimension in our broadcast industry. Satellite TV offers a variety of program to the avid viewers. Anyone from anywhere can get Satellite TV that can be broadcasted both in analog and digital format possessing higher quality of sound and picture. In my internship I have tried to gather a complete hand on experience on all the sections of Boishakhi TV channel and this report delivers a detailed description of the knowledge what I have achieved during my working period. The main parts of this internship paper are a complete illustration of Earth Station and Live Transmission process of Boishakhi TV channel.

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Chapter-1

1.1 Introduction

In this area of broadcast industry the transmission techniques are getting more sophisticated and efficient as well. To conduct with this new digitized and automation based transmission phenomenon it's vital to have a proper idea on it's infrastructural organization and operations. This report deals with some significant contents of both in side broadcast and outside broadcast (OB) and other auxiliary transmission units so that a uniformed idea about this updated transmission schemes can be achieved.

1.2 Objectives

The Objectives of this report are:

- Transmission organization and it's operation in a satellite Television channel.
- Operating function of a Overall Satellite Broadcasting in "Boishakhi Television"
- Roles of the auxiliary transmission of a DSNG(Digital Satellite News Gathering) van & Live.

1.3 Organization of this Report

- This report has fourth to forting chapters in total overall satellite broadcasting of Boishakhi TV.
- The first chapter holds the introductory discussion.
- The Second chapter describes the background study of satellite communication.
- The Third chapter depicts the Integration & Automation System.
- The 13th chapter is about the function of the Earth station (ES) and the overall air work flow.
- The 14th Chapter is deals with telecasting live with a OB van / DSNG van.
- The 15th and final Chapter is the conclusion.

Chapter-2

Satellite TV Communication

2.1.1 Introduction:

In the context of spaceflight, a satellite is an object which has been placed into orbit by human endeavor. Such objects are sometimes called artificial satellites to distinguish them from natural satellites such as the Moon.

Satellites are used for a large number of purposes. Common types include military and civilian Earth observation satellites, communications satellites, navigation satellites, weather satellites, and research satellites. Space stations and human spacecraft in orbit are also satellites. Satellite orbits vary greatly, depending on the purpose of the satellite, and are classified in a number of ways. Well-known (overlapping) classes include low Earth orbit, polar orbit, and geostationary orbit.

Satellites are usually semi-independent computer-controlled systems. Satellite subsystems attend many tasks, such as power generation, thermal control, telemetry, attitude control and orbit control.[4]

2.1.2 Configuration:

Satellite Communication system consist of antenna and reflective dishes, much as in a terrestrial microwave. The dish servers to focus the signal from a transmitting antenna to a receiving antenna. The send/recive dishes that make up the earth segment are of varying sizes, depending on power levels and frequency bands.

1.3 Bandwidth:

Satellites can support multiple transponders and therefore, substantial bandwidth, with each. Transponder generally providing increments in bandwidth.

2.1.4 Error Performance:

Satellite transmission is susceptible to environmental interference, particularly at frequencies above 20 GHz. Sunspots and other types of electromagnetic interference affect satellite and microwave transmission.

2.1.5 Distance:

Satellite is not considered to be limited in terms of distance as the signal largely travels through the vacuum of space. Each signal travels approximately 36000 kms in each direction.

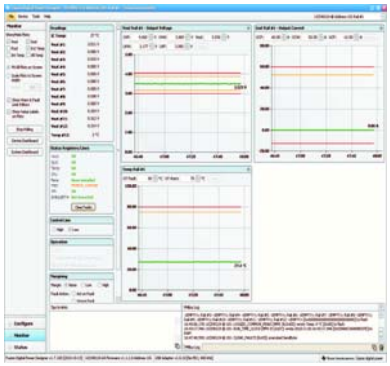
2.1.5 Propagation Delay:

Geostationary satellites, by virtue of their high orbital altitude, impose rather significant Propagation delay on the signal. Hence, highly interactive voice,data and voice applications are not effectively supported via two way satellite communications.

2.1.6 Security:

As is the case with all microwaves and other radio system, satellite transmission is inherently not secure. Therefore, the unauthorized user must know only the satellite and associated frequency range being employed to access the signal. Security must be imposed through encryption of the sign

2.1.6 Power Connection:



2.1.6 Cost

The acquisition, deployment and rearrangement costs of the space segment of satellite systems can be quite high, to the tune of several millions dollars. However, the satellite can be shared by a large number of users, with each user connecting a large number of sites. As a result, Satellite network soften compare very favorably with cabled systems for many point to multipoint applications.

2.2 Communications Satellite Advantages & Disadvantages:

Satellites are able to provide communications in many instances where other forms of communications technology may not provide a feasible alternative.

- **Flexibility: S**atellite systems are able to provide communications in a variety of way without the need to install new fixed assets.
- **Mobility: S**atellites communications are able to reach all areas of the globe dependent upon the type of satellite system in use, and the ground stations do not need to be in any one given location. For this reason, many ships use satellite communications.
- **Speedy deployment:** Deployment of a satellites communications system can be very speedy. No ground infrastructure may be required as terrestrial lines, or wireless bass station are not needed. Therefore many remote areas, satellite communications systems provide an ideal solution.
- **Provides coverage over the globe: D**ependent upon the type of satellite communications system, and the orbits used, it is possible to provide complete global coverage. As a result, satellite communications systems are sued for providing communication capabilities many remote areas where other technologies would not be viable. When considering the use of a satellite some disadvantages also need to be taken into consideration.

- **Cost: S**atellites are not cheap to build, place in orbit and then maintain. This means that the operation costs are high, and therefore the cost of renting or buying space on the satellite will also not be cheap.
- **Propagation delay:** As distances are very much greater than those involved with terrestrial systems, propagation delay can be an issue, especially for satellites using geostationary orbits. Here the round trip from the ground to the satellite and back an be of the order of a quarter of a second.
- **Specialized satellite terminals required:** Even though the operator will operate all the required infrastructure, the user will still need a specialized terminal that will communicate with the satellite. This is likely to be reasonably costly, and it will only be able to be used with one provider.

2.3Applications of Satellite Communication Technology

The span of satellite communication application is huge.

Some of the common application features are:

- State public communication
- Meteorological phenomena
- Distance medical treatment
- Distance learning
- Government online project
- TV & broadcast
- National defense
- E-commerce
- Video conference
- Space research
- Global environmental monitoring etc.

2.4 Radiation Pattern

A radiation pattern defines the variation of the power radiated by an antenna as a function of the direction away from the antenna. This power variation as a function of the arrival angle is observed in the antenna's far field.

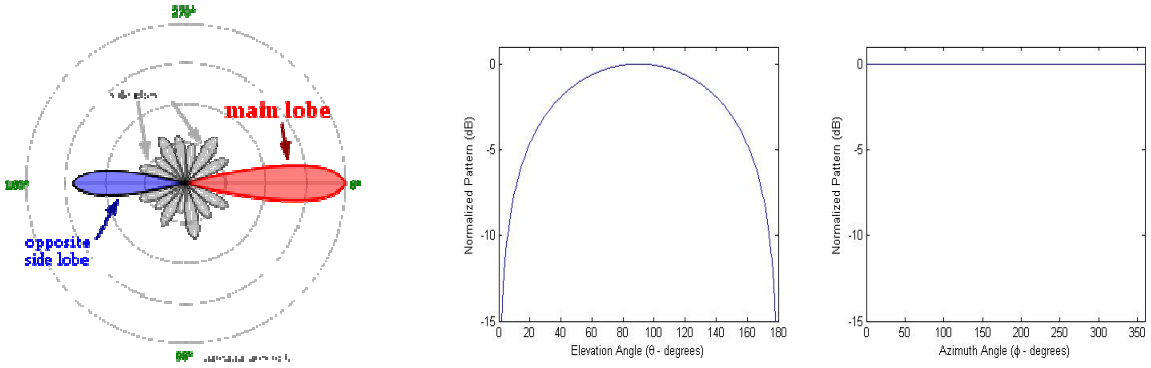
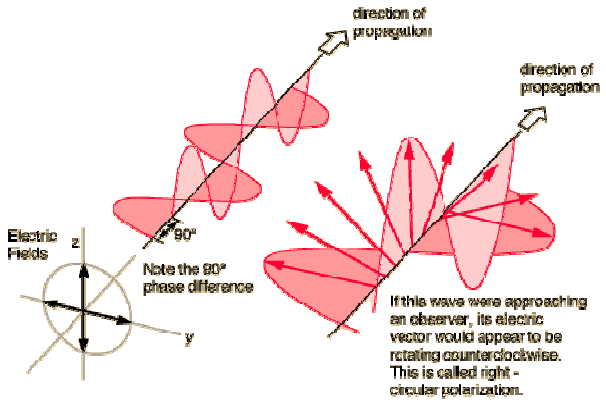


Figure 2. Two-dimensional Radiation Patterns.

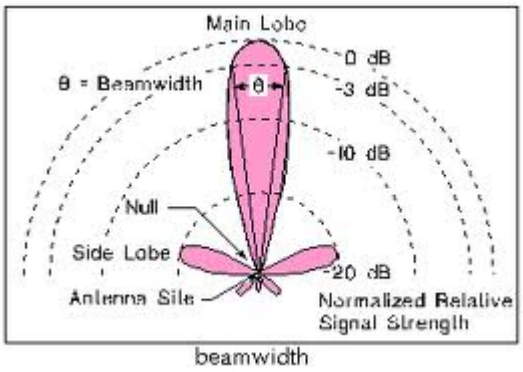
2.5 Polarization:

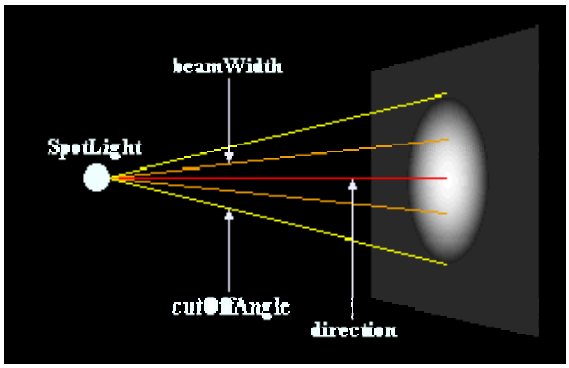
A condition in which transverse waves vibrate consistently in a single plane, or along a circle or ellipse. Electromagnetic radiation such as light is composed of transverse waves and can be polarized. Certain kinds of light filters, including sunglasses that reduce glare, work by filtering out light that is polarized in one direction.



2.6 Beamwidth:

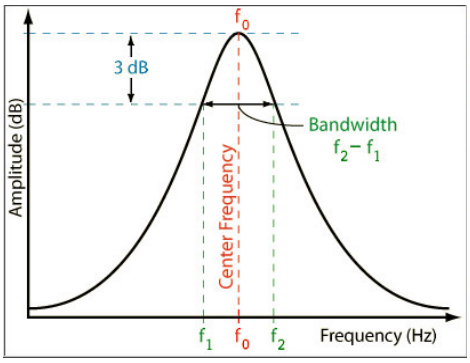
In the radio regime, of an antenna pattern, the angle between the half-power (3-dB) points of the main lobe, when referenced to the peak effective radiated power of the main lobe.

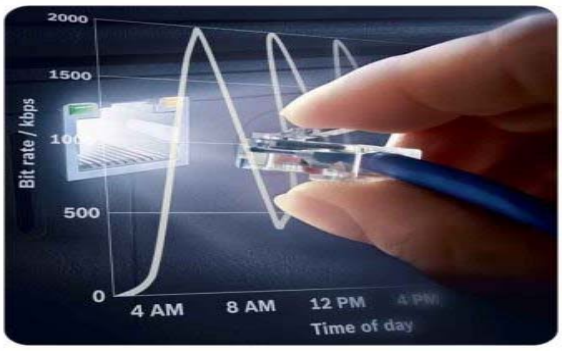




2.7 Bandwidth:

The **term** bandwidth in computer networking refers to the data rate supported by a network connection or interface. One most commonly expresses bandwidth in terms of bytes per second (bps). The term comes from the field of electrical engineering, where bandwidth represents the total distance or range between the highest and lowest signals on the communication channel (band).





The Satellite anatomy or subsystems are described below

2.8 Geostationary satellite:

A satellite that appears to remain in the same position above the earth is called geostationary.

Attributes:

- Orbit is circular.
- Inclination zero degree.
- Attitude is above 36,000 km.
- The satellite travels at 3 km/sec.
- Orbital period is roughly 24 hrs.

2.9 Fixed satellite service:

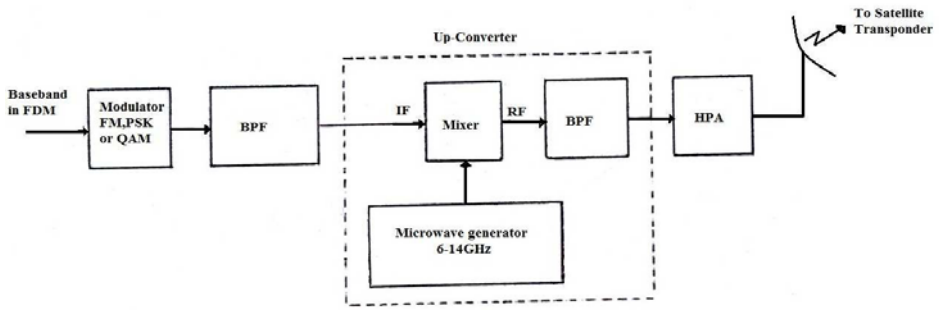
Fixed Satellite Service (FSS) refers to a satellite service which uses fixed terrestrial terminals. In other words, FSS is any satellite service where the ground station does not change locations frequently. Consumer satellite television is the most popular application of Fixed Satellite Service. The opposite of FSS is Mobile Satellite Service (MSS).[4]

2.10 Up link to satellite:

Uplink is the signal path from an earth station to a satellite. The frequency Range of up-link is shown below

Satellite Band	Uplink Frequency
C Band	5.850 - 6.425 GHz
Ku Band	14 - 14.5 GHz
Ka Band	27.5 - 31 GHz

Figure: below shows the block diagram of a satellite earth station transmitter.



The primary component within the section of a satellite system is the earth station transmitter.

A typical earth station transmitter consists of an IF modulator, an IF to RF microwave UP-converter, a high power amplifier (HPA).The RI modulator converts the input baseband signals to either an FM, a PSK or a QAM modulated intermediate frequency. The HPA provides adequate input sensitivity and output power to propagate the signal to the satellite transponder.

2.11 C band:

C Band is the original frequency allocation for communications satellites.

C-Band uses 3.7-4.2GHz for downlink and 5.925-6.425 GHz for uplink.

The lower frequencies used by C Band perform better under adverse weather conditions than the Ku band or Ka band frequencies.

2.13 Satellite transponder:

Transponder is a concatenation of transmitter and responder. A transponder is a transmitter and receiver. A satellite transponder receives signals from the earth and transmits signals back to the earth. A transponder usually receives on one frequency and transmits on another.

Fig. below shows a simplified block diagram of a satellite transponder.

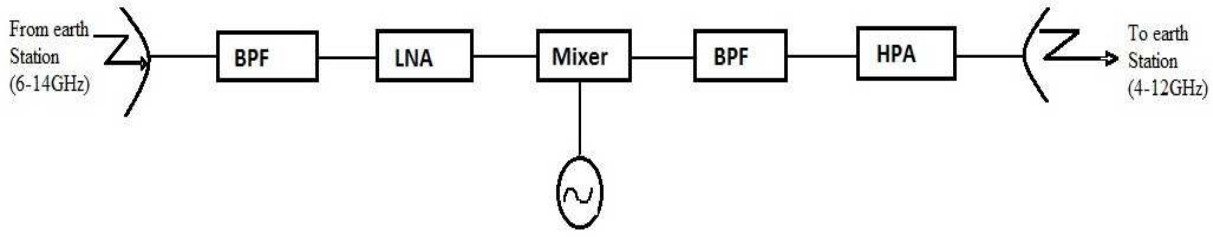


Figure 8.2 Satellite Transponder

2.14 Satellite orbit:

The first satellite, Sputnik 1, was put into orbit around Earth and was therefore in geocentric orbit. By far this is the most common type of orbit with approximately 2456 artificial satellites orbiting the Earth. Geocentric orbits may be further classified by their altitude, inclination and eccentricity.

The commonly used altitude classifications are Low Earth orbit (LEO), Medium Earth orbit (MEO) and High Earth orbit (HEO). Low Earth orbit is any orbit below 2000 km, and Medium Earth orbit is any orbit higher than that but still below the altitude for geosynchronous orbit at 35786 km. High Earth orbit is any orbit higher than the altitude for geosynchronous orbit.[4]

2.15 Polar orbit:

A polar orbit is an orbit where the satellite travels in a North to South direction instead of the common West to East orbit. Because the earth spins in an Easterly direction, a polar orbit will eventually cover every possible combination of latitude and longitude.

Low Earth Orbit (LEO) satellites often utilize a polar orbit.[4]

2.16 Characteristics of circular orbits

Title	**LEO**	**MEO**	**GEO**	**HEO**
Altitude	500-1500 Km	5000-10000 Km	36000 Km	Above 36000 km
Rotation	90 min	5-10 hrs	24 hrs	Less than 24 hrs
Time of sight	15 min	2-4 hrs	always	8 hrs
Example	Indium	GPS	VSAT	Molniya
Application	Mobile Com. & Surveying.	Global com. i.e. E-mail, FAX & Telephone.	TV & Radio Transmission.	Com. around the polar Countries.

2.16 Apogee:

Apogee is the point at which a satellite in an elliptical orbit is furthest from the Earth.

2.16 Perigees:

Perigee is the point at which a satellite in an elliptical orbit is closest to the Earth.

The opposite of perigee is apogee.

2.17 Rain fade:

Rain fade is signal degradation due to the interference of rainfall or clouds.

C band satellite frequencies have the best resistance to rain fade, Ku band satellite frequencies have the next best performance, and Ka band frequencies are the most susceptible to rain fade.

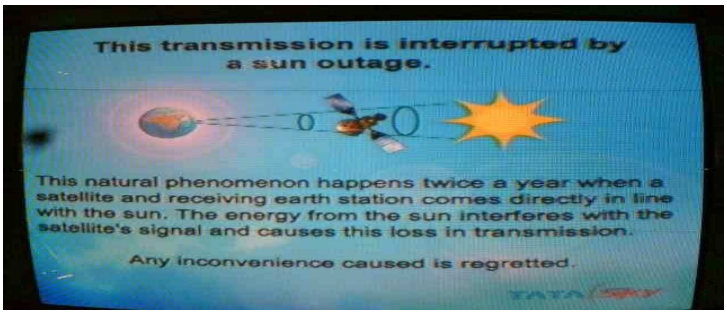
Satellite systems which transmit at higher power are more resistant to rain fade. Because of this, Ka and Ku band transponders tend to transmit at significantly higher power than C band transponders. Some satellite terminals are able to adjust their transmit power to work around rain fade. In all other variables are equal, a larger satellite antenna will have better performance against rain fade.

Rain fade is also known as rain attenuation.[4]

2.18 Sun Outage Problems:

Sun Outages or Solar interference occurs every February/March and September/October of each year, and results in the degradation or loss of satellite signal for short periods of time each day for about 2 weeks.

Solar interference is an inherent part of satellite operations. The effects will be seen on most channels and will occur during various times of the day. Interruptions can last from just a few minutes to up to 15 minutes a day and can range from mild to severe.



A Sun Outage is similar in behavior to a rain fade. The high energy level and broadband nature of the sun's energy can overpower a satellite's downlink signal and effectively wash out a receive signal with noise. Due to the angle of the sun in relationship to the satellite, a sun outage is actually a mixture of degraded receive performance with the possibility of a circuit outage.[4]

2.19 Down link from satellite

Downlink is the signal path from a satellite towards the earth station.

The frequency Range of down-link is shown below.

Satellite Band	Downlink Frequency
C Band	3.625 - 4.2 GHz
Ku Band	11.7 - 12.7 GHz
Ka Band	18.3 - 20.2 GHz

Figure: below shows a block diagram of a typical earth station receiver.

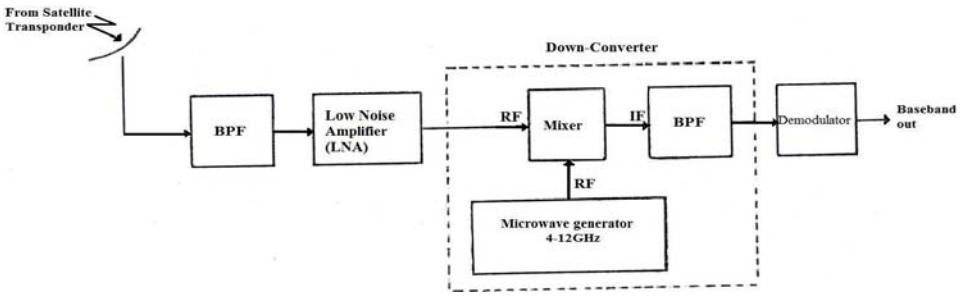


Figure 2.19 Satellite Earth Station Receivers

An earth station receiver includes an input BPF, an LNA and an RF to IF down converter.

The most common frequencies used for satellite communications are 6/4 and 14/12 GHz bands. The first number indicates the uplink (earth station-to-transponder) frequency and the second number is downlink (transponder-to-earth station) frequency. Since C band is most widely used, this band is becoming overcrowded. A typical C band transponder can carry 12 channels each with a bandwidth of 36 MHz.[2]

Chapter- 3

INTEGRATION AND AUTOMATION SYSTEM

Introduction:

An integrated system requires that there be two or more computers connected to pass information. A simple example is a robot controller and a programmable logic controller working together in a single machine. A complex example is an entire manufacturing plant with hundreds of workstations connected to a central database. The database is used to distribute work instruc- tions, job routing data and to store quality control test results. In all cases the major issue is con- necting devices for the purposes of transmitting data.

Automated equipment and systems don't require human effort or direction. Although this does not require a computer based solution

Automated systems benefit from some level of integration

Integrate:

This is an assumption that an engineer cannot afford to entertain. Some of the factors that justify an integrated system are listed below.

a large organization where interdepartmental communication is a problem

the need to monitor processes

Things to Avoid when making a decision for integration and automation,

- ignore impact on upstream and downstream operation
- allow the system to become the driving force in strategy
- believe the vendor will solve the problem
- base decisions solely on financials

• Justification of integration and automation,

- consider "BIG" picture
- determine key problems that must be solved
- highlight areas that will be impacted in enterprise
- volume of product

Automate:

- In many cases there are valid reasons for assisting humans
- tedious work -- consistency required
- dangerous
- tasks are beyond normal human abilities (e.g., weight, time, size, etc)

economics

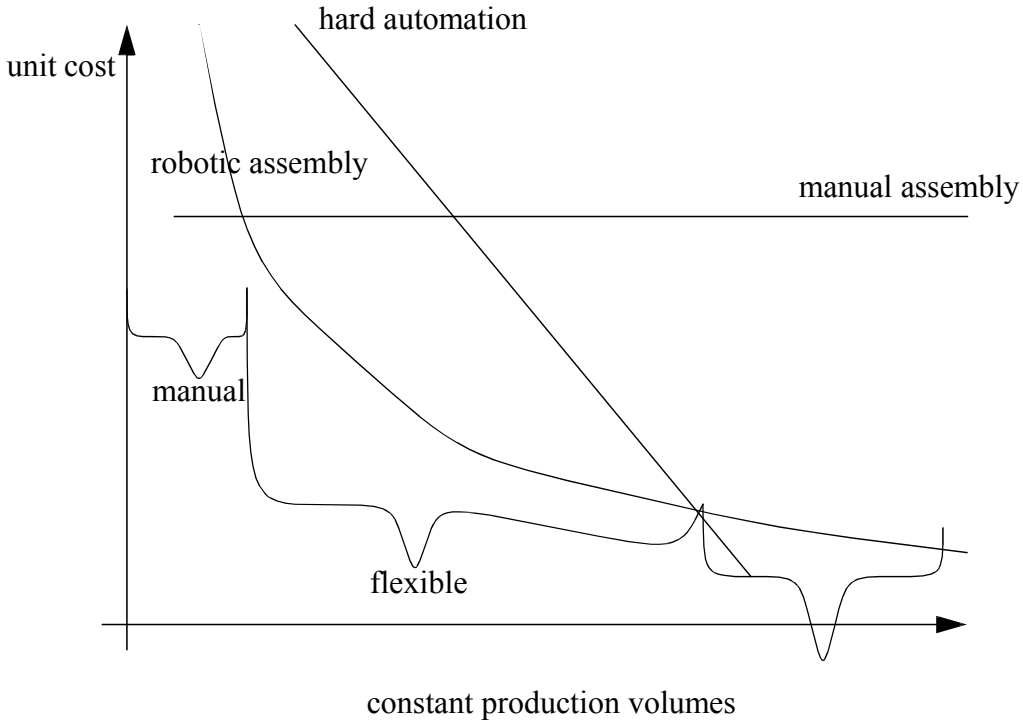
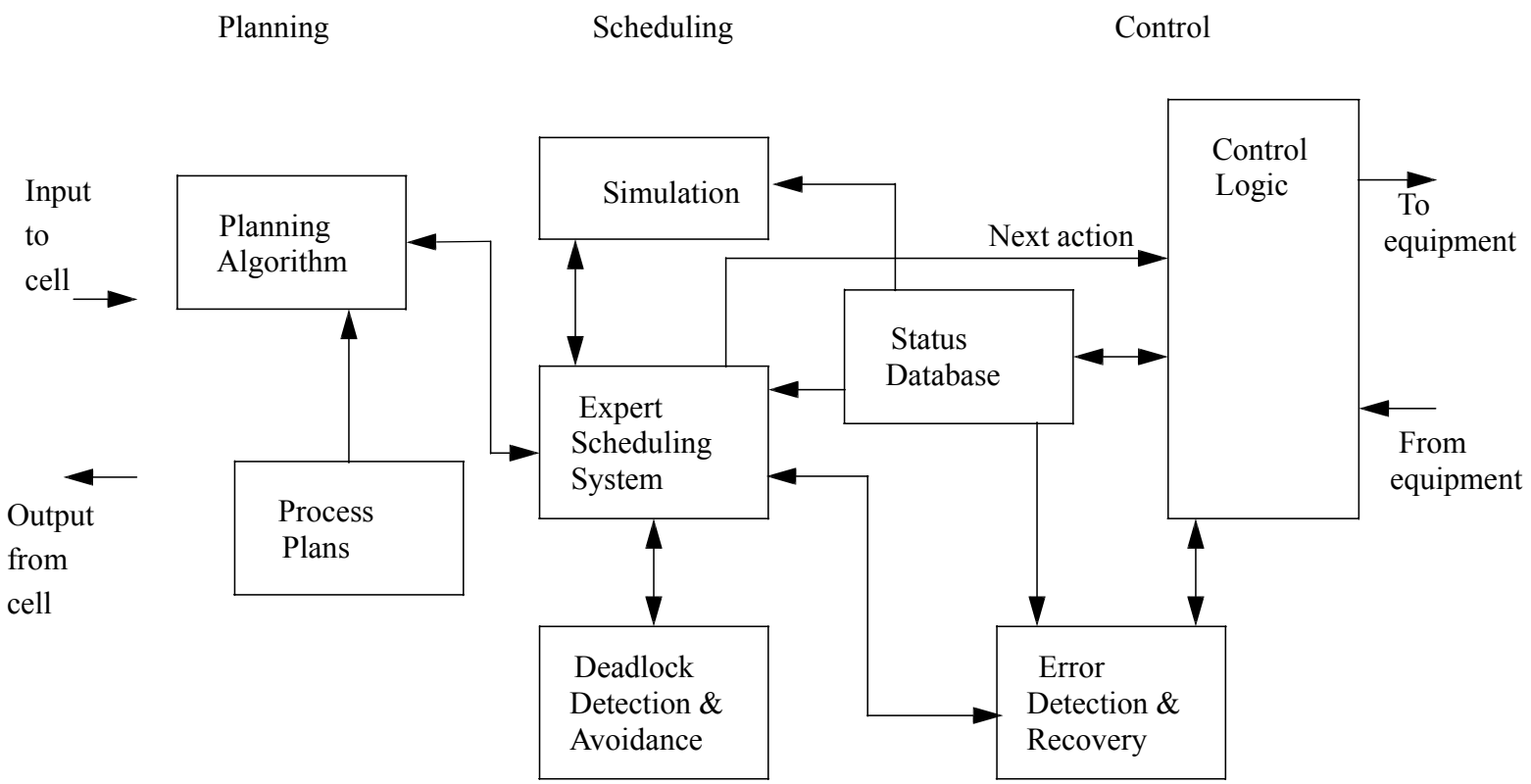


Fig: Automation Tradeoffs

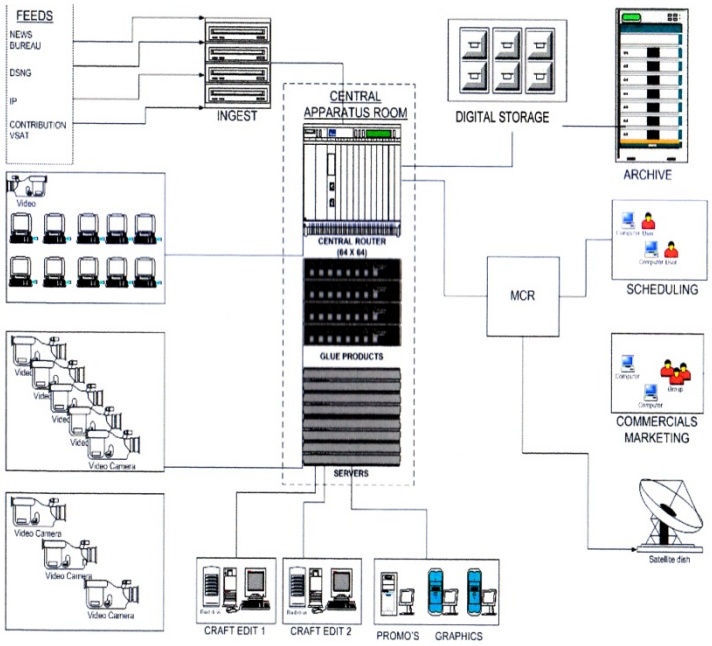
- Advantages of Automated Manufacturing,
- improved work flow
- reduced handling
- simplification of production
- reduced lead time
- increased moral in workers (after a wise implementation)
- more responsive to quality, and other problems
- etc.

The Picture of Automation System :



Detail of Wokstation Controller

The Diagram of Automation System:



Station Automation -AVECO :

System diagnostics:

AVECO automation systems contain internal diagnostics which checks the status of the automation system as well as status of all components which are connected to the automation system, such as TV equipment, cooperating systems etc.

Advantage of –AVECO

- Open system design
- Multi-Channel,24 haurs a day operation
- Supports parallel and alternative events
- Live broadcasting support
- Does not miss a frame
- Multiple layers of reliabilitty

Chapter-4

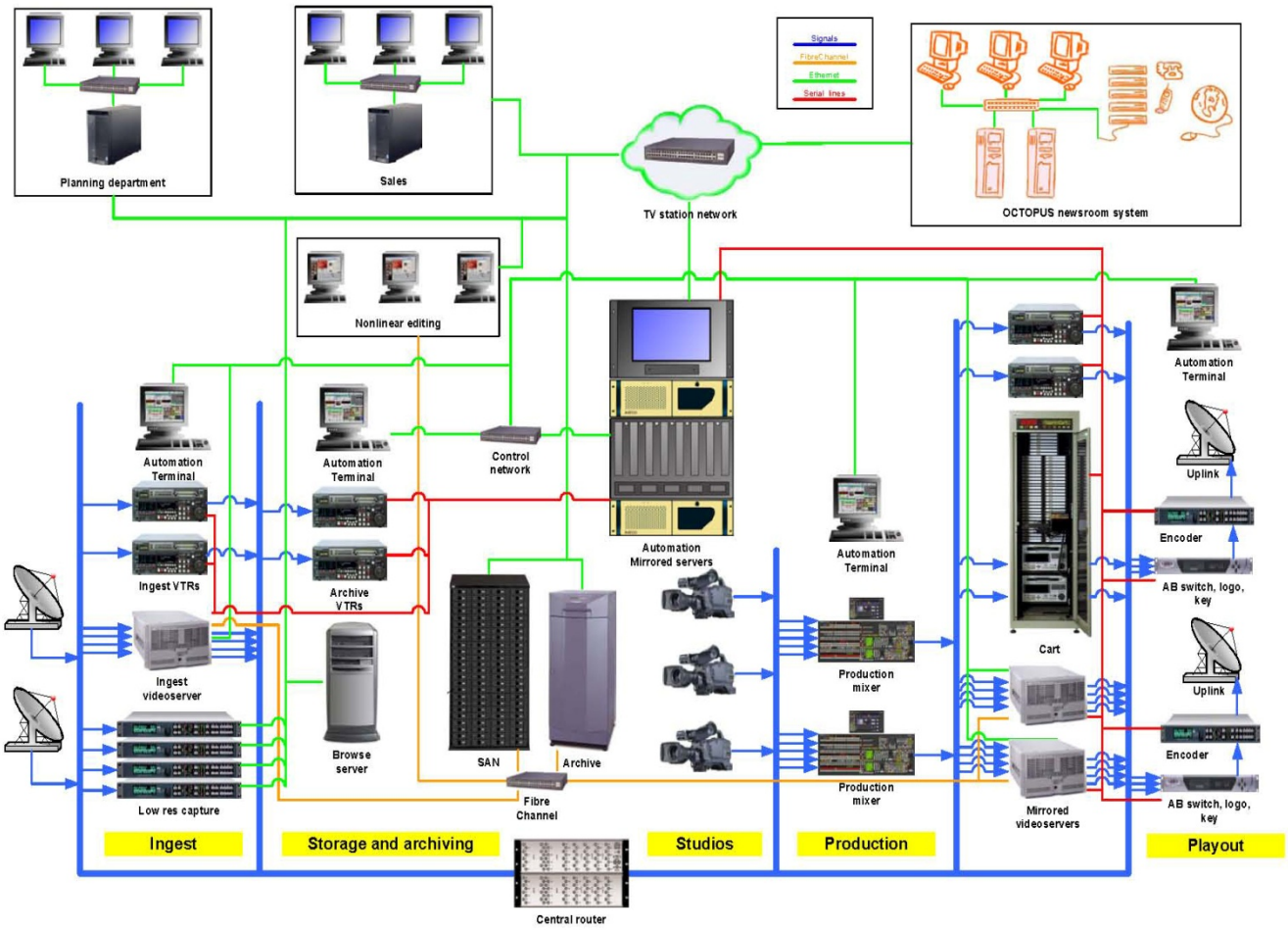
SATELLITE TELEVISION BROADCASTING

4.1 Key element of Satellite TV engineering

TV Studio with Equipment

1. Studio Production Control Room (PCR)
2. Ingest Room
3. Central Apparatus Room (CAR)
4. Master Control Room (MCR)
5. Edit Suite for News/Program
6. Electrical Power Generation (AVR, UPS)
7. Lighting System
8. ENG, EFP & Live
9. Play out Automation
10. News room Automation
11. Edit Suite for News/Program
12. Electrical Power Generation (AVR, UPS)
13. Lighting System
14. ENG, EFP & Live
15. Play out Automation
16. News room Automation

4.2 Block Diagram of a Satellite TV Station



4.3 Boishakhi Television

Boishakhi Media Lid. is a Private sector effort, dedicated to the creative presentation of television technology for Bangla speaking people all over the world. The company has established round the clock satellite television channel aimed at the a worldwide audience with programs depicting Bangla culture, history, geography, people, language and faiths responding to both national and international needs and demands. The name of the channel is "**BOISHAKHI**".

Boishakhi has a very experienced team of programmer makers, technical and management

consultants with intimate knowledge and experience of running a television station. Boishakhi has its own digital facilities with a large scale studio, a dedicated news studio, news room, computerized editing facility and in house transmission/broadcast facility based in Dhaka, Bangladesh.

Boishakhi is committed to maintain a high-level of quality, technical efficiency and reliability while keeping up to date with state of the art technology. It can be safely said that "Boishakhi" as a global and Bangla speaking channel will be available to 210 million Bengali people worldwide.

TechnicalInformationof BoishakhiTelevision

1. **Satellite: Apaster IIR**
2. **Orbit location: 76.5˚E**
3. **Modulation: QPSK**
4. **Up link frequency: 6234 MHz**
5. **Down link frequency: 4009 MHz**
6. **Symbol rate: 4300 Ksps**
7. **Forward error correction: ¾ Polarization: Horizontal**
8. **Type of carrier: MPEG-2/DVB-S**
9. **SDI video bit rate: 270 Mbit/s**
10. **Video compression format: MPEG-2**
11. **Audio level: (-20dB to -12dB)**
12. **Display resolution: 720X576**
13. **Video format: PAL**
14. **Aspect ratio: 4:3**
15. **Chrominance format: 4:2:2**
16. **Scanning line per second: 625**

Chapter-5

Studio

5.1 Studio Definition:

A studio is the heart of a TV station. It can produce audio & video signal by microphone & Camera. The studio can be both indoor & outdoor and both the studio consists with camera, microphone & lighting. The indoor studio must have a lighting system.

The studio needs to have enough space-horizontally for access and camera shots, and vertically to have the lighting in a suitable place. Technically it should have wall boxes where equipment can be plugged in and connection for other services, such as mains power and computer networks. There are two type of Television Studio.[1]

1. Normal Studio
2. Virtual Studio

TV Studio Consist into two parts

●Physical Studio

●Program Control Room(PCR)

5.2 Physical Studio:

Figure 5.2 inside the physical Studio

5.3 Camera:

Camera is an electronic device that convert light signal to electric signal Cameras may work with the light of the visible spectrum or with other portions of the electromagnetic spectrum. A camera generally consists of an enclosed hollow with an opening (aperture) at one end for light to enter, and a recording or viewing surface for capturing the light at the other end. A majority of cameras have a lens positioned in front of the camera's opening to gather the incoming light and focus all or part of the image on the recording surface. Most 20th century cameras use photographic film as a recording surface, while modern ones use an electronic camera sensor. The diameter of the aperture is often controlled by a diaphragm mechanism, but some cameras have a fixed-size aperture.

A typical still camera takes one photo each time the user presses the shutter button. A typical movie camera continuously takes 25 film frames per second as long as the user holds down the shutter button, or until the shutter button is pressed a second time.[1]

Fig:5.3 Camera

5.4 Tripod & Pedestals:

Tripod is a word generally used to refer to a three-legged object; generally one used as a platform of some sort, and comes from the Greek tripods, meaning "three feet". A tripod provides stability along the side-to-side and up-and-down Coordinate axis of motion and provides a large amount of leverage.

There are eight characteristics common to all tripods: Collapsed size, extended size, load capacity, head type, feet, leg locks, and common material.[1]

Figure:5.4 Camera Tripod

5.5 Lighting:

Lighting or illumination is the deliberate application of light to achieve some aesthetic or practical effect. Lighting includes use of both artificial light sources such as lamps and natural illumination of interiors from daylight. Day lighting (through windows, skylights, etc.) is often used as the main source of light during daytime in buildings given its low cost. Artificial lighting represents a major component of energy consumption, accounting for a significant part of all energy consumed worldwide. Artificial lighting is most commonly provided today by electric lights, but gas lighting, candles, or oil lamps were used in the past, and still are used in certain situations. Proper lighting can enhance task performance or aesthetics, while there can be energy wastage and adverse health effects of poorly designed lighting. Indoor lighting is a form of fixture or furnishing, and a key part of interior design. Lighting can also be an intrinsic component of landscaping.[1]

5.6 Light Dimmer:

Dimmers are devices used to vary the brightness of a light. By decreasing or increasing the RMS voltage and hence the mean power to the lamp it is possible to vary the intensity of the light output. Although variable-voltage devices are used for various purposes, the term dimmer is generally reserved for those intended to control resistive incandescent, halogen and more recently compact fluorescent (CFL) lighting. More specialized pulse-width modulation equipment is needed to dim fluorescent, vapor, solid and other arc lighting.

Dimmers range in size from small units the size of a normal light switch used for domestic lighting to high power units used in large theatre or architectural lighting installations. Small domestic dimmers are generally directly controlled, although remote control systems (such as X10) are available. Modern professional dimmers are generally controlled by a digital control system like DMX or DALI. In newer systems these protocols are often used in conjunction with Ethernet.[1]

Figure 5.6 Light Dimmer

5.7 Microphone:

A microphone is an acoustic-to-electric transducer or sensor that converts sound into an electrical signal. In 1876, Emile Berliner invented the first microphone used as a telephone voice transmitter. Microphones are used in many applications such as telephones, tape

recorders, karaoke systems, hearing aids, motion picture production, live and recorded audio engineering, FRS radios, megaphones, in radio and television broadcasting and in computers for recording voice, speech recognition, VoIP, and for non-acoustic purposes such as ultrasonic checking or knock sensors.

Most microphones today use electromagnetic induction (dynamic microphone), capacitance change (condenser microphone, pictured right), piezoelectric generation, or light modulation to produce an electrical voltage signal from mechanical vibration.[1]

Figure 5.7 Microphone

5.8 Teleprompt System

Teleprompter is an electronic prompting system. Actually it's a monitor which is sated front of camera and inside the monitor text can be rolling vertically that's why anchor can see the all text with control.

Figure: 5.8 The Studio of Boisakhi TV

5.9 Virtual TV Studio

Virtual TV Studio is two types

- Tracking Type (3-D)
- Trackless type (2-D)

Virtual Studio buildup on chroma technology

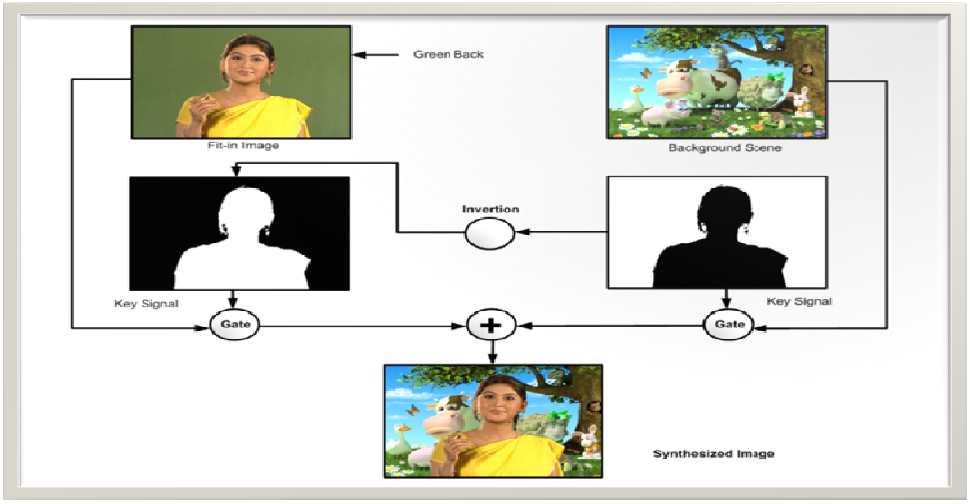


Figure: 5.9 Virtual Voice

Figure:5.9 Virtual Studio

Chapter-6

Production Control Room (PCR)

6.1 Definition of PCR:

This room controls the studio equipment & other equipment which is related with audio & video. So many equipment is using inside the room. The final output of the control room is prepared for transmission or it can record by VTR.

The production control room (PCR), also known as the "gallery" or Studio Control Room (SCR), is the place in a television studio in which the composition of the outgoing program takes place.[1]

The basic block diagram of a studio control room is shown below

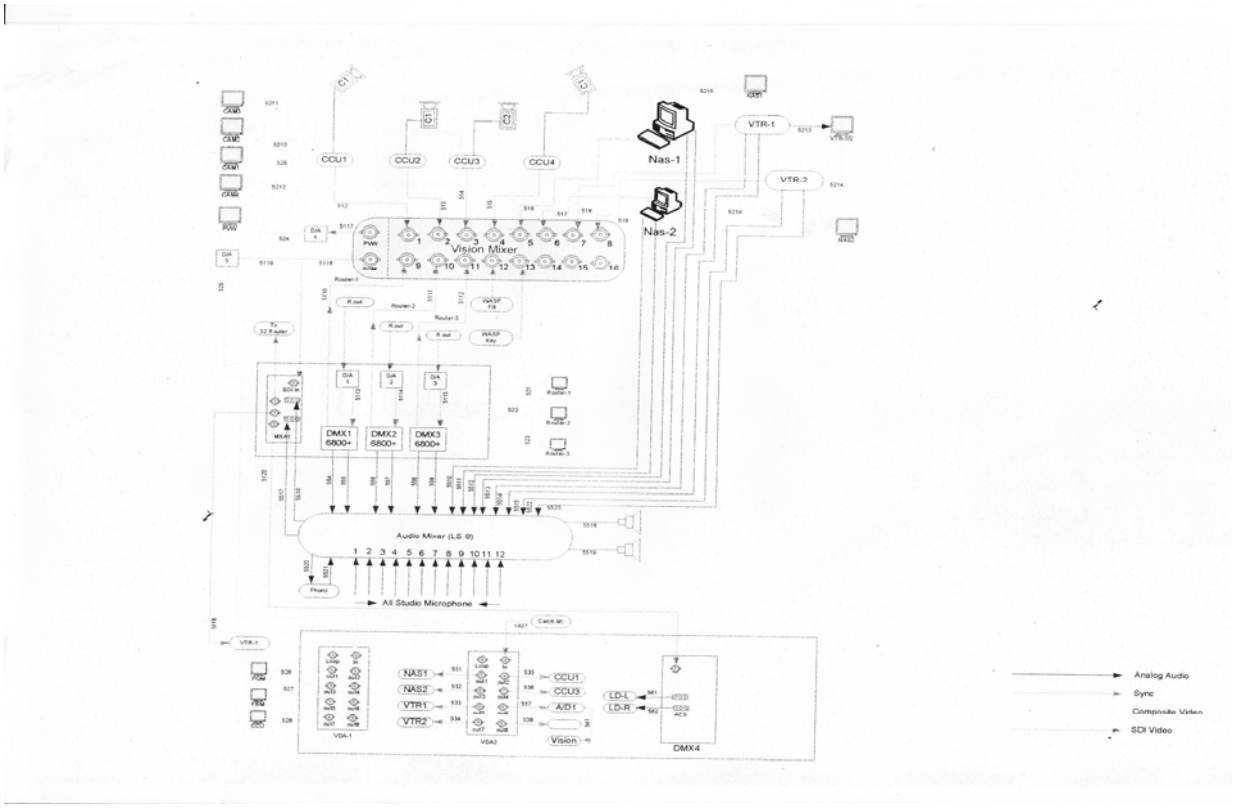


Figure:6.1 The block diagram of PCR

Figure 6.2 inside the Production Control Room (PCR)[1]

6.2 Camera control unit:

The camera control unit (CCU) is installed in the production control room (PCR), and allows various aspects of the video camera on the studio floor to be controlled remotely. The most commonly made adjustments are for white balance and aperture, although almost all technical adjustments are made from controls on the CCU rather than on the camera. This frees the camera operator to concentrate on composition and focus, and also allows the technical director of the studio to ensure uniformity between all the cameras.

As well as acting as a remote control, the CCU usually provides the external interfaces for the camera to other studio equipment, such as the vision mixer and intercom system, and contains the camera's power supply.

This unit is also providing the remote panel, by this panel all parameter can be controlled remotely.[1]

Figure:6.2 **Cameras Control Unit.**

6.3 Vision mixer

Basically the unit is use to mixing the video with various types of effects such as wipe, mix, DPM etc. It can take a number of video inputs and produce the single mixed (with keyer) video output. This unit can operate DSK (Down sting key) also.[1]

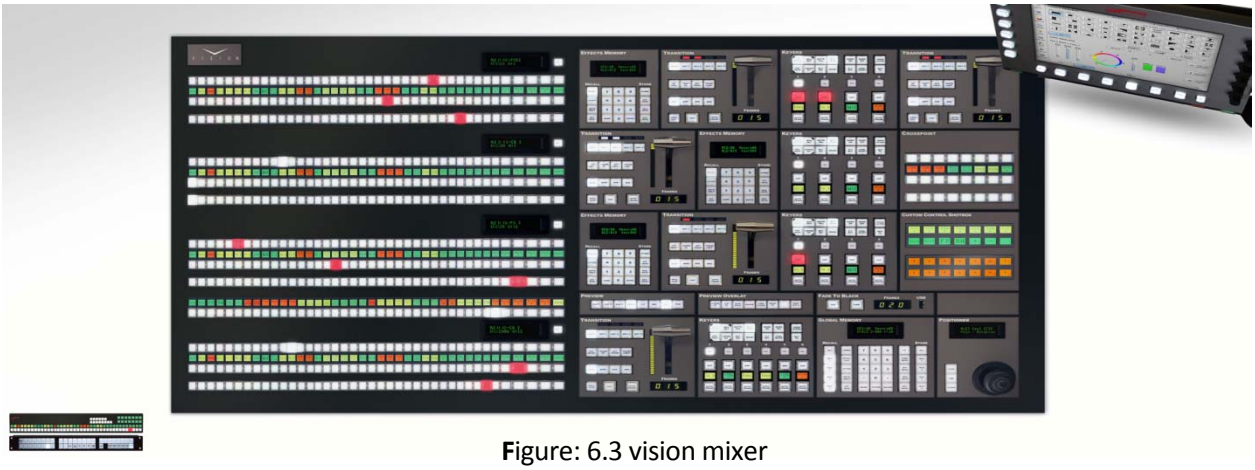


Figure: 6.3 vision mixer

6.4 Audio mixer:

In professional audio, a mixing console, or audio mixer, also called a sound board or soundboard, is an electronic device for combining (also called "mixing"), routing, and changing the level, timbre and/or dynamics of audio signals. A mixer can mix analog or digital

signals, depending on the type of mixer. The modified signals (voltages or digital samples) are summed to produce the combined output signals.

Fig: 6.4Audio Mixers.

6.5 Audio loudness meter:

Loudness monitoring of programmed levels is needed in radio and television broadcasting, as well as in audio post production. Traditional methods of measuring signal levels such as the Peak programmed meter, and VU meter do not give the subjectively valid measure of loudness which many would argue is needed to optimize the listening experience when changing channels or swapping disks. The meter is showing the dB or VU scale which can be selected by user.[1]

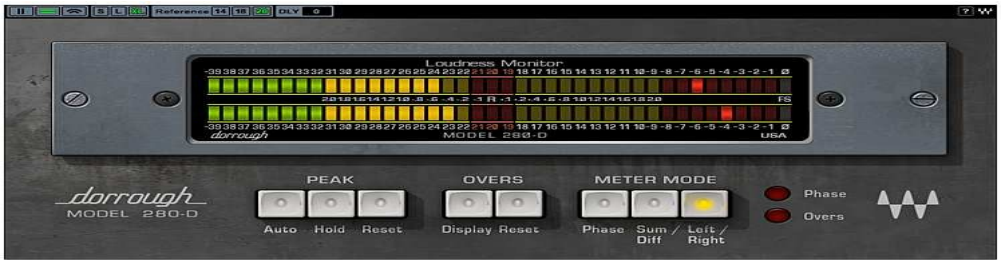


Figure :6.5 Audio Level Meters

6.6 VTR (Video tape recorder):

This device can simultaneously record the audio & video signal with different format e.g. (SDI, Composite, Component, and S-Video). This device is used to record the final output of PCR the device can also be used for Ingest & MCR. All VTR are capable to play the recorded cassette also.[1]

Figure 6.6 Video Tape Recorders (VTR)

6.7 Play out video server:

A video server is a computer based device (also called a 'host') dedicated for delivering video.
Unlike personal computers, being multi-application a device, a video server is designed for one purpose; provisioning video, often for broadcasters. A professional grade video server records, stores, and plays back multiple streams of video without any degradation in the video signal. Broadcast quality video servers often store hundreds of hours of compressed audio and video (in different codec's), play out multiple and synchronized simultaneous streams of video, and offer quality interfaces such as SDI for digital video and XLR for balanced analog audio or AES/EBU digital audio and also Time Code. A unlock input is usually provided to provide a means of synchronizing with the house reference clock, thereby avoiding the need for time base correction and frame synchronization.
Video servers usually offer some type of control interface allowing them to be driven by more sophisticated scheduling or play-listing applications. Popular protocols include VDCP and 9-Pin Protocol.[1]

6.8 Video Monitor:

A video monitor also called a broadcast monitor, broadcast reference monitor or just reference monitor, is a device similar to a television, used to monitor the output of a video-generating device, such as a media play out server, IRD, video camera, VCR, or DVD player. It may or may not have audio monitoring capability. Unlike a television, a video monitor has no tuner and, as such, is unable independently to tune into an over-the-air broadcast. One common use of video monitors is in Television stations and in outside broadcast vehicles, where broadcast engineers use them for confidence checking of signals throughout the system. Video monitors are used extensively in the security industry with Closed-circuit television cameras and recording devices.[1]

6.9 Audio Monitor:

A loudspeaker (or "speaker") is an electro acoustic transducer that converts an electrical signal into sound. The speaker moves in accordance with the variations of an electrical signal and causes sound waves to propagate through a medium such as air or water.

Loudspeakers (and other electro acoustic transducers) are the most variable elements in a modern audio system and are usually responsible for most distortion and audible differences when comparing sound systems.

6.10 Online graphics:

During LIVE telecasting or recording period the PCR people need to super impose the DSK (Down sting key) such as anchor name, program type and scroll or Roll text with graphics. Basically in our country the most television channel are using the inscriber for PCR online graphics

Chapter-7

NLE (Non-Liner Editing)

7.1 Definition of Non-Linear Editing (NLE):

Non-linear editing for films and television postproduction is a modern editing method which involves being able to access any frame in a digital video clip with the same ease as any other. This method is similar in concept to the "cut and paste" technique used in film editing from the beginning. However, the cutting of film negatives made it originally a destructive process. Non-linear, non-destructive methods began to appear with the introduction of digital video technology. It can also be viewed as the audio/video equivalent of word processing, which is why it is called desktop editing in the consumer space.

A computer for non-linear editing of video will usually have a video capture card to capture analog video and/or a FireWire connection to capture digital video from a DV camera, with its video editing software.

Various editing tasks can then be performed on the imported video before it is exported to another medium, or MPEG encoded for transfer to a Cassette.[1]

7.2 Workstation:

A workstation is a high-end microcomputer designed for technical or scientific applications. Intended primarily to be used by one person at a time, they are commonly connected to a local area network and run multi-user operating systems. The term workstation has also been used to refer to a mainframe computer terminal or a PC connected to a network.

Figure7.2 Work Station PC.

7.3 Edit Software

Video editing software, also known as Non Linear Editing (NLE), is application software which handles the editing of video sequences on a computer. NLE systems replace traditional flatbed celluloid film editing tools and analogue video tape-to-tape machines.

NLE software is typically based on a timeline interface paradigm where sections of moving image video recordings, known as clips, are laid out in sequence and played back. The NLE offers a range of tools for trimming, splicing, cutting and arranging clips across the timeline. As digital NLE systems have advanced their toolset their role has expanded and most consumer and professional NLE systems alike now include a host of features for color manipulation, titling and visual effects, as well as tools for editing and mixing audio in conjunction with the image.

Adobe premiere pro and final cut pro Software is most popular in our country.

7.4 Capture Hardware

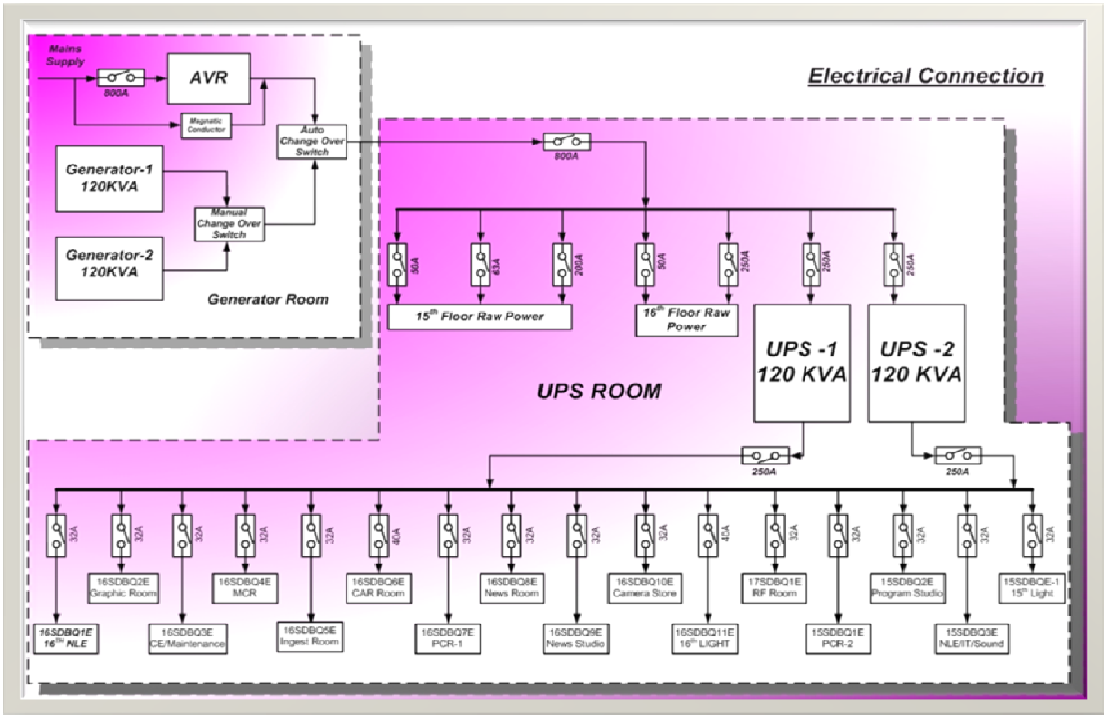
NLE capture system need to capture the audio & video in workstation hard disk, for that need to install the extra hardware in the work station. The hardware is interfacing with VTR, for import and export the audio & video.

Fig:7.4 Capture Hardware.

Chapter-8

Electrical Power

8.1 The block diagram of Electrical Connection



8.2 Electrical Power

- Electrical Sub-Station
- Generator
- Automatic Voltage Regulator (AVR)
- On Line UPS

Chapter-9

IT Network

9.1 The block diagram of IT Network:

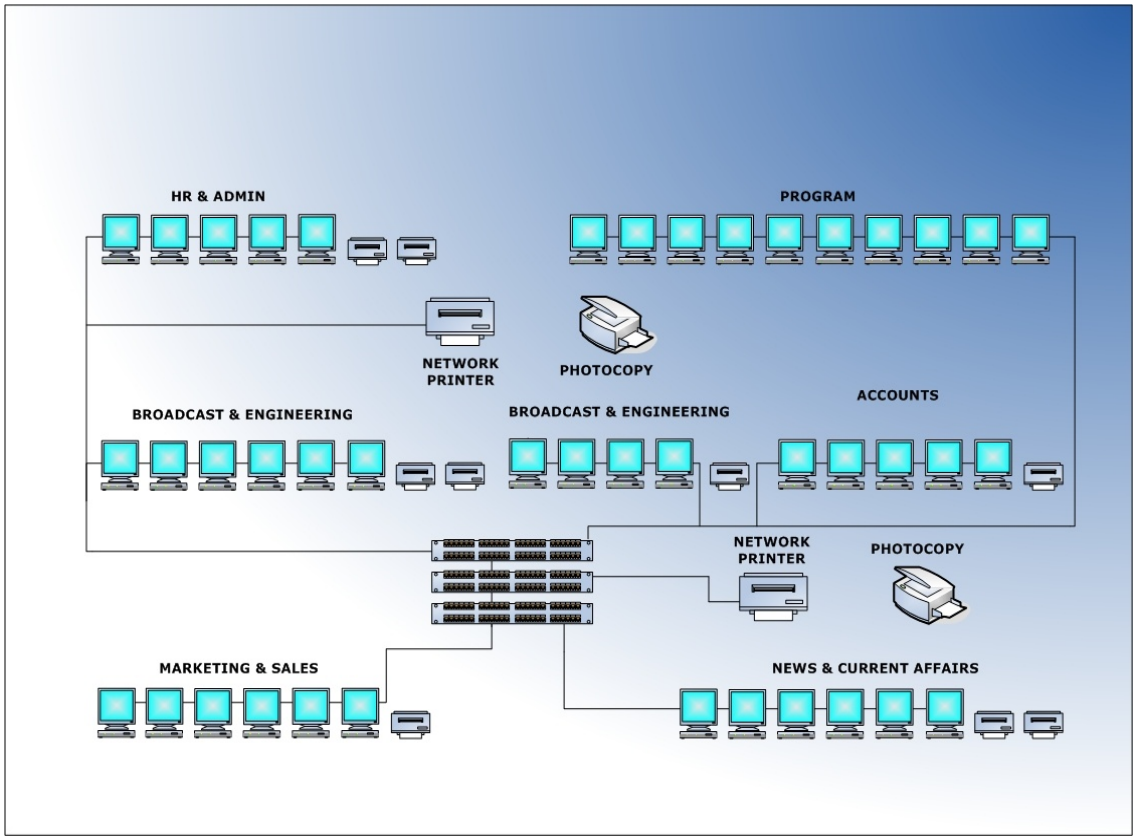


Figure: 9.1 The block diagram of IT Network

Chapter-10

Ingest

10.1 Definition of Ingest:

Ingest is a term used in broadcast that refers to the process of transferring content to a digital editing or storage system. In consumer speak, it means recording video material on to a hard disk recorder. The whole process includes digitizing the signal, compressing the digital data stream to reduce the amount of data stored and finally, storing the data as a file on a hard disk. Often, additional data is added to the file program identifiers and time stamps, for example.[1]

Figure: Inside the Ingest

10.2 Diagram of Ingest

:

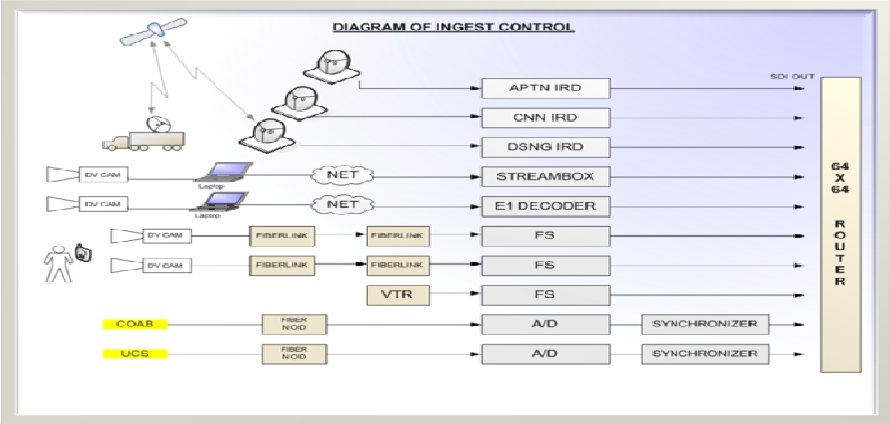


Figure: The block diagram of Ingest Control room

Basically all incoming source is come to this room

- Server Recorder
- Video Tape Recorder (VTR)
- Video Monitor
- Audio Monitor
- Router Terminal

10.3 Video Monitor:

A video monitor also called a broadcast monitor, broadcast reference monitor or just reference monitor, is a device similar to a television, used to monitor the output of a video-generating device, such as a media play out server, IRD, video camera, VCR, or DVD player.

Video monitors are used extensively in the security industry with Closed-circuit television cameras and recording devices.[1]

10.4 Audio Monitor:

A loudspeaker (or "speaker") is an electro acoustic transducer that converts an electrical signal into sound. The speaker moves in accordance with the variations of an electrical signal and causes sound waves to propagate through a medium such as air or water.[1]

Figure:10.4 Audio Monitor

Chapter-11

Central Apparatus Rooms(CAR)

11.1 Definition of CAR:

Central apparatus room (CAR, pronounced "C-A-R"), Central machine room, or Central equipment room (CER), or Central technical area (CTA), or Rack Room is where shared equipment common to all technical areas is located. It should be air-conditioned; however low- noise specifications such as acoustical treatments are optional. Equipment is connected either directly with an attached foldout monitor, keyboard and mouse or remotely via KVM switch.[1]

Figure:11.1 Central Apparatus Rooms

11.2 Video server:

A video server is a computer based device (also called a 'host') dedicated to delivering video.

Unlike personal computers, being multi-application devices, a video server are designed for one purpose; provisioning video, often for broadcasters. A professional grade video server records, stores, and plays back multiple streams of video without any degradation in the video signal.

They can optionally allow recording using the same codec that is used in various editing software packages to prevent any wasted time in transcending.[1]

11.3 News Room Automation:

A news server is a set of computer software used to handle Usenet articles. It may also refer to a computer itself which is primarily or solely used for handling Usenet. A reader server provides an interface to read and post articles, generally with the assistance of a news client.[1]

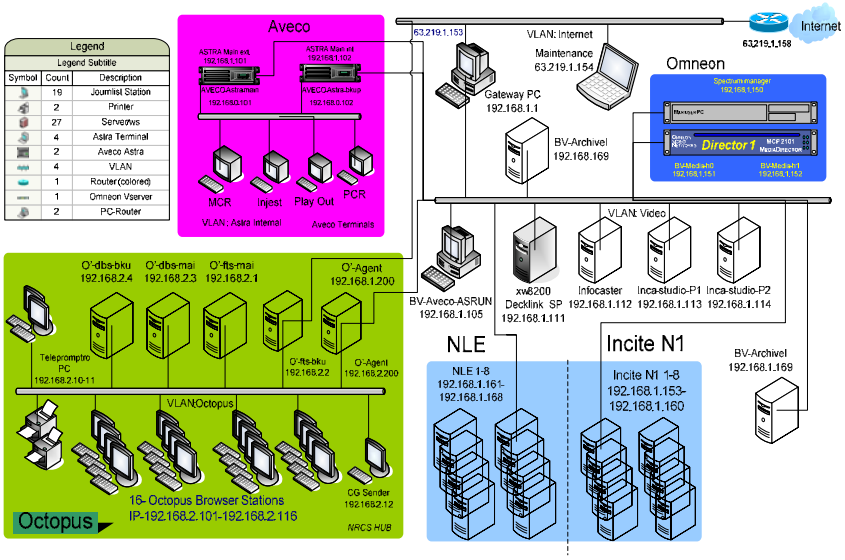


Figure:11.3 News Room Automation

11.4 Video Router:

A video router is a routing device that allows the selection of any one of a set of sources and routes the selected source to any of a set of destinations. Each destination is independent and isolated from each of the others. This type of router can be visualized as a matrix that can serve any input to any, or all, of the outputs. For this reason they are often called matrix video routers.

Every router must have some sort of control system. These range from a simple automatic switch from one input to another, determined by manufacturer-established criteria, to a series of remote- control panels, each of which can perform any routing connection available. When a routing connection is made in coincidence with the vertical interval of the video sources, it is appropriately said to be a vertical interval switch.[1]

Figure :11.4 Video Router

11.5 Sync pulse generator:

A **sync pulse generator** is a special type of generator which produces synchronization signals, with a high level of stability and accuracy. These devices are used to provide a master timing source for a video facility. The output of an SPG will typically be in one of several forms, depending on the needs of the facility:

A continuous wave signal

In standard-definition applications, a **bi-level sync** signal, often with a color burst signal in facilities that have analog equipment. Typically, this is either in NTSC or PAL format. As the resulting signal is usually indistinguishable from an all-black television signal of the same format, this sort of reference is commonly known as **black** or **black burst**.

In some high-definition applications, a **tri-level sync** signal is used instead. This signal is virtually identical to the synchronization signal used in component analogue video (CAV); and is similar to the synchronization signals used in VGA (the main difference being, in VGA the horizontal and vertical syncs are carried on different wires; whereas TLS signals include both H and V syncs).[1]

Figure 11.5 Sync Pulse Generators

11.6 News Work Flow

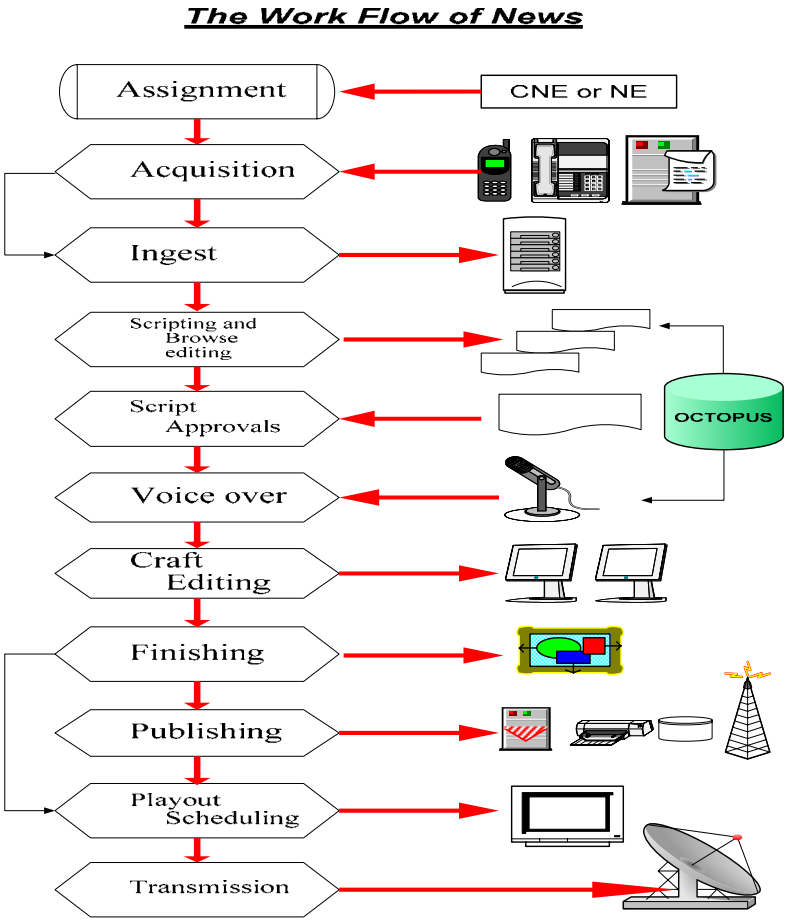


Fig:11.6 News work flow Diagram

11.7 Graphics system:

Graphics are visual presentations on some surface, such as a wall, canvas, computer screen, paper, or stone to brand, inform, illustrate, or entertain. Examples are photographs,

drawings, line art, graphs, diagrams, typography, numbers, symbols, geometric designs, maps,Graphic design may consist of the deliberate selection, creation, or arrangement of typography alone, as in a brochure, flier, poster, web site, or book without any other element. Clarity or effective communication may be the objective, association with other cultural elements may be sought, or merely, the creation of a distinctive style.[1]

11.8 Archival system:

Media archiving is the process of transparently moving older data from a log file to log archive files to free storage space. Media archiving must be enabled to automatically generate the log files needed to recover a server's data volumes. This section describes how to enable media archiving and, if necessary, how to flush the media archive[1]

11.9 GPS Clock:

GPS wireless clock is a very precise clocking system that uses the GPS (global positioning system) satellite technology. These satellites scattered around the earth records time with 100% accuracy until the smallest fractions of a second and then therefore transmits those time data's into various locations on Earth. The GPS data receivers which can be positioned anywhere like on rooftops of buildings, windows of different facilities in turn gets these data transmissions and afterwards relay it to the master GPS transmitters installed in various facilities.

In television station the GPS Clock is used for synchronization with the GMT time. And it's connected to the all broadcast equipment which is related with the time.[1]

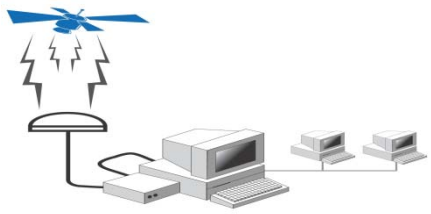


Fig:11.9 Block Diagram of Global positioning system (GPS)

11.10 Color Corrector:

Color correction by using color gels, or filters, is a process used in stage lighting, photography, television, cinematography and other disciplines, the intention of which is to alter the

overall color of the light; typically the light color is measured on a scale known as color temperature, as well as along a green–magenta axis orthogonal to the
Color temperature axis.

.

Figure :11.10 Color Corrector

11.11 Audio level process:

It is a combo card with one SDI or HD/SDI interface combined with one DSP unit doing automatically individual audio Loudness processing. It is designed for digital satellite TV; IPTV and Cable operations where SDI based incoming signals have widely varying levels and don't match a uniform synchronization.

Each C8486 card combines one SD or HD/SDI interface, capable of handling 4 or 8 channels SDI streams and one LEVEL MAGIC DSP to handle the Loudness Control.

11.13 Processing frame:

This is a simple frame included the redundant power supply and cooling system. This frame holds the all processing device.

Figure11.13 Processing Frame

11.12 Embedded Audio Router:

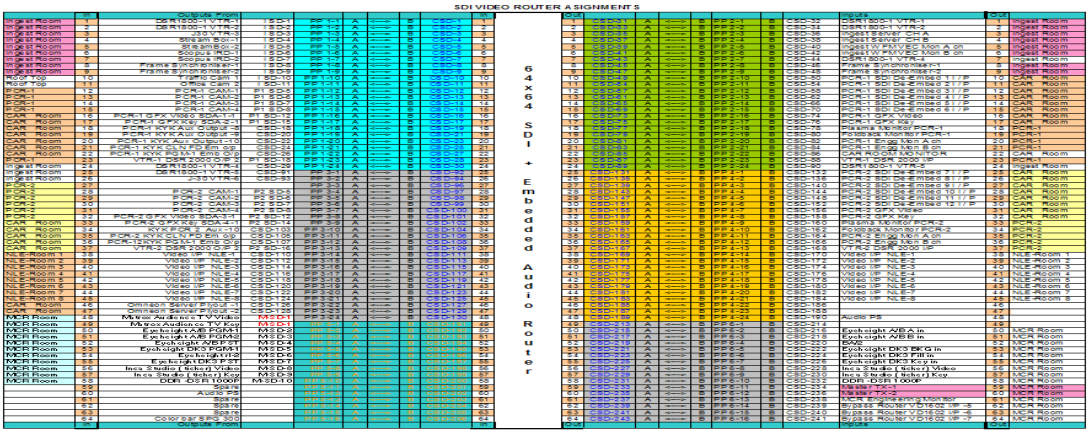


Figure: 11.12Embedded Audio Router

11.14 Multiplexing (MSA6800+B/C2):

The MSA6800+ AES/EBU Digital Audio Multiplexers with Synchronizer accept a serial video input and embed two AES signals (MSA6800+B2/C2) or four AES signals (MSA6800+B4/ C4) into the SDI signal. Each module provides three SDI outputs containing the embedded audio. The 2-input modules also provide 2 AES outputs for general-purpose use. These modules are optimized to provide automatic audio delay tracking when used with the DES6800+ Decoder/Synchronizer or VFS6800+ Frame Synchronizer, compensating for video delay in the video processing modules.

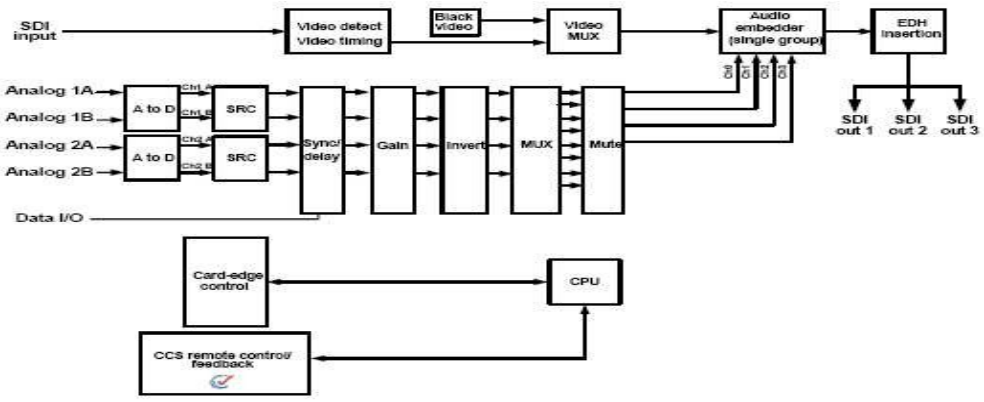


Figure 11.14 Multiplexing (MSA6800+B2/C2)

11.15 De-Multiplexing(DMX6800+A2B):

This series of DMX6800+ Analog Audio and AES Digital Audio De-multiplexer modules accepts an SDI input with embedded audio and de-embeds it to provide up to four analog audio outputs and up to two balanced or unbalanced AES outputs. [1]

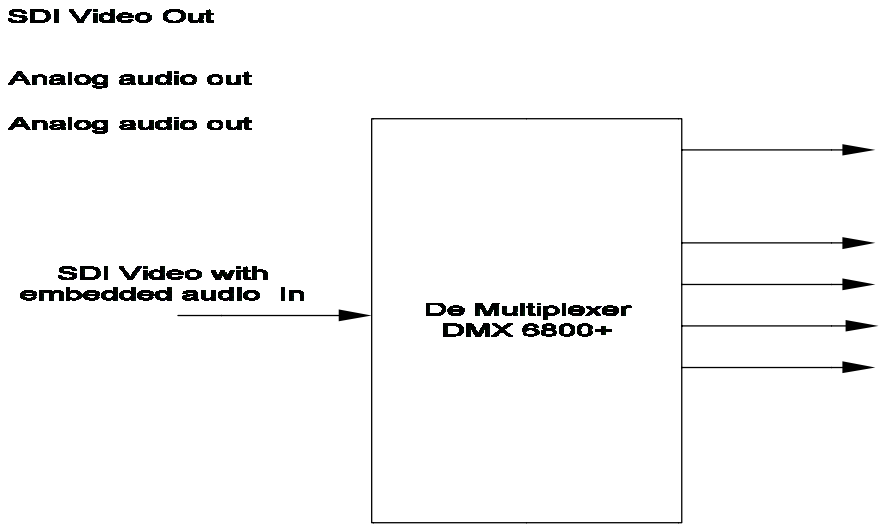


Figure 11.15 De-Multiplexing (DMX6800+)

11.16 Converter (DES 6800 +D):

pDES6800+ is a compact, high precision 12 bit decoder that convert NTSC and/or PAL analog comosite signals into superior quality component (4:2:2) digital video. Utilizing the advanced Letch 'Phase Quadrate Mixing (PQM)' Technology for 2D adaptive comb filtering, coupled with TBC capabilities, these cards are designed for high performance and optimal value[1]

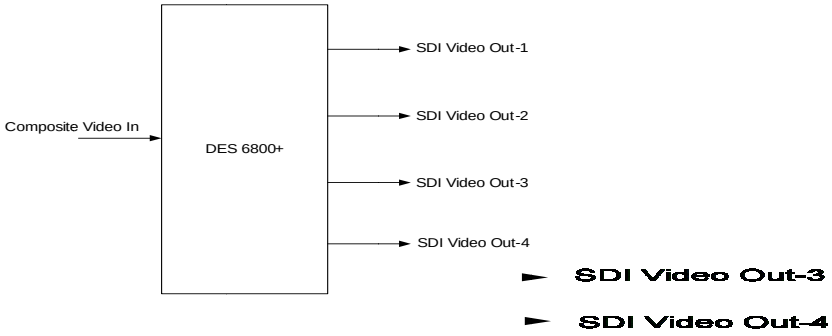


Figure 11.16 Analog to Digital Converter

11.18 Serial digital interface:

Serial digital interface standard is based on a 270 Mbps transfer rate, over a single 75 ohm coaxial cable up to 600 feet. Serial Digital Interface is a digital broadcast television standard providing a lossless digital encoding of standard NTSC and PAL formats. SDI is used in Television stations, cable channels, and professional production Equipment. SDI provides a method for transmitting uncompressed digital video, audio and other data between video devices

Serial digital data interface (SDDI) is a way of compressing digital video for use on SDI-based equipment from Sony. SDDI is now incorporated into Serial digital transport interface.[1]

Television Standards:

Name	**Bitrates**	**Example Video Formats**
SD-SDI	270 Mbit/s, 360 Mbit/s, 143 Mbit/s, and 177 Mbit/s	480i, 576i
ED-SDI	540 Mbit/s	480p, 576p
HD-SDI	1.485 Gbit/s, and 1.485/1.001 Gbit/s	720p, 1080i
Dual Link HD-SDI	2.970 Gbit/s, and 2.970/1.001 Gbit/s	1080p
3G-SDI	2.970 Gbit/s, and 2.970/1.001 Gbit/s	1080p

Chapter-12

Master Control Room(MCR)

12.1 Definition of MCR

Master control is the technical hub of a broadcast operation. It is common among most over-the- air television stations and networks. It is distinct from production control rooms in television studios where the activities such as switching from camera to camera are coordinated.

Master control is generally staffed with one or two operators around-the-clock, every day to ensure continuous operation. Master control operators are responsible for monitoring the quality and accuracy of the on-air product, ensuring the transmission meets government regulations, troubleshooting equipment malfunctions, and preparing programming for future playback. Regulations include both technical ones (such as those against over-modulation and dead air), as well as content ones (such as indecency and station ID).[1]

Block diagram of MCR

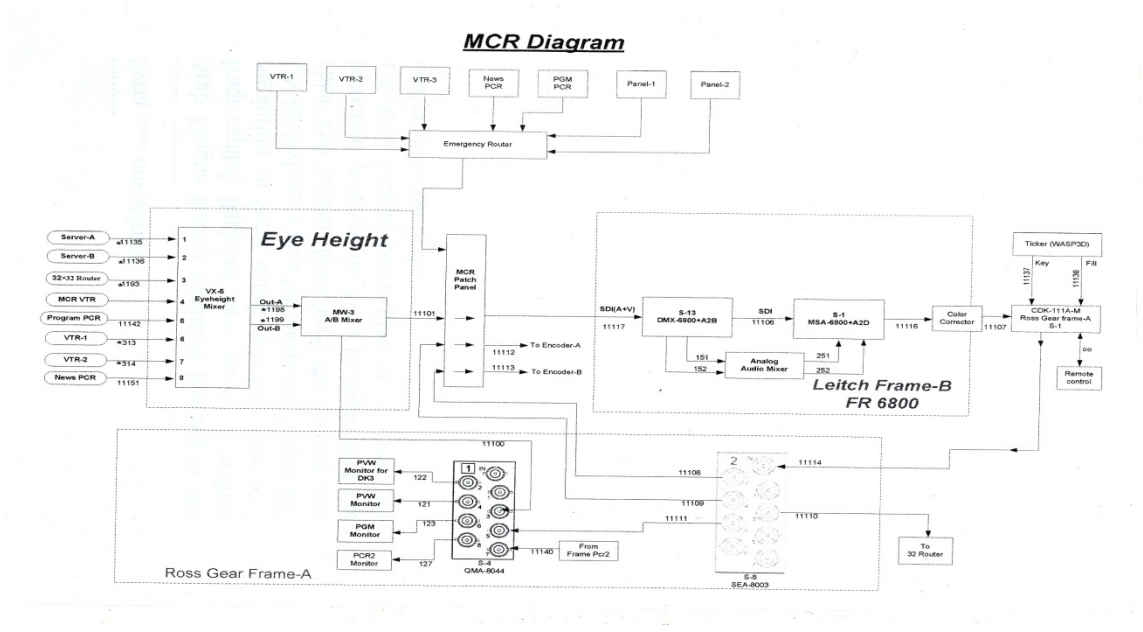


Figure:12.1 Diagram of MCR

Figure 12.1 inside the Master Control Room (MCR)

12.2 AV Switcher

This is a basic audio video switcher which has multiple input and single output. The operator can select any source from multiple inputs which is selected for on air. The AV switcher is connected with Graphics system also for that the operator can select the DSK function.[1]

Figure 12.2 AV Switcher

12.3 Audio Controller

The MCR taken the different AV source from different place, that's why the audio level is not similar with each other source, for that the operator need to control the audio level.

Figure 12.3 Audio Controller

12.4 Talk back Device

Figure12.4 Talk back Device

12.5 Video Router Control panel

This is a serial video router control panel which is connected with main router. The main video router is installed in CAR (Central apparatus room). By the control panel operator can select any source for On-Air.[1]

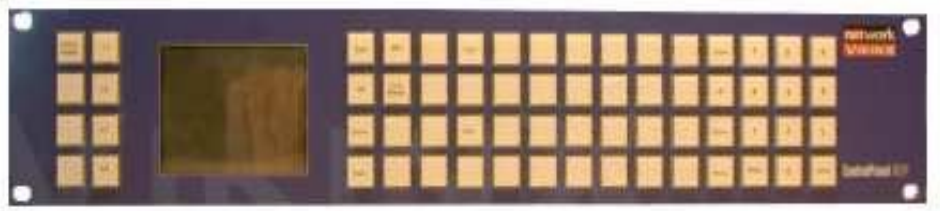
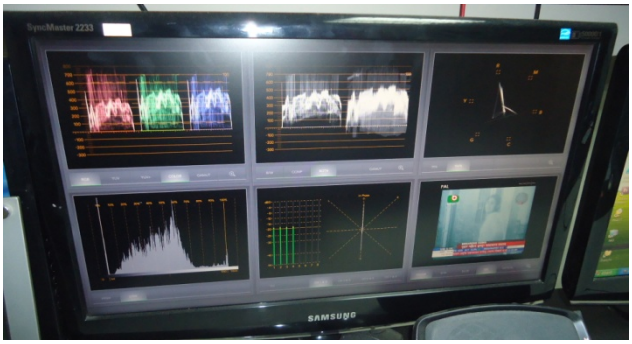


Figure 12.5 Video Router Control Panel

12.6 On line DSK

This is workstation computer where the DSK software and hardware is installed. The hardware gives the Key and Fill and the key and Fill is connected to the MCR switcher. The operator can insert all type of graphics to the On-Air such as News ticker, graphical commercial etc.

12.7 Blackmagic Ultrascope



12.8 By pass System

12.9 Audio & Video monitoring

In MCR so many incoming source are come from different place. The operator needs to monitor the all video and audio source, that's why number of video and audio monitor is connected in MCR.

12.10 Intercom System

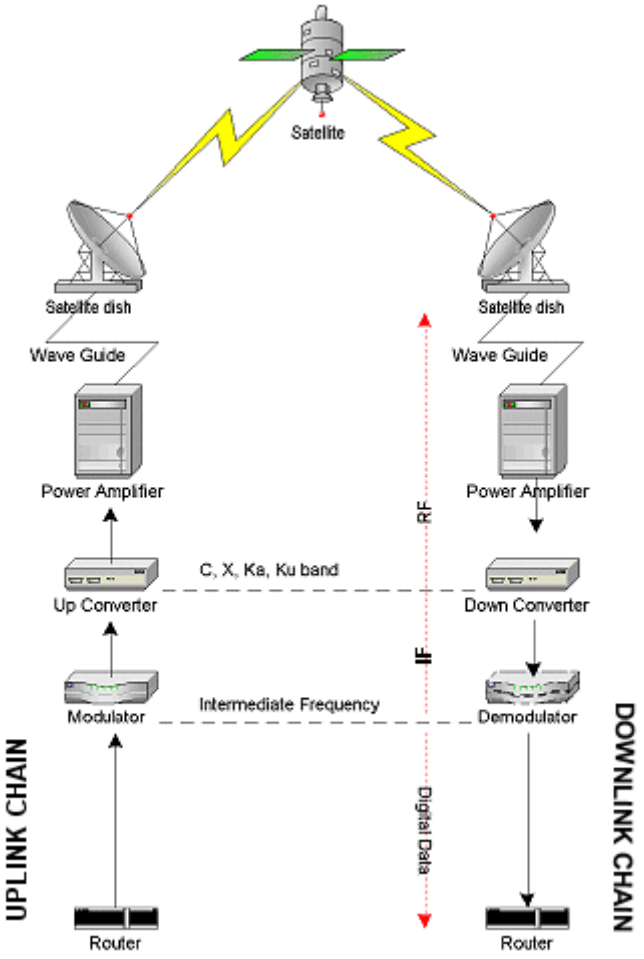
The Intercom is installed to the MCR for internal Communicate with each other. During LIVE transmission the MCR operator can communicate with all concern people such as Ingest, PCR and Editing by intercom.[1]

Figure 12.10 Wireless Intercom

Chapter-13

Earth Station

13.1 Definition of Earth Station



An earth station, ground station, or earth terminal is a terrestrial terminal station designed for extra planetary telecommunication with spacecraft, and/or reception of radio waves from an astronomical radio source. Earth stations are located either on the surface of the Earth, or within Earth's atmosphere. Earth stations communicate with spacecraft by transmitting and receiving radio waves in the super high frequency or extremely high frequency bands (e.g., microwaves). When an earth station successfully transmits radio waves to a spacecraft (or vice versa),I testablishes a telecommunications link.

When a satellite is within an earth station's line of sight, the earth station is said to have a view of the satellite. It is possible for a satellite to communicate with more than one earth station at a time. A pair of earth stations are said to have a satellite in mutual view when the stations share simultaneous, unobstructed, line-of-sight contact with the satellite. [4]

13.2 Type of earth station

Transmit & Receive: Earth station can transmit signal for satellite and can receive signal from satellite.

1. Receive only: Earth station can only receive signal, mostly used for CATV system.
2. Transmit only: Earth station can only transmit signal towards satellite.

13.3 Encoder

An encoder is a device, circuit, transducer, software program, algorithm or person that converts information from one format or code to another, for the purposes of standardization, speed, secrecy, security, or saving space by shrinking size.

In TV station basically its taken SDI video with embedded audio and given ASI output to de modulator.[1]

Figure 6.2 Encoder

13.4 Asynchronous signal

In general, asynchronous is an adjective describing objects or events that are not coordinated in time. In information technology, the term has several different usages.

In telecommunication signaling within a network or between networks, an asynchronous signal is one that is transmitted at a different clock rate than another signal. Signals are almost but not quite in synchronization - and a method is used to adjust them - and synchronous signals are those that run at the same clock rate.[4]

13.5 Multiplexer

In electronics, a multiplexer is a device that selects one of several analog or digital input signals and forwards the selected input into a single line. A multiplexer of 2n inputs has n select lines, which are used to select which input line to send to the output. Multiplexers are mainly used to increase the amount of data that can be sent over the network within a certain amount of time and bandwidth.

An electronic multiplexer makes it possible for several signals to share one device or resource, for example one A/D converter or one communication line, instead of having one device per input signal.[1]

13.6 Single Channel per Carrier (SCPC)

SCPC stands for Single Channel per Carrier.

SCPC is a form of satellite transmission where each channel is transmitted on a dedicated single carrier.

The alternative to SCPC is MCPC (Multiple Channel per Carrier).

MCPC is more efficient than SCPC, but SCPC is still utilized for some satellite feeds. By using SCPC, satellite users are able to uplink to the same transponder from multiple locations.[4]

13.7 Multiple channels per carrier

MCPC stands for Multiple Channel per Carrier.

MCPC is a form of satellite transmission where each carrier is utilized to transmit multiple channels.

MCPC transmits multiple video or audio channels on one carrier by utilizing Time Division

Multiplexing (TDM).The alternative to MCPC is SCPC (Single Channel per Carrier).

MCPC is used much more than SCPC because it makes much more efficient use of expensive Satellite bandwidth. [4]

13.8 Modulator

In electronics, modulation is the process of varying one or more properties of high frequency periodic waveform, called the carrier signal, with respect to a modulating signal. This is done in a similar fashion as a musician may modulate a tone (a periodic waveform) from a musical instrument by varying its volume, timing and pitch. The three key parameters of a periodic waveform are its amplitude ("volume"), its phase ("timing") and its frequency ("pitch"), all of which can be modified in accordance with a low frequency signal to obtain the modulated signal.

In telecommunications, modulation is the process of conveying a message signal, for example a digital bit stream or an analog audio signal, inside another signal that can be physically transmitted. Modulation of a sine waveform is used in view to transform a base band message signal to a pass band signal, for example a radio-frequency signal (RF signal). In radio communications, cable TV systems or the public switched telephone network for instance, electrical signals can only be transferred over a limited pass band frequency spectrum, with specific (non-zero) lower and upper cutoff frequencies. Modulating a sine wave carrier makes it possible to keep the frequency content of the transferred signal as close as possible to the centre frequency (typically the carrier frequency) of the pass band.[1]

Figure 13.8 Modulator

13.8 Quadrature phase shift keying (QPSK)

QPSK Phase modulation is a version of frequency modulation where the phase of the carrier wave is modulated to encode bits of digital information in each phase change.

The "PSK" in QPSK refers to the use of Phased Shift Keying. Phased Shift Keying is a form of phase modulation which is accomplished by the use of a discrete number of states. QPSK refers to PSK with 4 states. With twice the number of states as QPSK, you will have 8PSK.

The "Quad" in QPSK refers to four phases in which a carrier is sent in QPSK: 45, 135, 225, and 315 degrees. QPSK Encoding, Because QPSK has 4 possible states; QPSK is able to encode two bits per symbol.

Phase	Data
45 degrees	Binary 00
135 degrees	Binary 01
225 degrees	Binary 11
315 degrees	Binary 10

QPSK is more tolerant of link degradation than 8PSK, but does not provide as much data capacity. [4]

13.9 Intermediate Frequency

In communications and electronic engineering, an intermediate frequency (IF) is a frequency to which a carrier frequency is shifted as an intermediate step in transmission or reception. The intermediate frequency is created by mixing the carrier signal with a local oscillator signal in a process called heterodyning, resulting in a signal at the difference or beat frequency. Intermediate frequencies are used in super heterodyne radio receivers, in which an incoming signal is shifted to an IF for amplification before final detection is done. There may be several such stages of intermediate frequency in a super heterodyne, which is called double (or triple) conversion. There are some values for intermediate frequencies. [4]

Ex:

Audio signal/am: 455 KHz

FM: 10 MHz

TV/Video: 26-45 MHz

Satellite: 30-60 MHz

13.10 Up Converter

A block up converter (BUC) is used in the transmission (uplink) of satellite signals. It converts a band (or "block") of frequencies from a lower frequency to a higher frequency. Modern BUCs convert from the L band to K_u band, C band and K_a band. Older BUCs convert from a 70 MHz intermediate frequency (IF) to K_u band or C band.

BUCs used in remote locations are often 2 or 4 W in the K_u band and 5 W in the C band. The 10

MHz reference frequency is usually sent on the same feed line as the main carrier. Many smaller

BUCs also get their DC current over the feed line, using an internal DC block.

BUCs are generally used in conjunction with low-noise block converters (LNB). The BUC, being an up-converting device, makes up the "transmit" side of the system, while the LNB is the down-converting device and makes up the "receive" side. An example of a system utilizing both a BUC and an LNB is a VSAT system, used for bidirectional internet access via satellite.[1]

Figure 13.10 Up-Converters

13.11 Radio Frequency

Radio frequency (RF) is a rate of oscillation in the range of about 3 kHz to 300 GHz, which corresponds to the frequency of radio waves, and the alternating currents which carry radio signals. RF usually refers to electrical rather than mechanical oscillations, although mechanical RF systems do exist.

In order to receive radio signals an antenna must be used. However, since the antenna will pick up thousands of radio signals at a time, a radio tuner is necessary to tune in to a particular frequency (or frequency range). This is typically done via a resonator – in its simplest form, a circuit with a capacitor and an inductor forming a tuned circuit. The resonator amplifies oscillations within a particular frequency band, while reducing oscillations at other frequencies outside the band.[1]

13.12 Chart of Radio Frequency

Frequency	Designation	Abbreviation
300-3000Hz	Voice frequency	VF
3-30KHz	Very low frequency	VLF
30-300KHz	Low frequency	LF
300KHz-3MHz	Medium Frequency	MF
3-30MHz	High frequency	HF
30-300MHz	Very high frequency	VHF
300MHz-3GHz	Ultra high frequency	UHF
3GHz-30GHz	Super high frequency	SHF
30-300GHz	Extra high frequency	EHF

13.13 High power amplifier

An RF power amplifier is a type of electronic amplifier used to convert a low-power radio-frequency signal into a larger signal of significant power, typically for driving the antenna of a transmitter. It is usually optimized to have high efficiency, high output Power (P1dB) compression, good return loss on the input and output, good gain, and optimum heat dissipation.[1]

Figure 6.6 High Power Amplifiers (HPA)

13.14 Wave Guide

A waveguide is a structure which guides waves, such as electromagnetic waves or sound waves. There are different types of waveguide for each type of wave. The original and most common meaning is a hollow metal pipe used for this purpose.

Waveguides differ in their geometry which can confine energy in one dimension such as in slab waveguides or two dimensions as in fiber or channel waveguides. In addition, different waveguides are needed to guide different frequencies: an optical fiber guiding light (high frequency) will not guide microwaves (which have a much lower frequency). As a rule of thumb, the width of a waveguide needs to be of the same order of magnitude as the wavelength of the guided wave.[1]

Figure 13.14Wave Guide

13.15 Feed Horn

The feed horn is the part of a satellite dish system which gathers the reflected signal from the dish and focuses it towards the LNB.

The feed horn also does the job of attenuating unwanted signals from sources like adjacent channels. This is done by selection of the polarity of the waves that are to be received. As an accessory located at the focal point of a satellite dish system or a parabolic antenna, it gathers the reflected signal from the dish and focuses it towards the Low Noise Block (LNB), which is usually affixed in or on the dish.

An LNB with an integrated feed horn is referred to as an LNBF. Most LNB are of this form, with a feed horn at the front to catch high frequency satellite signals reflected from the dish.[1]

Figure 13.15 Feed Horns

13.16 Antenna

Satellite TV station are using the C band parabolic Dish antenna for both transmitting and receiving. Basically the TV station are using 4.5 to 5.0 diameter antenna for transmitting.
A parabolic antenna is a high-gain reflector antenna used for radio, television and data communications, and also for radiolocation (radar), on the UHF and SHF parts of the electromagnetic spectrum. The relatively short wavelength of electromagnetic radiation at these frequencies allows reasonably sized reflectors to exhibit the desired highly directional response for both receiving and transmitting.[1]


13.17 Elevation

Elevation is the angular measurement of a satellite above the horizon.

Elevation is measured in degrees. A satellite which is higher in the sky will have a greater elevation than one which is close to the horizon.

A satellite exactly level with the horizon would have an elevation of 0 degrees. A satellite with an elevation of 90 degrees would be directly overhead.

Knowing the elevation of a satellite from your location is critical to being able to successfully point a satellite antenna to it.[4]

13.18 Low Noise Block

An LNB - Low Noise Block (also called an LNC- Low Noise Converter), is used for communications (broadcast) satellite reception. The LNB is usually affixed either in or on the satellite dish.

The purpose of the LNB is to utilize the super heterodyne effect; and amplify and convert a wide block (band) of frequencies. This helps compensate the signal loss associated with typical coaxial cable at relatively high frequencies.

The term 'low noise' relates to the quality of the 1st stage input amplifier transistor, measured in either called Noise Temperature units, Noise Figure units or Noise Factor units.

The "low-noise" part also indicates that amplification and mixing takes place prior to cable attenuation, in a circuit that requires no power supply or receiver.

With the high frequencies that satellites operate at, it is critical that the noise is controlled prior to signal processing.

An LNB helps keep the overall sound and picture of satellite TV from becoming greatly degraded, without the need of introducing a much larger dish reflector.
For wide-band satellite television carrier reception (generally 27 MHz wide band), the tolerance (accuracy) of the LNB local oscillator frequency needs to be in the range of ±500kHz, This makes low cost DRO's (dielectric oscillators) feasible.[1]

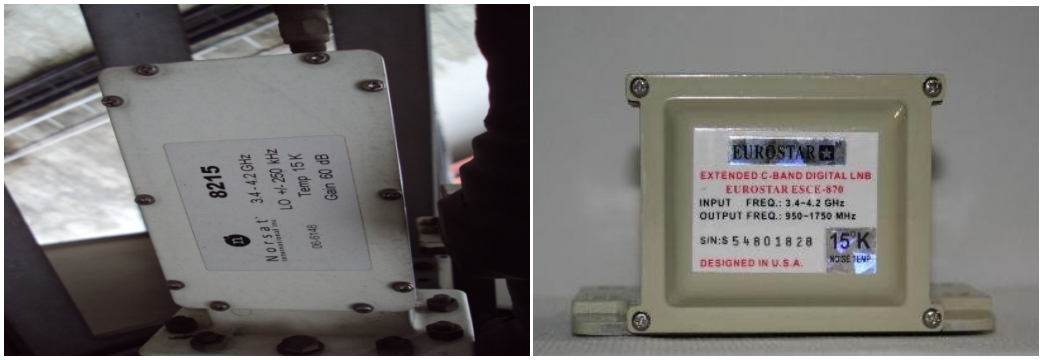


Figure 13.18 LNB

13.19 Integrated Radio Decoder

An integrated receiver/decoder (IRD) is an electronic device used to pick-up a radio-frequency signal and convert to audio video signal.

Figure 13.19 IRD

13.20 Base band system

In telecommunications and signal processing, base band is an adjective that describes signals and systems whose range of frequencies is measured from close to 0 hertz to a cut-off frequency, a maximum bandwidth or highest signal frequency; it is sometimes used as a noun for a band of frequencies starting close to zero. Base band can often be considered as a synonym to low pass or non-modulated, and antonym to pass band, band pass, carrier-modulated or radio frequency (RF) signals.[1]

Boishakhi downlink parameters

Name of the Satellite:

Apaster IIR Orbit Location:

76.5˚ E Modulation: QPSK

Down-link Frequency:

4009 MHz Symbol Rate:

4300 Ksps FEC: ¾

Polarization:

Horizontal Type of carrier:

MPEG-2/DVB-S

Chapter-14

ENG, EFP & Live

14.1 Electronic news gathering (ENG)

Electronic News Gathering is an independent single camera operation normally for news event coverage.

ENG is a broadcasting (usually television) industry acronym which stands for electronic news gathering. It can mean anything from a lone broadcast journalist reporter taking a single camcorder out to get a story, to an entire television crew taking a production truck or satellite truck on location to do a live television news report for a newscast.[4]

14.2 Electronic field production (EFP)

Electronic Field Production is a wider setup i.e. more than 1 cam and normally it comes together with a switcher, several monitors and sets of cables. It can be a live or recording coverage e.g. concert, football match and seminars.

14.3 Digital Satellite news gathering (DSNG)

DENG is a broadcasting (usually television) industry acronym which stands for digital electronic news gathering.

Satellite News Gathering is a mini transmitter to send footages via satellite or micro link depend on the mode of transmission. Those days, it takes a big lorry to carry such equipment used to be called OB van.

Our modulation products are based on the DVB-DSNG and DVB-S2 standard. Their very high bandwidth efficiency enables mobile TV contribution even in High Definition.[4]

14.4 Input

14.4.1 Video

Analog composite video (PAL/NTSC) 10bit sampling SNR >60dB SDI serial digital video 625 and 525 line standard supported with EDH error detection and health monitoring HSYNC support for 625 and 525 line.

14.4.2 Audio

2 stereo pairs input via analog, AES-EBU or SDI Analog audio balanced 600Ω/20kΩ Input levels: 12, 15, 18, 21, 22 and 24dB Up to 4 stereo pairs can be de-embedded from SDI.

14.5 Output

Note: Base unit will have **either** 70MHz IF output **or** L-Band output.

14.6 IF Output Option

IF Frequency: 50 to 180 MHz (1 kHz steps) Output Power: -20 to +5dBm (0.1 dB steps) Monitor Output: -20dB relative to main IF output

14.7 L-band Output Option

Frequency: 950 to 1750 MHz (1 kHz steps) Output Power: -20 to +5dBm (0.1 dB steps) Monitor Output: -30dB relative to main output

Switchable up-converter Power: +24Vdc, 500mA max Switchable 10MHz reference

Signal Conditioning**:** EN 300 421 (DVB-S) and EN 301 210 (DVB-DSNG) Modulation: QPSK, 8-PSK (option) and 16-QAM (option)

Symbol rate: 1 to 48 MSym/s variables in 1 Sym/s increments

Transport Stream: 3 x ASI Copper Single Program Transport Stream [6]

Figure 14.7 DSNG Van

14.9 Transmit

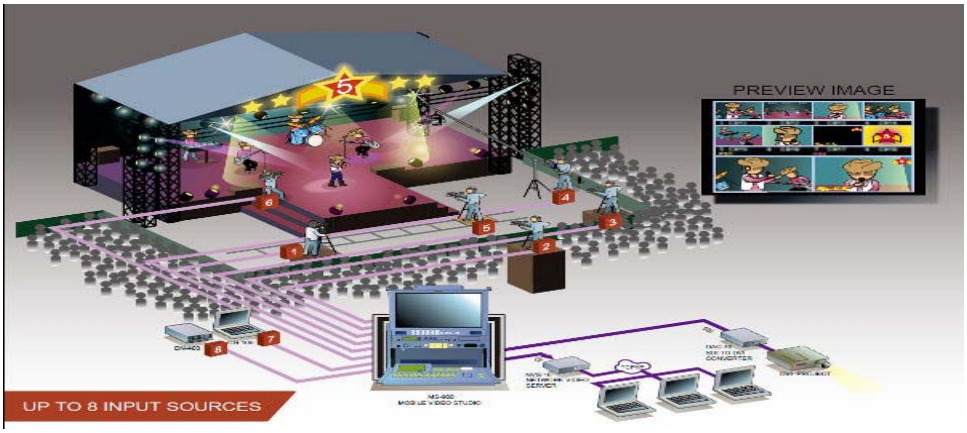
Transmit Bands: FA-180/60 5 . 8 5 to 6.65 GHz 3dB Beam widths: <2.0˚ at 5.85GHz

Transmit Power: 1.5KW max

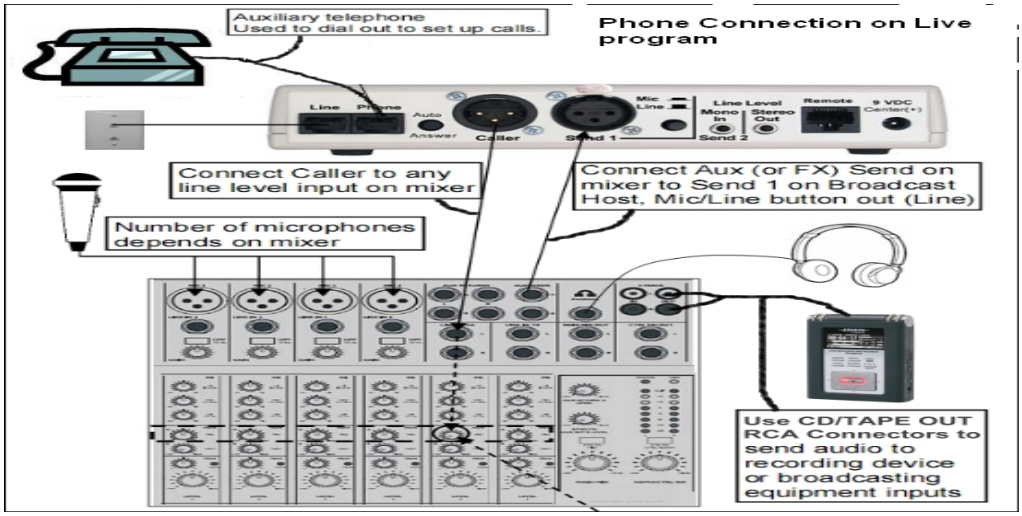
Off Axis Transmit Gain: <29-25 log dBi VSWR: 1.3:1

Transmit Gain: FA-180/60 39.5dBi mid band[5]

14.10 Live Transmission :



Phono on Live Transmission program :



Viewers can call on talk show while transmitting Live program or music show

Chapter-15

CONCLUSION

This report is a new approach to describe the broadcast composition and implementation issues. All the agendas of this repot are tried to illustrate with the basics of communication. It is necessary for an efficient and successful broadcast engineer to make his steps with the core fundamentals of communication studies: but in real life there is distortion. This report to make a bridge between the core basics and the real time practices.

Firstly in this report some primary issues of satellite communication phenomenon and analog and digital video standards have discussed. After that a chapter was overall Satellite TV station of "**Boishakhi TV**" internal structures and with its administration. In the earth station chapter there was an elaborate discussion of satellite communication, it parameters, antenna parameters, earth station devices and its work functions. I have also discussed how a signal is transmitted accurately with the help of diagram, Most of all TV channels in our country transmit the SDI(Aspect Ratio **4:3**) signal, but recently the "**Channel 71"** transmits the HD (Aspect Ratio **16:9**) signal. Our Television Channels use single channel per carrier and they use 6MHz BW. But if we can use multi channels per carrier. We can use more channels in the same BW. The broadcast automation software's **AVECO** also have been introduced with some featuring illustrations.

The objective of this report is to produce an overall idea about the newly practiced broadcast techniques. It is an effort to be a useful guideline for the new or for the broadcast engineers of tomorrow.

List of Abbreviations

A

ADC-Analog to Digital Converter

APTN-Aboriginal Peoples Television Network

B

BPP-Bits Per pixel

BEC-Backward Error Correction BUC-Block up Converter

BPF-Band Pass Filter

BUD-Big Ugly Dish

C

CAR-Central Apparatus Room

CATV-Community Antenna Television CD-Compact Disc

CRT-Cathode Ray Tub

COAB-Cable Operator Associations of Bangladesh CCU-Camera Control Unit

CRC-Cyclic Redundancy Check

D

DVB-Digital Video Broadcasting

DVB-S-Digital Video Broadcasting -Satellite DAC-Digital to Analog Converter

DVD-Digital Video Disc

DSNG-Digital Satellite News Gathering

E

EDTV-Enhanced Definition Television ENG-Electronic news gathering

EFP-Electronic field Production

EIRP- Effective Isotropic Radiated Power

F

FEC-Forward Error Correction
FCC-Federal Communication Commission

G

GOP-Group Of pictures

GPS-Global Positioning Systems GEO-Geostationary Earth Orbit

H

HD-High Definition

HDTV-High Definition Television HPA-High Power Amplifier

HEO-High Earth Station

I

IF-Intermediate Frequency

IRD-Integrated Radio Decoder

L

LCD-Liquid Cristal Display LEO-Low Earth Orbit

LNC-Low Noise Converter

LNBF-Low Noise Block Frequency

M

MCR-Master Control Room

MPEG-Moving Pictures Experts Group MCPC- Multiple channels per carrier

MEO-Medium Earth Orbit

N

NTSC-National Television Systems Committee

O

OB-Outside Broadcast

P

PCR-Production Control Room PAL-Phase Alternating Line PQM-Phase Quadrate Mixing

Q

QEF-Quasi Error Free

S

SECAM-Sequential Color with Memory SDTV-Standard Definition Television SCPC-Single Channel PER Carrier

U

UCS-United Cable Service

UPS- Uninterruptible power supply

V

VCR-Video Cassette Recorder VTR-Video Tape Recorder

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