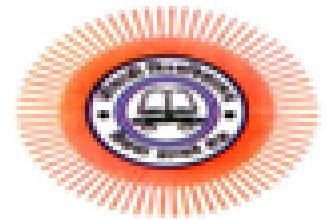


Institute of Engineering JIWAJI UNIVERSITY



PRESENTATION ON TV & RADAR

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EL- 804

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MODULATION

TWO TYPES OF MODULATION

- **HIGH LEVEL MODULATION:**

In this, both the audio and video signals are amplified to the required level before modulation.

- **LOW LEVEL MODULATION:**

In this, the signal is modulated before amplification.

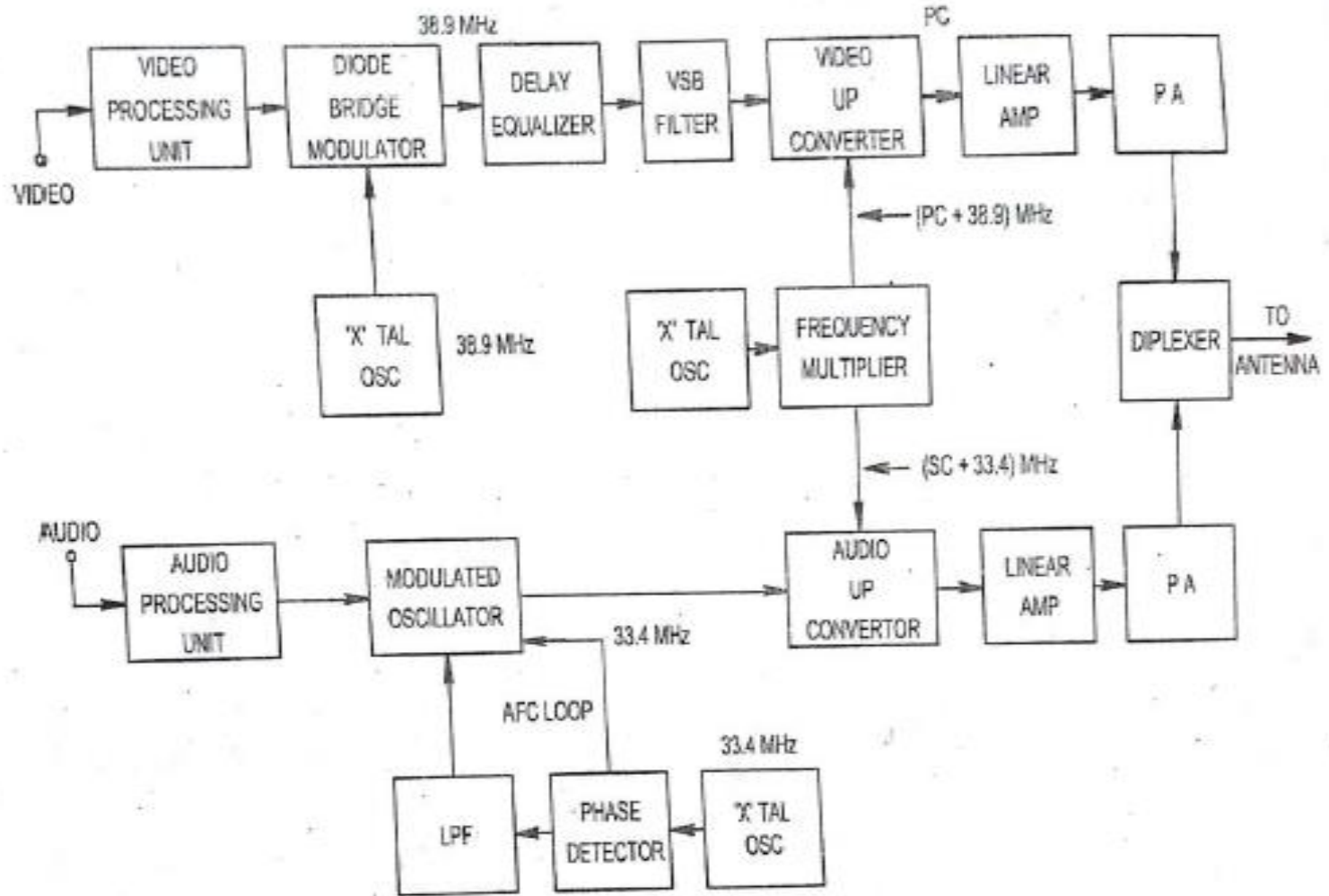
Principles

- A television transmitter both audio and video signals using a channel bandwidth of 7 MHz. The two outputs, one from picture signal transmitter and the other from sound signal transmitter are combined in suitable network and then fed to a common antenna network for transmission.

Comparison between high level modulation and low level modulation

| S.No | High level modulation | Low level modulation |
|------|--------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| 1 | Both audio and video signals are amplified to required level before modulation | Both audio and video signals are amplified to required level after modulation |
| 2 | Transmitter power high | Transmitter power is low |
| 3 | Difficult to design and operation | Simple is design and operation |

BLOCK DIAGRAM OF LOW LEVEL IF MODULATED TV TRANSMITTER



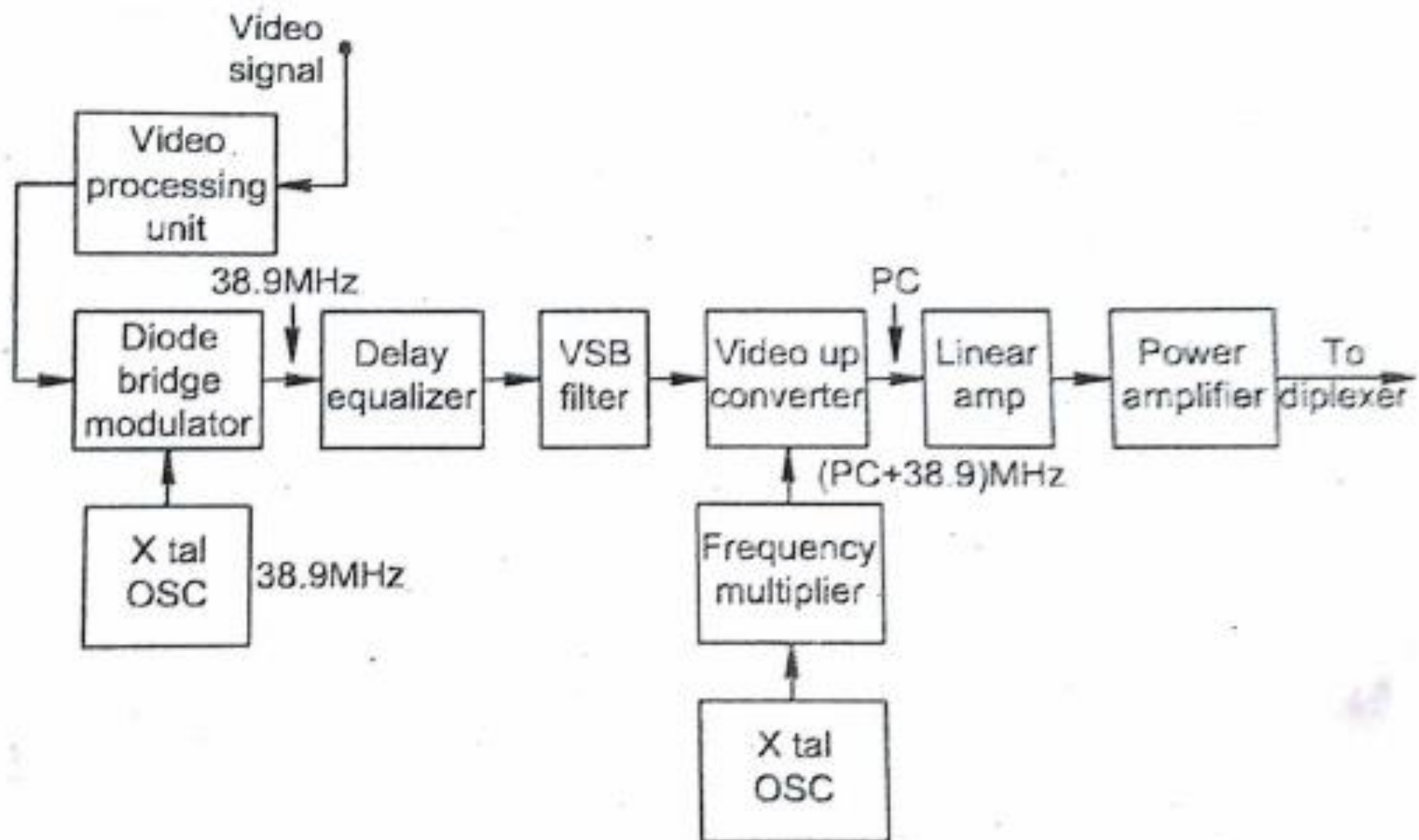
In this video modulation is done at IF frequency of 38.9 MHz and sound modulation is done at IF frequency of 33.4 MHz. Both video and sound IF UP converted after modulation. A VSB filter is also included at lower IF power level. After up conversion they are given to lines, amplifier for power amplification and then it is connected to the diplexer unit.

VISUAL EXCITER:

Visual exciter deals with circuits related to video signals. It consists of video processing unit, video modulator, VSB filter, Delay equalizer, Frequency up converter, Linear and power amplifier.

VIDEO PROCESSING UNIT:

In video processing unit, the Camera output signal having IVP-P amplitude is converted into standard form by eliminating hum and noise. Also after proper amplification sync pulses and blanking pulses are added to the Camera signal to get CVS.



VIDEO MODULATOR:

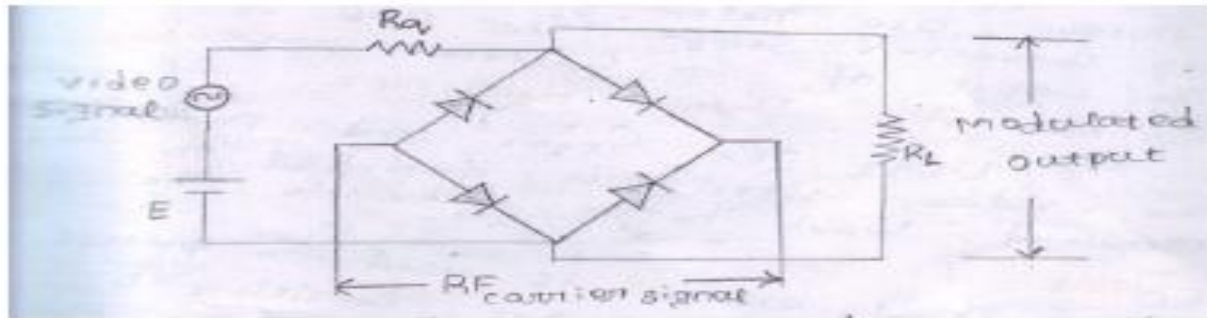
convert by the positive and negative half cycles. During the positive half cycle of carrier signal, RL is short circuited. So output across RL is zero. During negative half cycle, RL is series with RS. So output is proportional to the potential divider ratio formed by RS and RL.

Instantaneous amplitude of output voltage is,

$$e_o = \frac{R_L}{R_S + R_L} (E_o + E_m \sin \omega_m t) \cos \omega_c t$$

$$= A_o (1 + m \sin \omega_m t) \cos \omega_c t$$

From the above equation, the video signal is amplitude modulated by the carrier signal.



A bridge diode modulator or a diode balanced modulator is used for LLM.

In diode bridge modulator, the diodes are switched ON and OFF by the carrier voltage ($E_c \cos \omega_c t$)

VSB FILTER:

It consists of four sections of LPF networks. This is used to attenuate the frequencies beyond 1.5 MHz.

DELAY EQUALIZER:

This is used to avoid the phase distortions.

FREQUENCY UP CONVERTER:

The VSB filter output and crystal oscillator output are heterodyned in the frequency UP converter stage. The BPF is used at the output of UP converter stage.

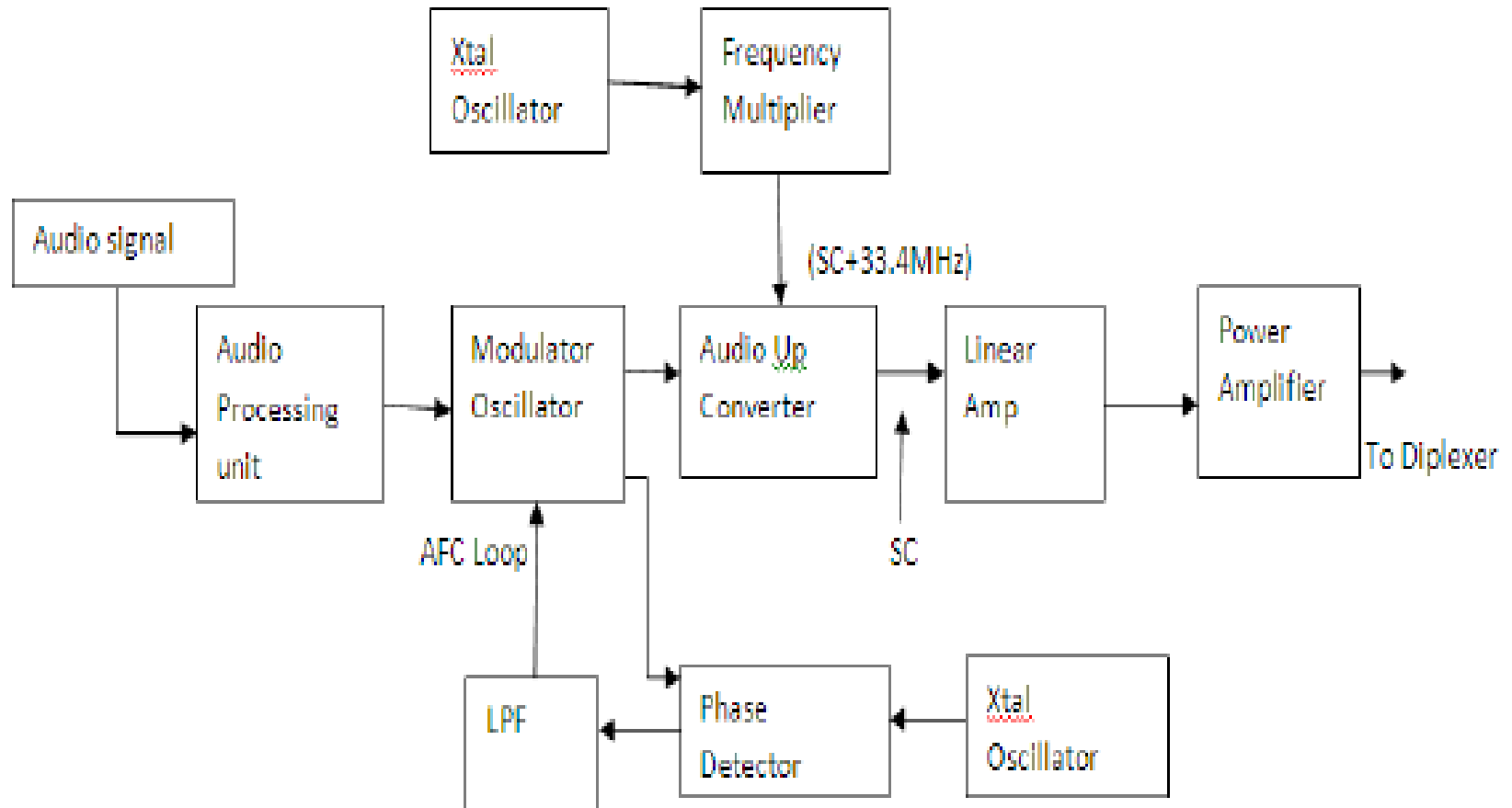
LINEAR AND POWER AMPLIFIER:

Using the linear and power amplifier, the video signal is amplified to the required level before fed into the diplexer.

AURAL EXCITER:

Aural exciter is used to process the audio signal. This section consists of, Audio processing unit, Audio modulator, Audio UP converter, Linear and power amplifier. Block diagram of aural exciter is show

Block Diagram of Aural Exciter



AUDIO PROCESSING UNIT:

In this section, pre emphasis circuit and amplifier are used to improve the signal to noise ratio and amplify the audio signal to the required level.

AUDIO MODULATOR:

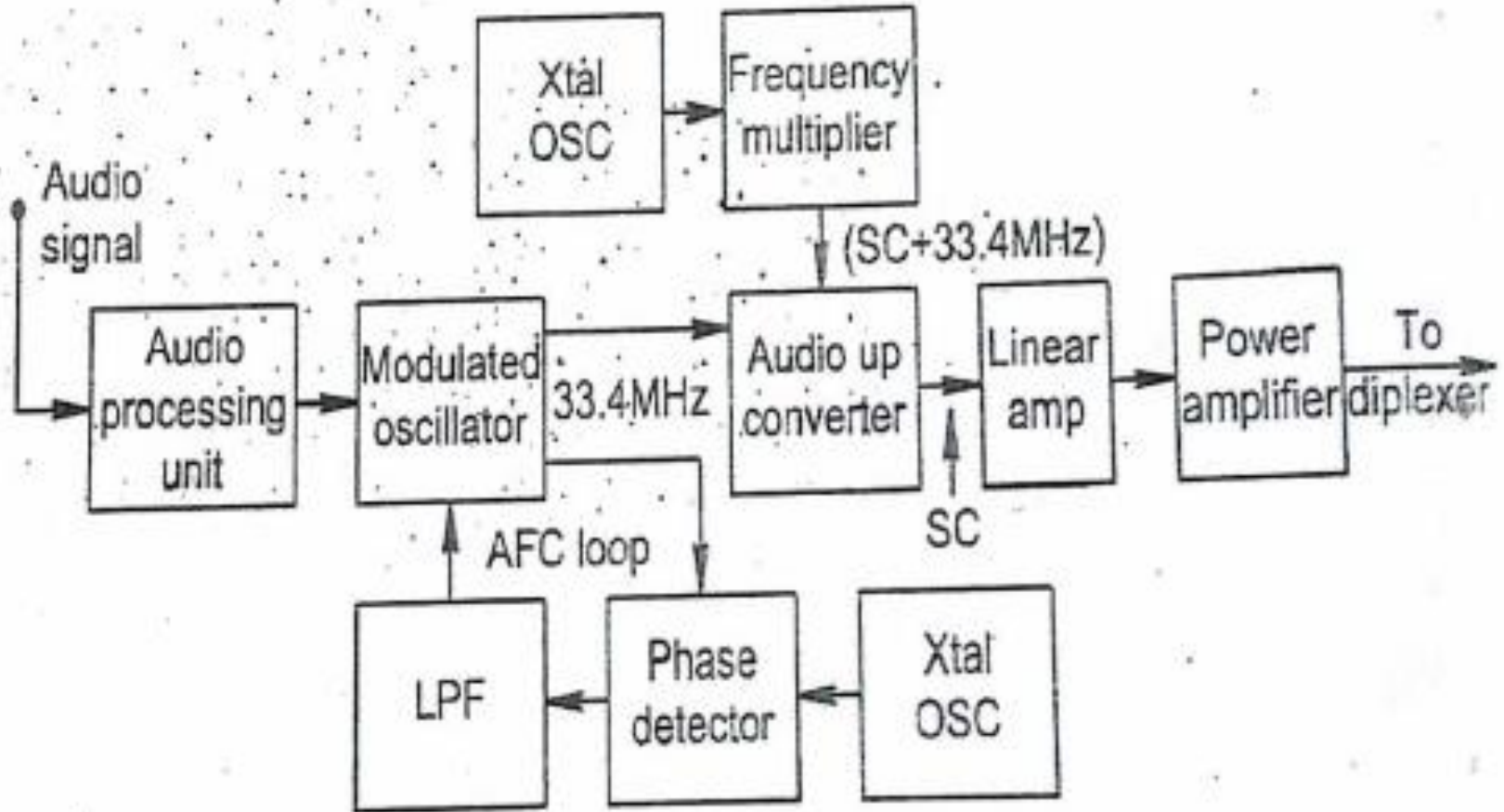
Audio modulator has two inputs, one is from the video processing unit and the other is from crystal oscillator. These two frequencies are given to Varactor diode in parallel with LC tank circuit. The output is sound IF of 33.4 MHZ.

If there is any change in sound IF, the phase detector produces an error voltage. This voltage is given to the varactor diode to correct sound IF. Here the audio signal is frequency modulated.

AUDIO UP CONVERTER:

The output of audio modulator and crystal oscillator are heterodyned to produce the required audio signal output.

LINEAR AND POWER AMPLIFIER:



Using the linear and power amplifier the audio signal is amplified to the required level and is fed into the diplexer unit along with the video signal.