

UNIT – I TELEVISION ENGINEERING

1.1 TV FUNDAMENTALS

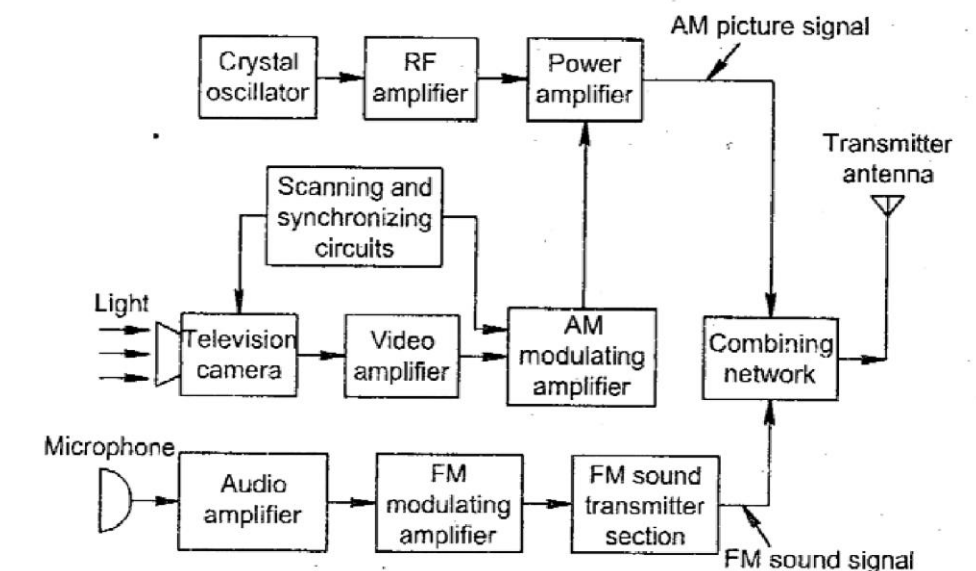
INTRODUCTION:

Television means Tele + Vision, i.e., Television is used to see the picture telecast from long distance.

In TV transmission both picture and sound are transmitted. For picture AM Modulation is used and for sound FM modulation is used.

1.1.1 BASIC BLOCK DIAGRAM OF TV TRANSMISSION:

The simplified block diagram of a Monochrome TV Transmitter is shown.



It consists of Television Camera, Video amplifier, AM Modulating amplifier, Audio amplifier, FM Modulating amplifier, FM sound transmitter, Crystal oscillator, RF amplifier, Power amplifier, Scanning and Synchronizing Circuits, Combining network, Transmitting antenna and Microphone.

- **TELEVISION CAMERA:**

Its function is to convert optical image of television scene into electrical signal by the scanning process.

- **VIDEO AMPLIFIER:**

Video amplifier amplifies the video signal.

- **AM MODULATING AMPLIFIER**

The video signals are amplified by the modulating amplifier to get the modulated signal.

- **AUDIO AMPLIFIER**

Audio amplifier amplifies the electrical form of audio signal from the microphone.

- **FM MODULATING AMPLIFIER:**

Sound signal from audio amplifier is frequency modulated by FM Modulating amplifier.

- **FM SOUND TRANSMITTER:**

FM modulated amplified signal is transmitted through this FM sound transmitter to transmitting antenna through the combining network.

- **CRYSTAL OSCILLATOR:**

Crystal Oscillator generates the allotted picture carrier frequency.

- **RF AMPLIFIER:**

RF amplifier amplifies the picture carrier frequency generated by crystal oscillator to required level.

- **POWER AMPLIFIER:**

Power amplifier varies according to the modulating signal from AM modulating amplifier.

1.1.2 SCANNING AND SYNCHRONIZING CIRCUITS

Scanning is the process where picture elements are converted into corresponding varying electrical signal

COMBINING NETWORK

Combining network is used to isolate the AM picture and FM sound signal during transmission.

TRANSMITTING ANTENNA:

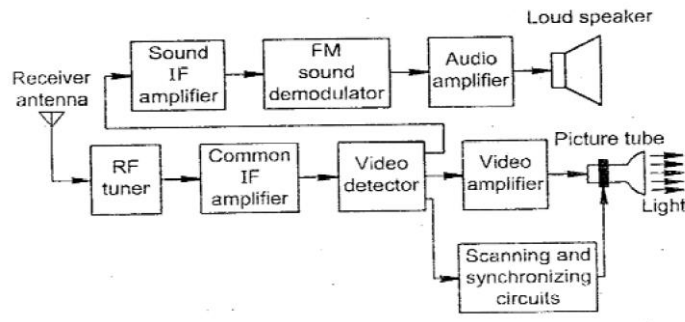
Transmitting antenna receives the AM picture signal and FM sound signal from combining network for radiation as electromagnetic waves.

MICROPHONE:

Converts sound associated with picture being televised into proportionate electrical signal.

1.1. 3 SIMPLE BLOCK DIAGRAM OF TV

RECEPTION BASIC MONOCHROME TV



RECEIVER

Block diagram of a monochrome TV receiver is shown. It consists of RF Tuner, Receiver antenna, common IF amplifier, video detector, video amplifier, scanning and synchronizing circuits, sound IF amplifier, FM Sound demodulator, Audio amplifier, Loud Speaker, Picture tube.

RF TUNER:

RF Tuner selects the desired channel frequency band from the receiving antenna.

RECEIVER ANTENNA:

Receiver antenna intercepts the radiated RF signals and sends it to RF Tuner.

COMMON IF AMPLIFIER:

There are 2 or 3 stages of IF amplifiers.

VIDEO DETECTOR:

Used to detect video signals coming from last stage of IF amplifiers.

VIDEO AMPLIFIER:

It amplifies the detected video signal to the level required.

SCANNING AND SYNCHRONIZING CIRCUITS:

Scanning is the process where picture elements are converted into corresponding varying electrical signals.

SOUND IF AMPLIFIER:

Detected audio signal is separated and selected for its IF range and amplified.

FM SOUND DEMODULATOR:

FM Sound signal is demodulated in this stage.

AUDIO AMPLIFIER:

FM demodulated audio signal is amplified to the required level to feed into the loud speaker.

LOUD SPEAKER:

Loud Speaker converts FM demodulated amplifier signal associated with picture being televised into proportionate sound signal.

PICTURE TUBE:

In picture tube the amplified video signal is converted back into picture elements.

SCANNING:

Scanning is the process used to convert the optical into electrical signal. Fastest movement of electron beam on the image is called scanning.

1.2 SCANNING PROCESS:

Scanning process is a technique similar to reading of written information on a page starting at the top left and processing line by line downwards to the end at the bottom right.

Scanning is done frame by frame. Each frame consists of 625 horizontal lines. Each frame is scanned at a rate of 25 frames / sec.

Scanning types,

- 1.Horizontal Scanning
- 2.Vertical Scanning
- 3.Sequential (or) Progressive Scanning
- 4.Interlaced Scanning.

1.3 HORIZONTAL SCANNING (H-SCANNING)

Movement of electron beam from left to right on the screen is known as trace period. When the beam returns quickly from right to left is called retrace or fly back.

Trace and retrace period together in horizontal direction is known as Horizontal Scanning.

$$\begin{aligned}\text{Horizontal frequency} &= \text{Number of lines in a Frame} * \text{Number of frames/sec} \\ &= 625 * 25 = 15,625 \text{ Hz}\end{aligned}$$

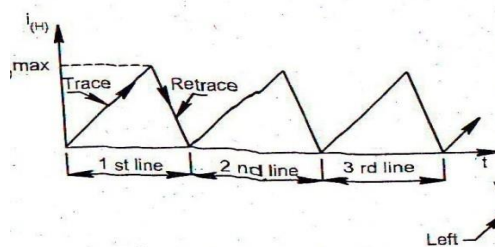


Fig.1.3 Waveform of horizontal deflection coils.

1.4 VERTICAL SCANNING (V – SCANNING)

Movement of electron beam in vertical direction. Movement of electron beam from top to bottom is called trace. Movement of beam from bottom to top of the frame is called retrace.