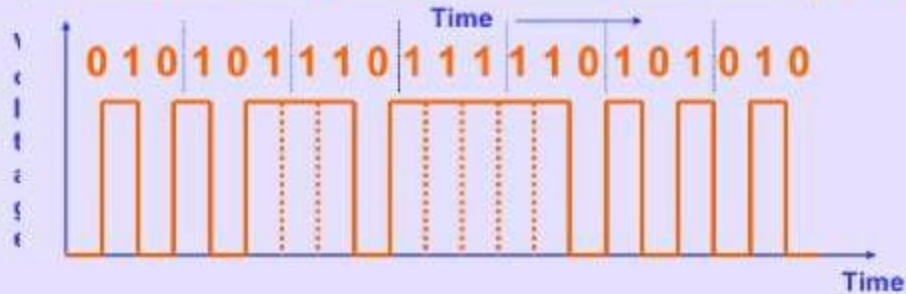
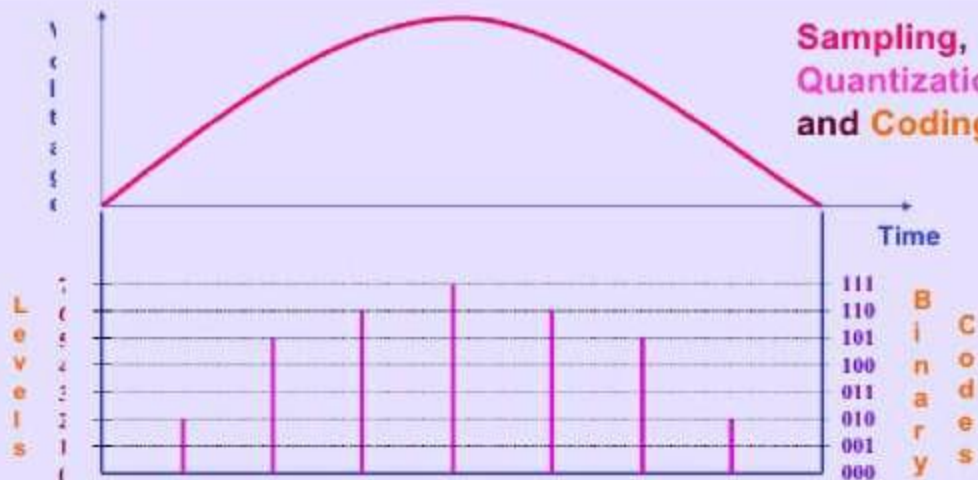


Pulse Code Modulation (PCM):

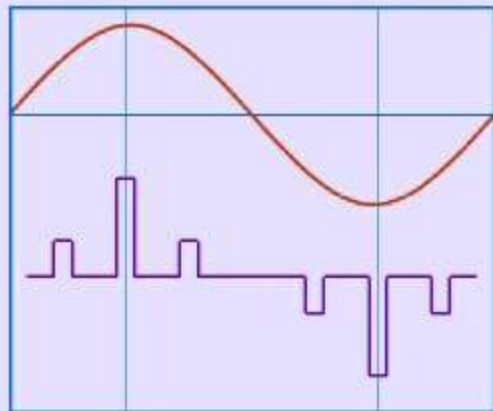
- * Analog signal is converted into digital signal by using a digital code.
- * Analog to digital converter employs two techniques:
 1. **Sampling:** The process of generating pulses of zero width and of amplitude equal to the instantaneous amplitude of the analog signal. The no. of pulses per second is called "sampling rate".
 2. **Quantization:** The process of dividing the maximum value of the analog signal into a fixed no. of levels in order to convert the PAM into a Binary Code. The levels obtained are called "quanization levels".
- * A digital signal is described by its 'bit rate' whereas analog signal is described by its 'frequency range'.
- * Bit rate = sampling rate x no. of bits / sample



Sampling, Quantization and Coding



Pulse Amplitude Modulator



Analog Signal

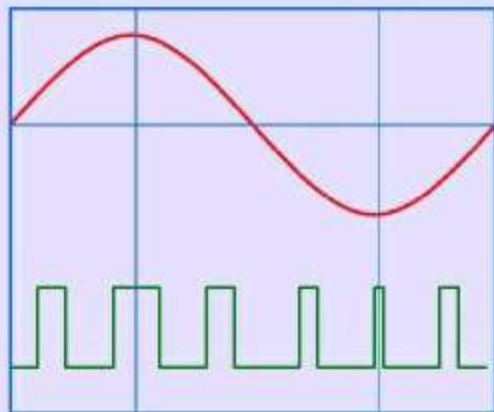
Amplitude Modulated Pulses



Pulse Width Modulation (PWM or PLM or PDM):

* In this type, the amplitude is maintained constant but the duration or length or width of each pulse is varied in accordance with instantaneous value of the analog signal.

* The negative side of the signal is brought to the positive side by adding a fixed d.c. voltage.



Analog Signal

Width Modulated Pulses

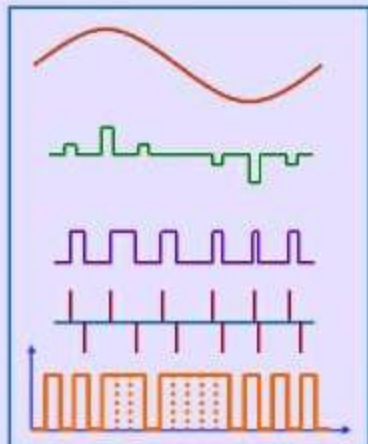


PULSE MODULATION

The process of transmitting signals in the form of pulses (discontinuous signals) by using special techniques.

The Chapter includes:

- **Pulse Amplitude Modulation**
- **Pulse Width Modulation**
- **Pulse Position Modulation**
- **Pulse Code Modulation**



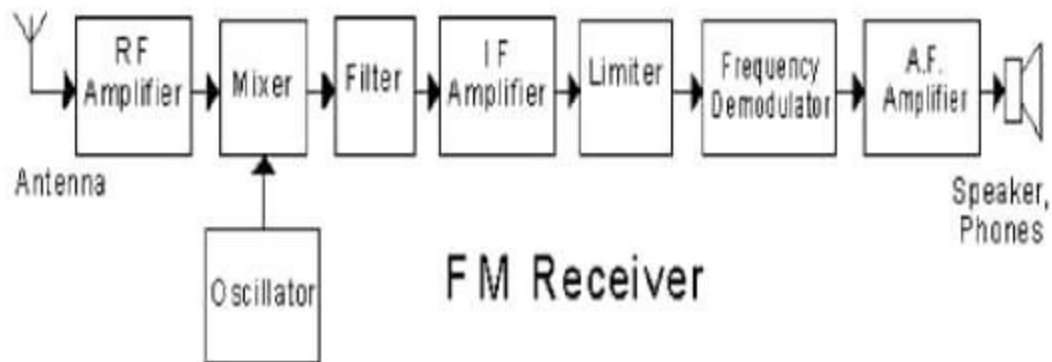
FM Receiver.

- FM receiver is the circuit that receive Frequency Modulated signals.
- Its frequency ranges from 88 to 108 Mega Hertz.
- FM Receiver and transmitters are more complex as compare to AM Receiver.
- FM Receiver was developed in United State in 1930s.

Mixer.

- In electronics frequency mixer is a nonlinear electrical circuit that creates new frequencies from two signals applied to it.
- If two signals at frequencies f_1 and f_2 are applied to a mixer, and it produces new signals at the sum $f_1 + f_2$ and difference $f_1 - f_2$ of the original frequencies.
- Mixers are widely used to shift signals from one frequency range to another, a process known as heterodyning.

Block Diagram.





Sections of Block Diagram of FM Receiver

Filter.

- Ceramic filters are electronic components used as the band pass element for Intermediate Frequency (IF) amplifier stages of an FM radio.
- It reject the unwanted signal received by antenna.

IF Amplifier.

- Intermediate Frequency Amplifier is used to amplify the Intermediate Frequency received from filter.
- IF amplifier is used to strengthen the intermediate frequency (IF) before forwarded to the limiter block.

Limiter.

- The signal received from IF Amplifier is applied to limiter which remove noise from received signal and gives a constant amplitude signal.
- Limiter (delimitter): fatherly damping function which is modulated amplitude waves (the signal sent by the transmitter) in order to form a pure FM signal.

Demodulator.

- A demodulator is an electronic circuit that is used to recover the information content from the modulated carrier wave.
- Demodulation is extracting the original information-bearing signal from a modulated carrier wave.
- FM demodulation or detection involves changing the frequency variations in a signal into amplitude variations at baseband, e.g. audio.

Oscillator.

- In electronics a local oscillator (LO) is an electronic oscillator used with a mixer to change the frequency of a signal.
- This frequency conversion process also called heterodyning produces the sum and difference frequencies from the frequency of the local oscillator and frequency of the input signal.
- Processing a signal at a fixed frequency gives a radio receiver improved performance.

AF Amplifier.

- In radio equipment Automatic Frequency Control (AFC), also called Automatic Fine Tuning (AFT), is a method or circuit to automatically keep a resonant circuit tuned to the frequency of an incoming radio signal.
- It is primarily used in radio receivers to keep the receiver tuned to the frequency of the desired station.