SNS COLLEGE OF ENGINEERING

An Autonomous Institution

Coimbatore-641 107

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

19EC504-ANALOG AND DIGITAL COMMUNICATION

III YEAR/ V SEMESTER

UNIT - II - RADIO TRANSMITTER & RECEIVER

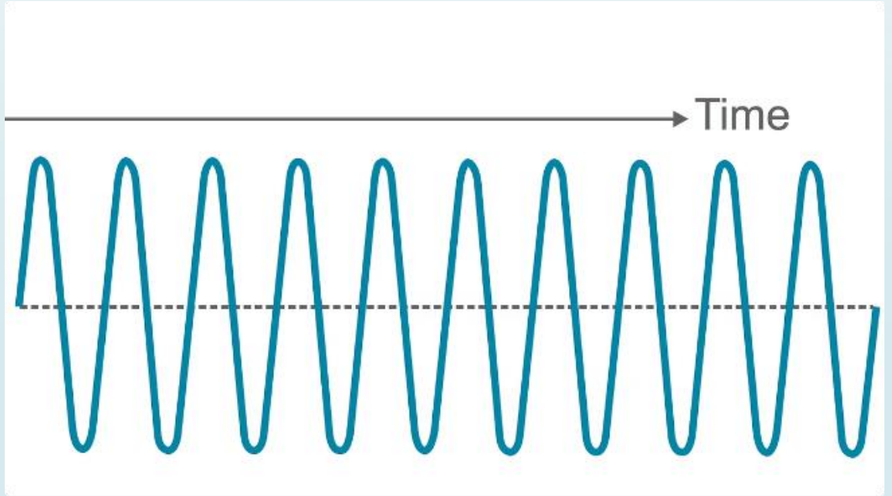
TOPIC - FM RECEIVERS

Introduction to FM Receivers

FM receivers are essential electronic devices that allow us to tune into radio broadcasts and enjoy a wide range of audio content, from music and news to podcasts and talk shows. They work by receiving radio waves modulated with audio signals, then converting those signals into sound waves we can hear.

Basic Principles of FM Modulation

FM modulation involves varying the frequency of a carrier wave to represent the audio signal. The carrier wave is a high-frequency signal that is easily transmitted over long distances. By changing the carrier wave's frequency in proportion to the amplitude of the audio signal, we encode the audio information.



1 Frequency Deviation

The extent to which the carrier frequency changes is known as frequency deviation, and it determines the bandwidth required for transmission.

2 Frequency Response

The range of frequencies that can be faithfully transmitted and received is called the frequency response, which affects the fidelity of the audio.

3 Signal-to-Noise Ratio

FM modulation offers a higher signal-to-noise ratio compared to AM, leading to clearer audio reception, especially in noisy environments.

Block Diagram of an FM Receiver

The basic building blocks of an FM receiver include an RF front-end, an intermediate frequency (IF) amplifier, an FM demodulator, and an audio amplifier.

1

RF Front-end

The RF front-end receives and filters the radio waves, selecting the desired FM broadcast frequency.

2

IF Amplification

The IF amplifier amplifies the signal at a fixed intermediate frequency for further processing.

3

FM Demodulator

The FM demodulator extracts the audio signal from the modulated carrier wave.

4

Audio Amplification

The audio amplifier boosts the signal to a level suitable for driving speakers or headphones.

RF Front-end and Tuning Circuitry

The RF front-end is responsible for receiving and amplifying the incoming radio waves. It typically includes an antenna, a preamplifier, and a tuning circuit.

Antenna

The antenna captures the radio waves from the air and converts them into electrical signals. The antenna's size and design are crucial for efficient reception at different frequencies.

Preamplifier

The preamplifier amplifies the weak signals received by the antenna to ensure a strong enough signal for further processing.

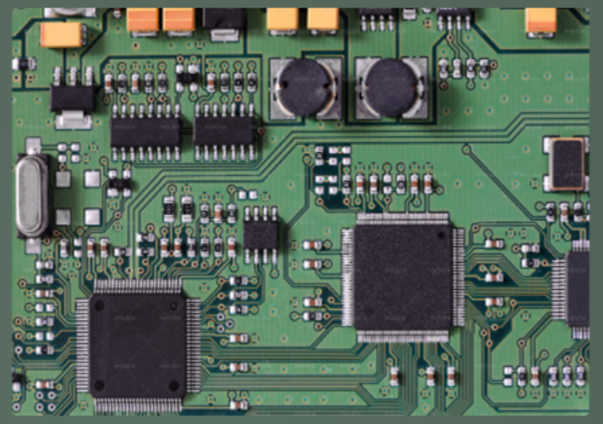
Tuning Circuit

The tuning circuit selects the desired FM broadcast frequency by filtering out other frequencies. This allows you to tune into different stations.

FM Demodulation Techniques

The FM demodulator extracts the audio signal from the modulated carrier wave by detecting changes in the carrier frequency.

Technique	**Description**
Slope Detection	Utilizes a tuned circuit to create a slope in the frequency response, and the audio signal is extracted by detecting changes in the voltage across the circuit.
Ratio Detector	Employs two diodes and a capacitor to create a voltage proportional to the frequency deviation, effectively extracting the audio signal.
Phase-Locked Loop (PLL)	Uses a feedback loop to lock onto the carrier frequency and extract the audio signal from the phase difference.



Intermediate Frequency (IF) Amplification

The IF amplifier amplifies the signal at a fixed intermediate frequency, typically around 10.7 MHz. This fixed frequency allows for more efficient amplification and filtering.

Amplification

The IF amplifier increases the signal strength, ensuring a clear and strong signal for demodulation.

Filtering

The IF amplifier filters out unwanted noise and interference that may have been picked up by the antenna.

Frequency Conversion

The IF amplifier often incorporates a frequency conversion stage to shift the incoming radio frequency to the desired IF frequency.

Applications and Advancements in FM Receivers

FM receivers have revolutionized how we consume audio content, offering a wide range of applications, from home entertainment to automotive systems and portable devices.

Car Radios

FM receivers are ubiquitous in automobiles, providing entertainment and information for drivers and passengers.

1

Home Audio Systems

FM receivers are commonly incorporated into home audio systems, allowing for listening to radio broadcasts and streaming

2

Portable Devices

Portable FM receivers are available in various forms, from small pocket radios to smartphone apps, offering convenience and accessibility.

3

Digital Radio

The advent of digital radio technology has brought new features and improved audio quality to FM receivers, offering a more

4

THANK YOU