

FM- TRANSMITTERS AND RECEIVERS



INTRODUCTION

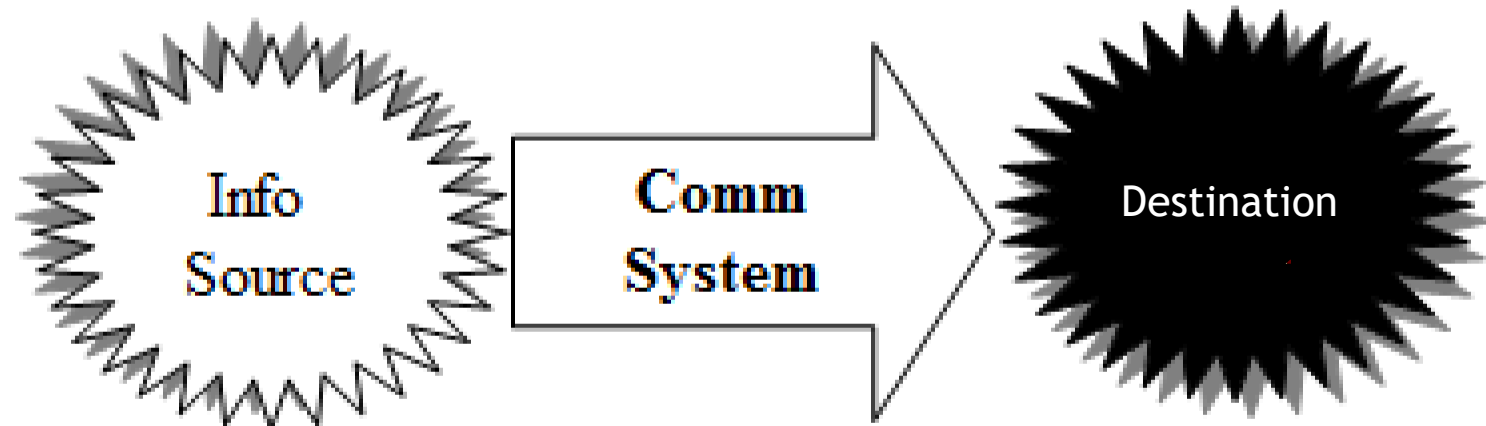
The FM transmitters and receivers are those devices which is used for sending and receiving FM signal.

The transmitters are those devices which is used to send frequency modulated wave through a band and

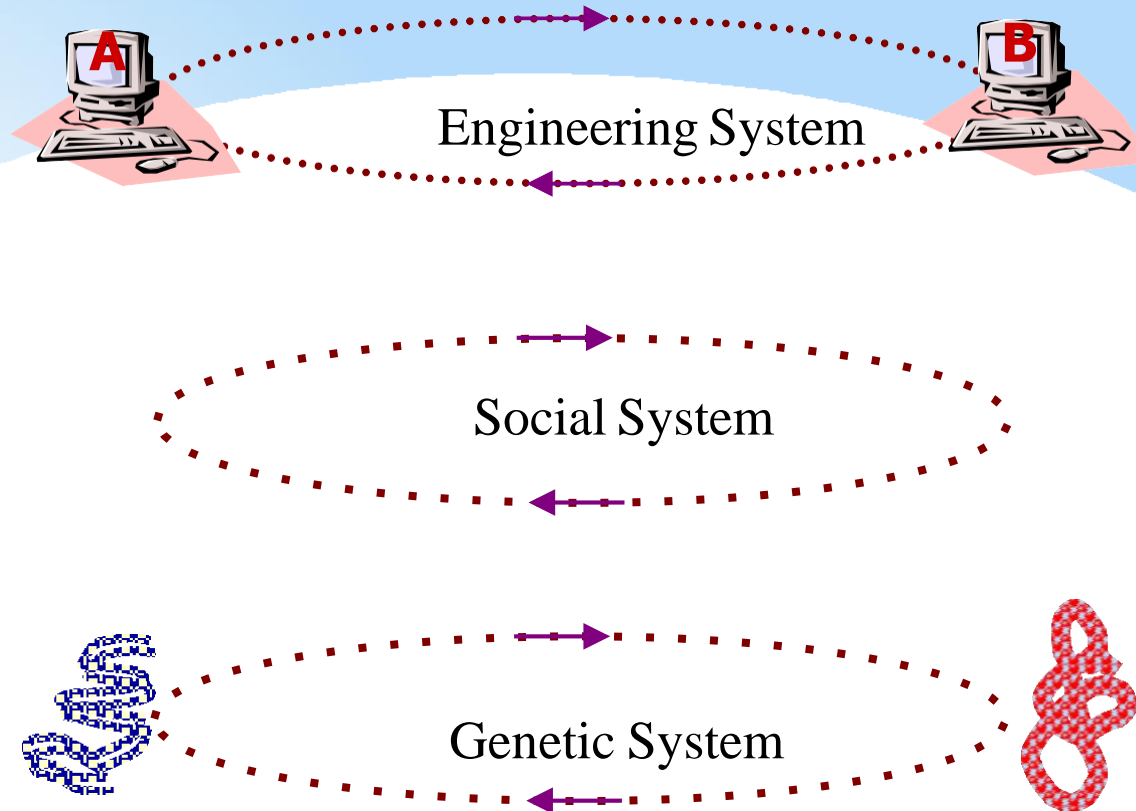
the receivers are the devices which received modulated signal then after demodulation it gives us the original signal.

What is a communications system?

- Communications Systems: Systems designed to transmit and receive *information*

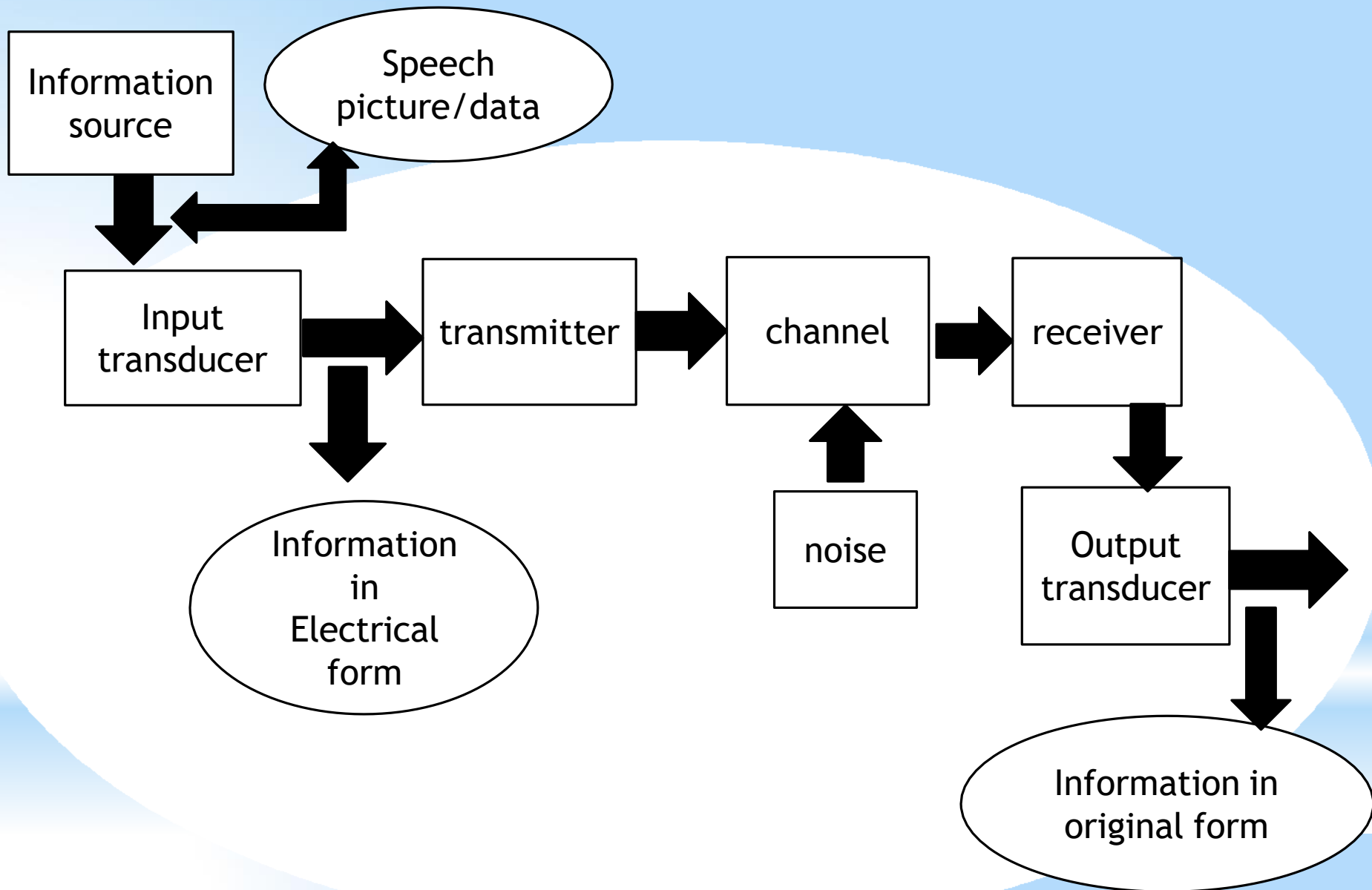


Ways of Communication System



History and fact of communication

Block diagram of communication system



Modulation

“IT IS A PHENOMENON IN WHICH THE CARRIER SIGNAL IS VARIED IN ACCORDANCE WITH THE MESSAGE SIGNAL”



TYPES OF MODULATION

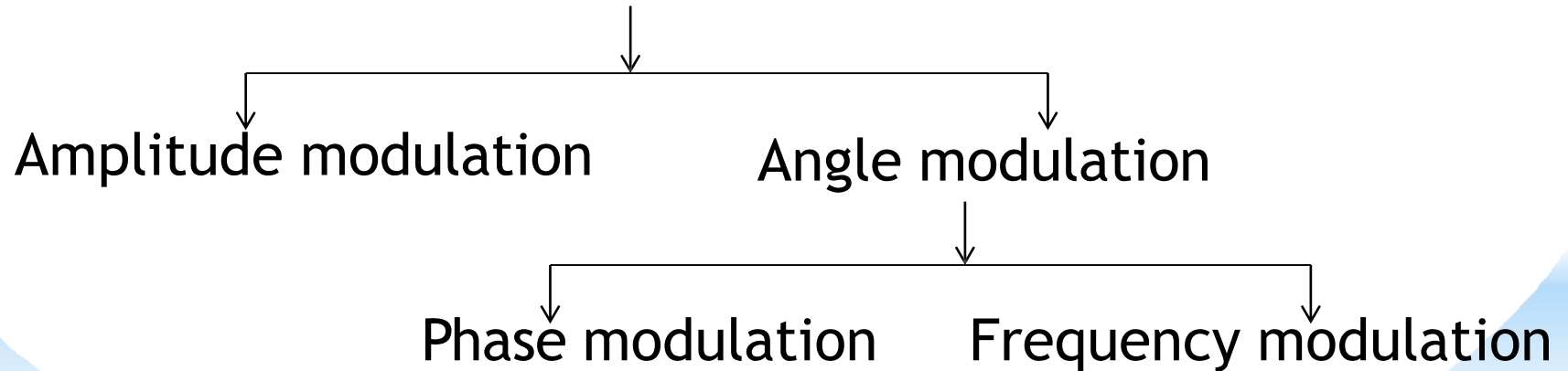
1. CONTINUOUS WAVE

When the carrier signal is continuous in nature, the modulation process is known as continuous wave modulation.

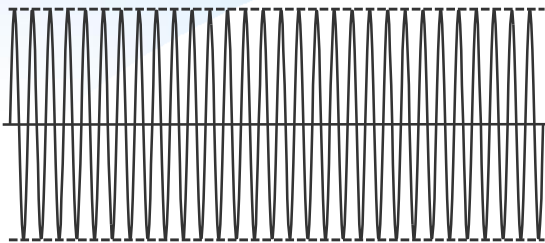
Pulse modulation

When the carrier wave is pulse type waveform, the modulation process is known as pulse modulation.

Continuous wave modulation

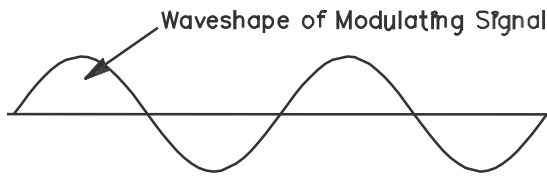


Frequency Modulation (FM)



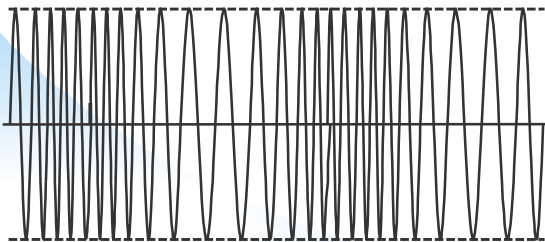
(A)

Unmodulated carrier, full power at all times



(B)

Waveform of modulating signal



(C)

Modulated carrier with frequency deviation and constant amplitude

DIFFERENT TYPES OF FM.

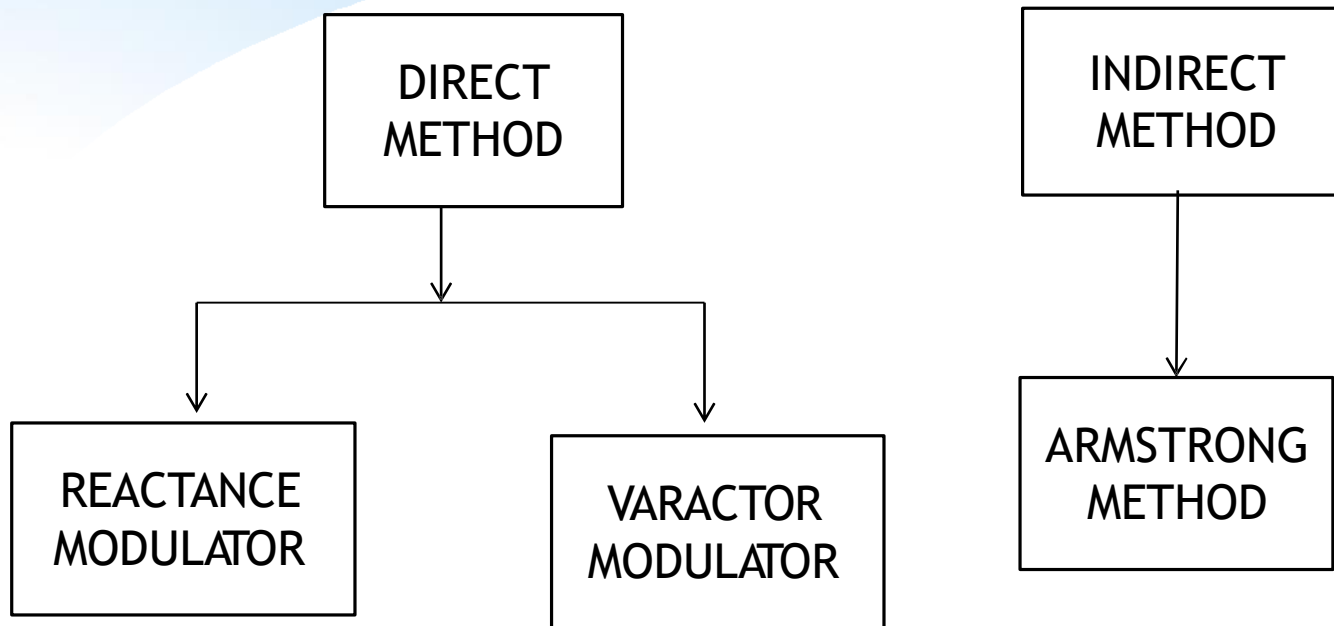
1. NARROW BAND F.M.

We know that the bandwidth of an FM signal depends upon the frequency Deviation ($\Delta\omega = k_f \cdot x(t)$).if frequency deviation is low it means k_f is low then bandwidth will be narrow then narrow band FM is formed.

2.WIDEBAND FM

If frequency deviation ($\Delta\omega = k_f \cdot x(t)$) is high , it means frequency sensitivity k_f is high result as bandwidth will be wide hence wide band is formed

METHODS OF FM GENERATION

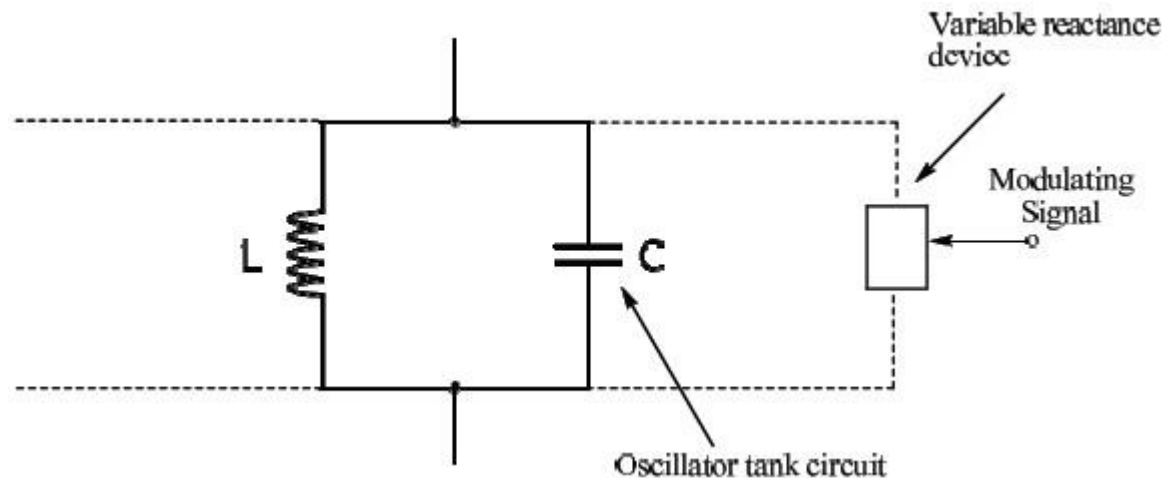


DIRECT METHOD-

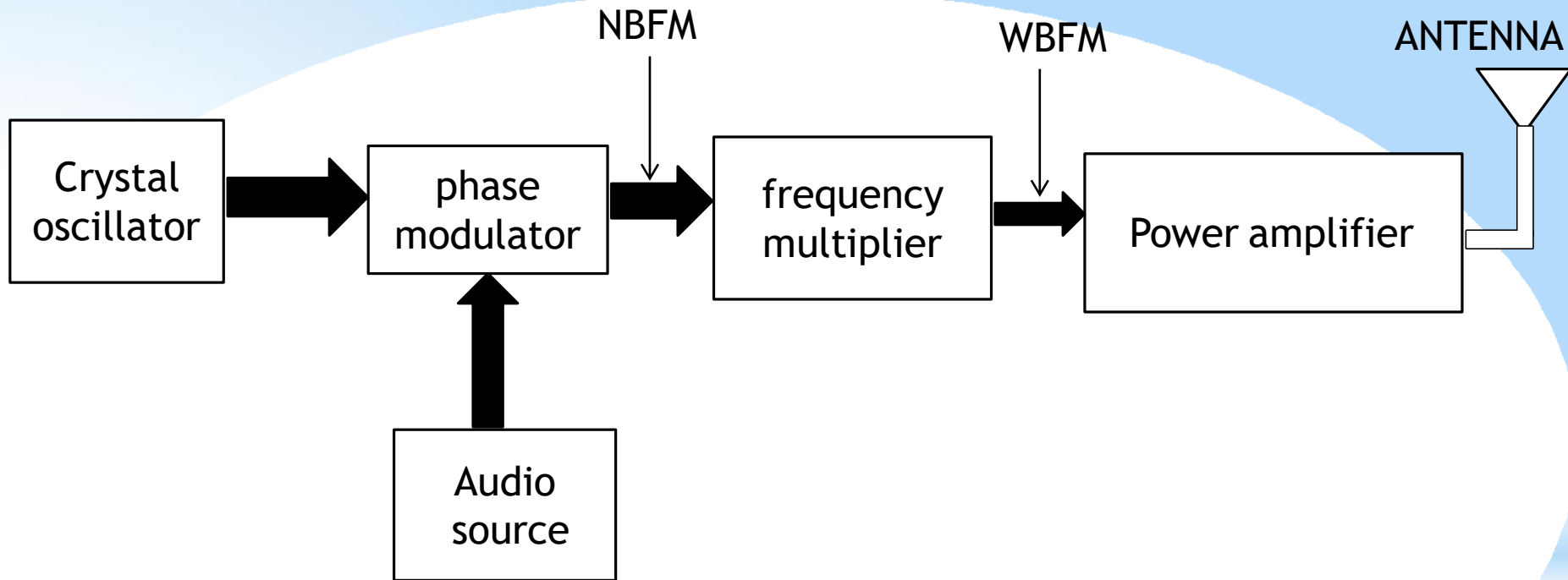
In direct method, the modulating (base band) signal directly modulates the carrier .The carrier signal is generated using a LC oscillator circuit.

Frequency of oscillator of carrier

$$\omega_c = \frac{1}{\sqrt{LC}}$$



FM Transmitters



Crystal oscillator-

Crystal oscillator generates the stable carrier signal.

phase modulator-

The phase modulator modulates the carrier signal and the message signal in the low power range to generate a narrowband FM.

Frequency multiplier-

The frequency multiplier is used to increase the frequency deviation and carrier signal frequency to a desired level.

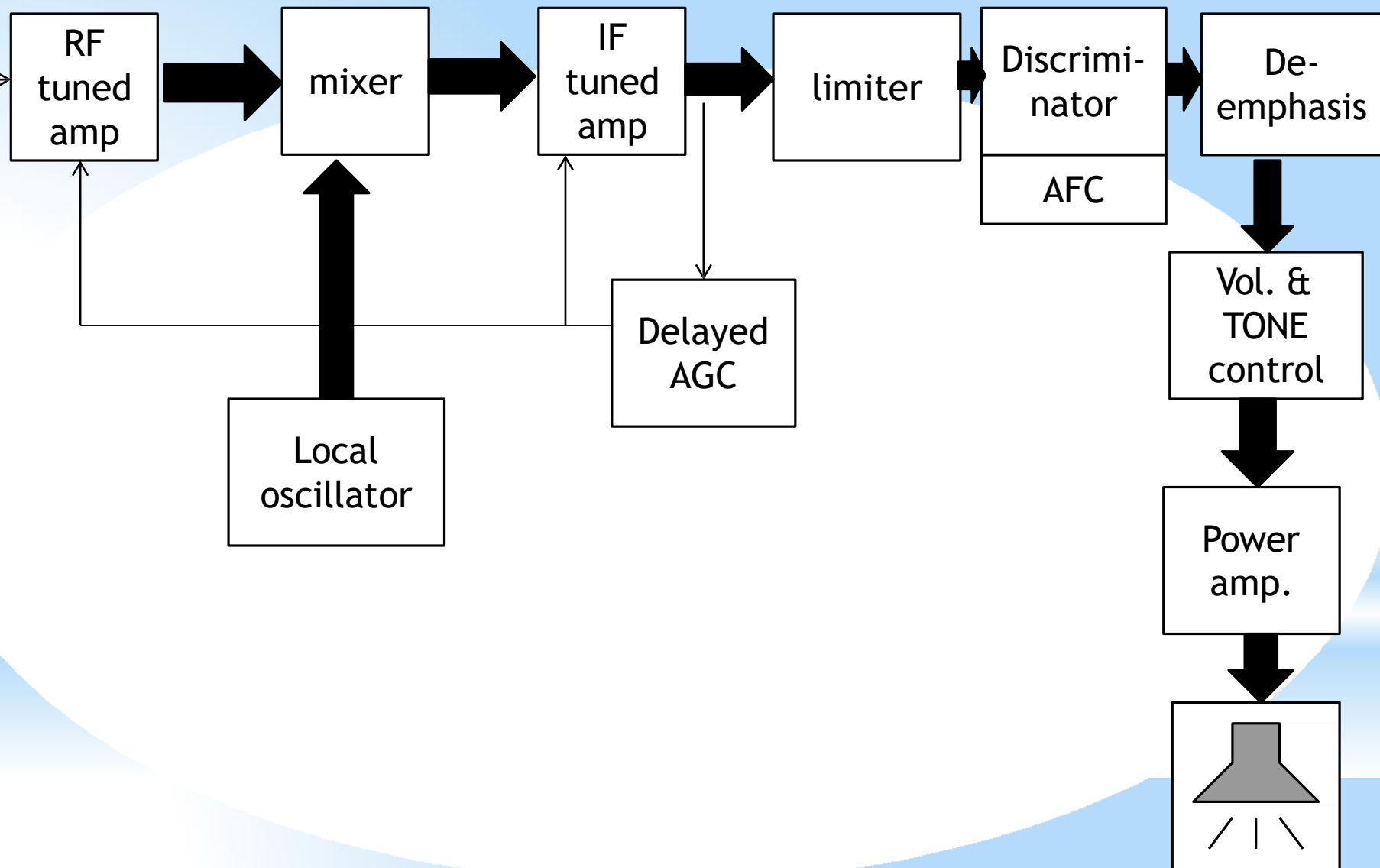
Power amplifier-

The power amplifier gives the required power level to the signal which passes through the antenna.

Antenna-

Antenna is a device which is used for sending and receiving the information.

FM Receiver



RF tuned amplifier-

These amplifiers are used for impedance matching to minimise noise level

Mixers-

These oscillator circuits are take any form to mix up the frequency modulated signal for performing the operation in such circuit central frequency are change but deviation are constant

Intermediate frequency amplifier-

The IF amplifier provides most of the gain and bandwidth requirement of the receiver.

Limiters-

Limiters are those circuit which allows the certain frequency range to pass out and block the other signals

Discriminator-

The discriminator change FM into AM. A simple diode detection then recover the intelligence contained in the envelop of the AM waveform.

De-emphasis-

The artificial boosting given to the higher modulating frequencies in the process of pre-emphasis is nullified or compensated at the receiver by the process of De-emphasis

Vol & tone controller-

In this circuit it control the efficiency of audio signal. The signal whose efficiency is more then audible range are neglected in this circuit.

Power amplifier-

The power amplifier gives the required power level to the signal which passes through the loudspeaker.

PERFORMANCE COMPARISON B/W FM & AM SYSTEM

FM SYSTEM	AM SYSTEM
Amplitude is constant & independent of modulation index & hence the transmitted power remains constant	Amplitude will change with modulating voltage & transmitted power is dependent on the modulating index
Transmitted power is useful	Carrier power and one sideband power are useless
Immune to noise	Not Immune to noise
Bandwidth is large hence wide channel is required $2(\Delta\omega + f_m)$	Bandwidth is less than FM $2f_m$
FM transmission & reception equipment are more complex	AM transmission & reception equipment are more complex

ADVANTAGES OF FM OVER AM

- Noise reduction
- Improved system fidelity
- More efficient use of power

DISADVANTAGES OF FM OVER AM

- Increased band width
- Use of more complex circuit

APPLICATIONS-

- Radio broadcasting
- Two way mobile radio
- Microwave communication
- TV sound transmission
- Cellular radio communication
- Satellite communication

THANK YOU