

EXPERIMENT NO-1

AMPLITUDE MODULATION & DEMODULATION

AIM: (i) To study of Amplitude Modulation & Demodulation.

APPARATUS :

1. Amplitude Modulation & De modulation trainer kit.
2. C.R.O (20MHz)
3. Function generator (1MHz).
4. Connecting cords & probes.

THEORY:

Modulation is defined as the process of changing the characteristics (Amplitude, Frequency or Phase) of the carrier signal (high frequency signal) in accordance with the intensity of the message signal (modulating signal).

Amplitude modulation is defined as a system of modulation in which the amplitude of the carrier is varied in accordance with amplitude of the message signal (modulating signal).

The message signal is given by the expression.

$$E_m(t) = E_m \cos \omega_m t$$

Where ω_m is ----- $>$ Angular frequency

E_m ----- \square Amplitude

Carrier voltage $E_c(t) = E_c \cos \omega_c t$

$$E(t) = E_c + K_a E_m \cos \omega_m t$$

$K_a E_m \cos \omega_m t$ ----- \square change in carrier amplitude

K_a ---- \square constant

The amplitude modulated voltage is given by

$$E = E(t) \cos \omega_c t$$

From above two equations

$$E = (E_c + K_a E_m \cos \omega_m t) \cos \omega_c t$$

$$E = (1 + K_a E_m / E_c \cos \omega_m t) E_c \cos \omega_c t$$

$$E = E_c (1 + M_a \cos \omega_m t) \cos \omega_c t$$

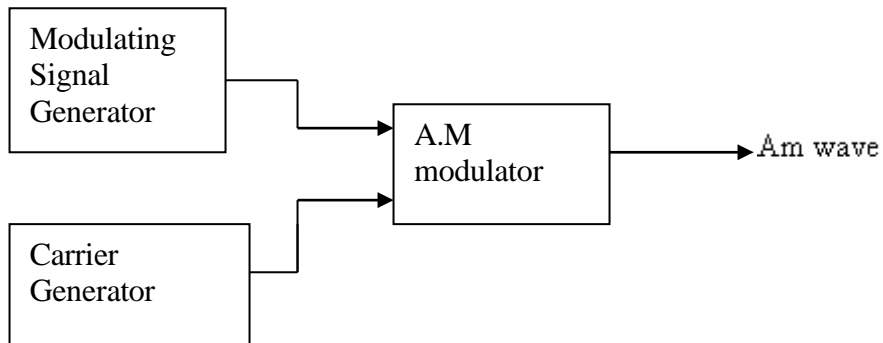
Where M_a ---- \square depth of modulation/ modulation index/modulation factor

$$M_a = K_a E_m / E_c$$

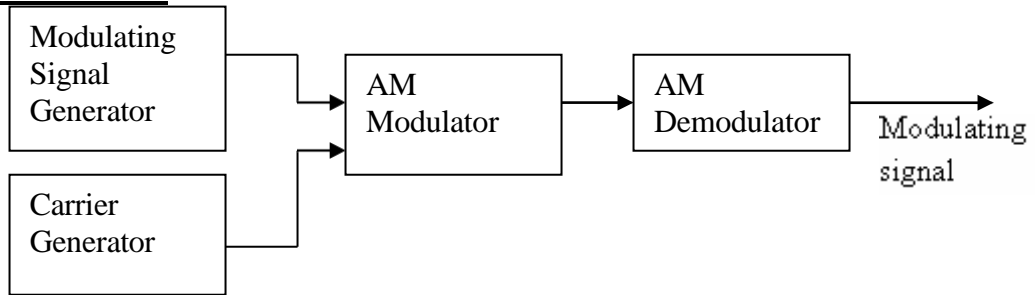
100* M_a gives the percentage of modulation.

BLOCK DIAGRAM:

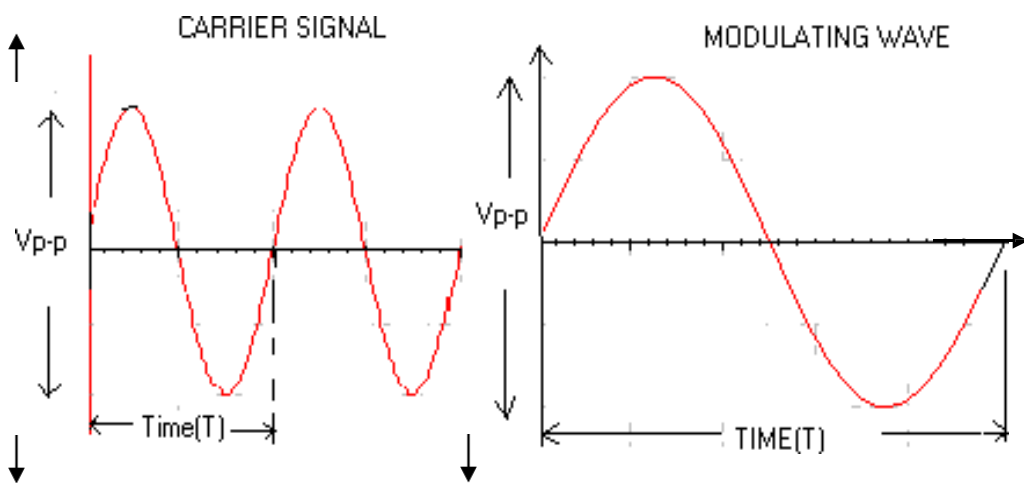
Modulation



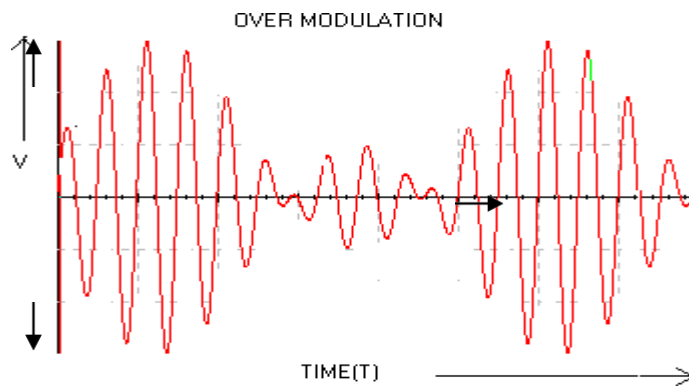
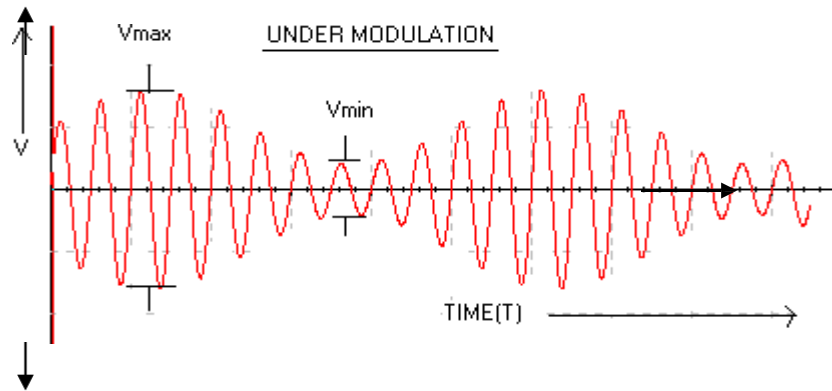
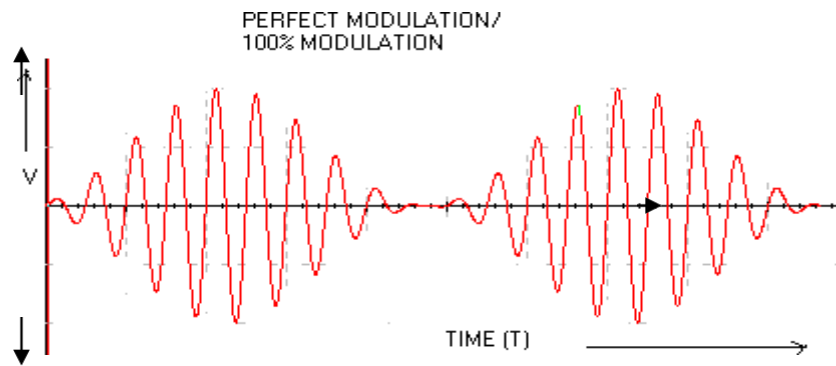
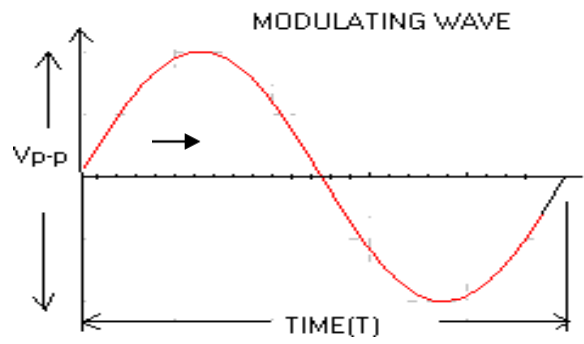
Demodulation



EXPECTED WAVEFORMS: -



Demodulated signal



OBSERVATIONS:

Modulation

	V _c (V)	V _m (V)	V _{max} (V)	V _{min} (V)	$m = \frac{V_{max} - V_{min}}{V_{max} + V_{min}}$	$m = V_m / V_c$
Under modulation						
Perfect modulation						
Over modulation						

Demodulation

Modulating signal Frequency	Demodulated output signal frequency

RESULT:

QUESTIONS

1. Define AM and draw its spectrum?
2. Draw the phase's representation of an amplitude modulated wave?
3. Give the significance of modulation index?
4. What are the limitations of square law modulator?
5. Explain how AM wave is detected?
6. Define detection process?
7. What are the different types of distortions that occur in an envelop detector?
8. What is the condition of for over modulation?

9. Define modulation & demodulation?
10. What are the different types of linear modulation techniques?
11. Explain the working of carrier wave generator.
12. Explain the work