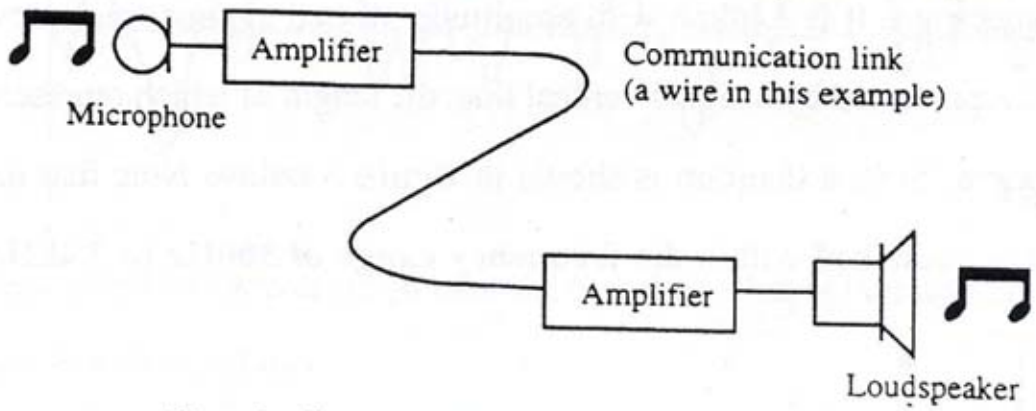
A SIMPLE COMMUNICATION SYSTEM

Once we are out of shouting range of another person, we must rely on some communication system to enable us to pass information.

The essential parts of any communication system are transmitter, a communication link and a receiver, and in the case of speech, this can be achieved by a length of cable with a microphone and an amplifier at one end and a loudspeaker and an amplifier at the other.



Simple Communication System **Fig. 4**

For long distances, or for when it is required to send signals to many distinations at the same time, it is convenient to use a radio communication system.

AMPLITUDE MODULATION (AM) :

The method that we are going to use is called Amplitude Modulation. As the name would suggest, we are going to use the information signal to control the amplitude of the carrier wave.

As the information signal increases in amplitude, the carrier wave, is also made to increase in amplitude. Likewise, as the information signal decreases, then the carrier amplitude decreases.

By looking at **figure 5** below, we can see that the modulated carrier wave, does appear to 'contain' in some way the information as well as the carrier.

We will see later how the receiver is able to extract the information from the amplitude modulated carrier wave.

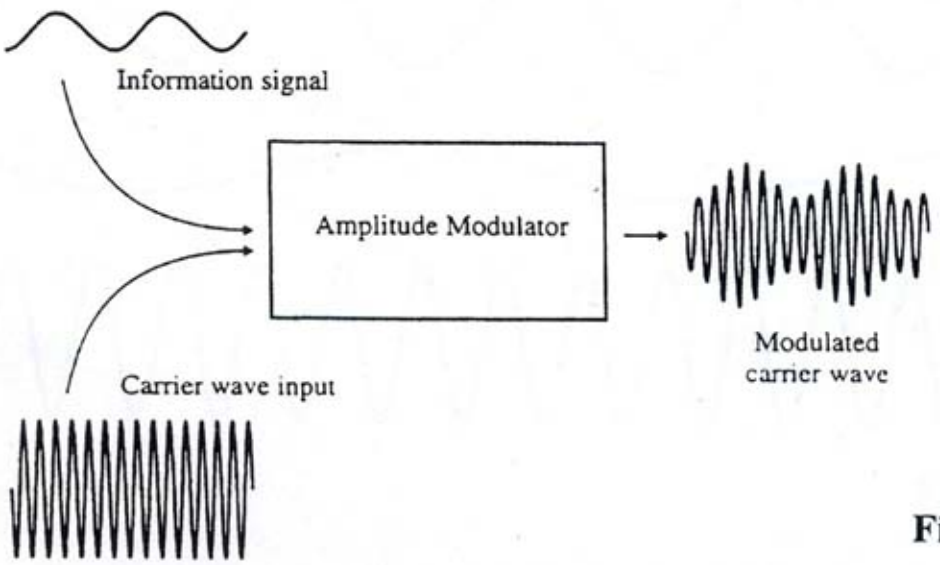


Fig. 5

Depth of Modulation :

The amount by which the amplitude of the carrier wave increases and decreases depends on the amplitude of the information signal and is called the 'depth of modulation'.

The depth of modulation can be quoted as a fraction or as a percentage.

$$\text{Percentage modulation} = \frac{V_{max} - V_{min}}{V_{max} + V_{min}} \times 100\%$$

Here is an example :

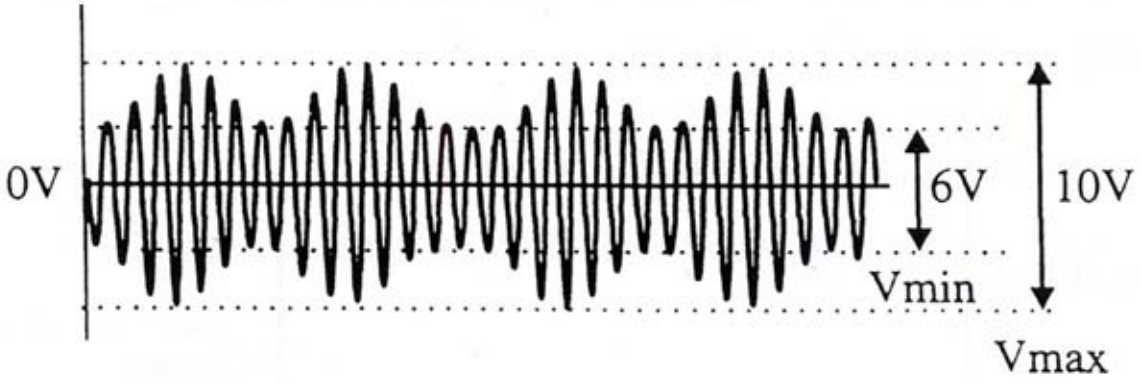


Fig. 6

In above figure 6 we can see that the modulated carrier wave varies from a maximum peak-to-peak value of 10 volts, down to a minimum value of 6 volts. Inserting these figure in the above formula, we get :

$$\text{Percentage modulation} = \frac{10-6}{10+6} \times 100\%$$

$$= \frac{4}{16} \times 100\%$$

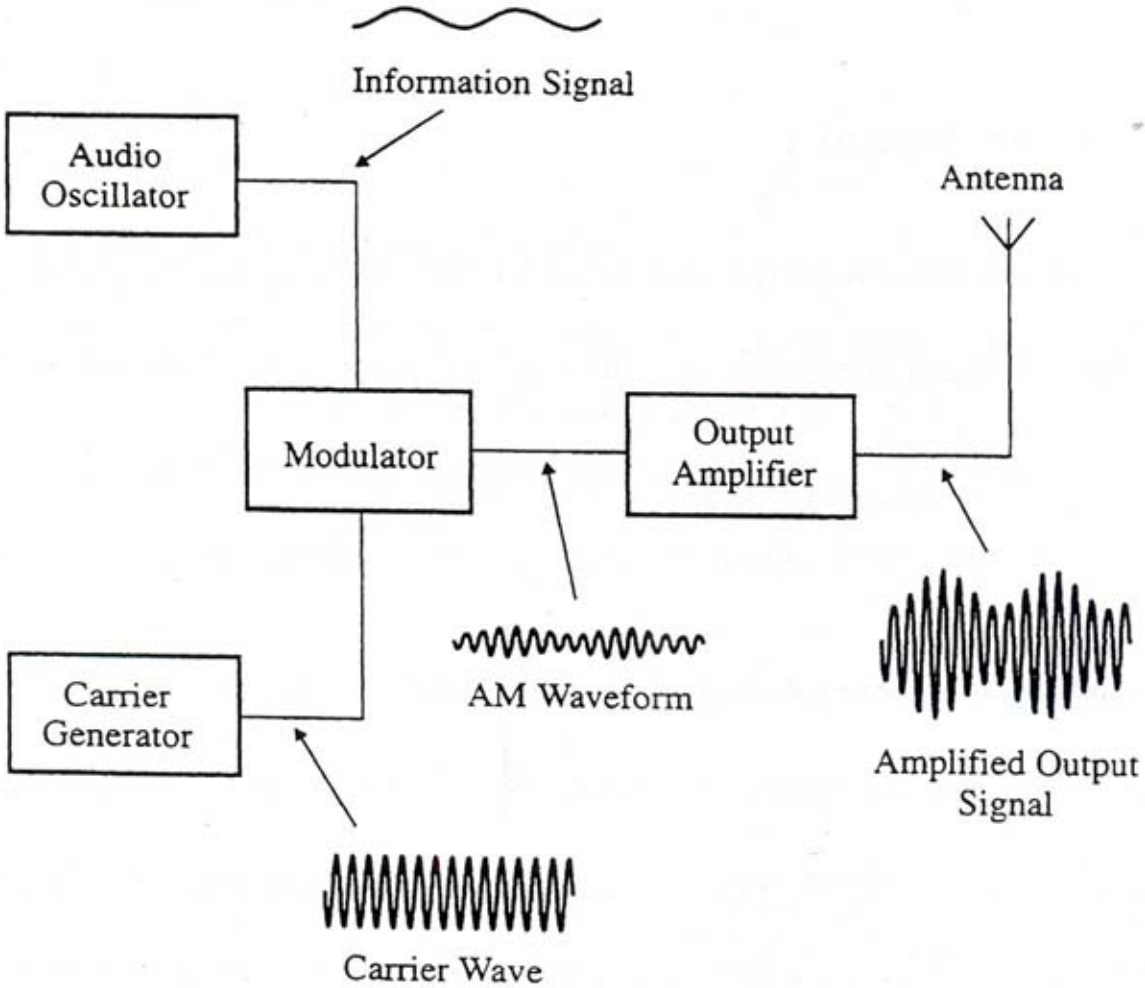
$$= 25\% \text{ or } 0.25$$

The Frequency Spectrum :

Assume a carrier frequency (fc) of 1 MHz and an amplitude of, say 5 volts peak-to-peak.

The carrier could be shown as :

In **Figure 11 & 12**, we can see that the peak-to-peak voltage in the AM waveform increase and decrease in sympathy with the audio signal.



AM TRANSMITTER SYSTEM **Fig. 11**

To emphasize the connection between the information and the final waveform, a line is sometimes drawn to follow the peaks of the carrier wave as shown in Figure 12. This shape, enclosed by a dashed line in out diagram, is referred to as an 'envelope', or a 'modulation envelope'.

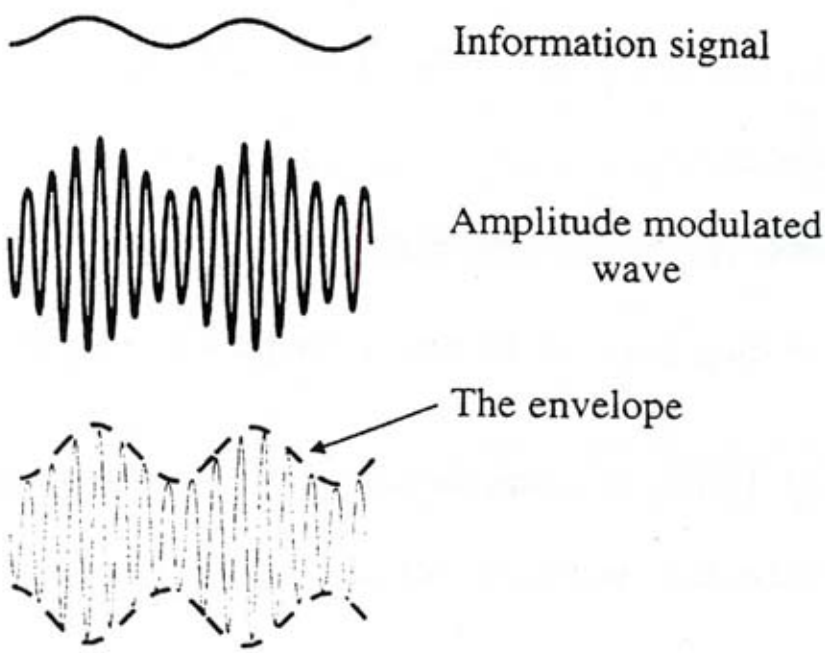


Fig. 12