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ASK GENERATION AND DETECTION

DEFINITION OF ASK ::

In Amplitude **Shift Keying** (ASK), the amplitude A of the carrier signal Acos(ωct) is switched between the two levels, which correspond to the level of the input **binary** signal. The two levels of the binary signal can be 0 volt (Logic 0) and 1 volt (Logic1).

ASK GENERATION ::

There are two methods of generating ASK signals.
First Method :-

In ASK generation, the base band signal F_b (t) is multiplied by any periodic signal S(t) so that the result is as follows: -

$x(t) = F_b(t)S(t)$

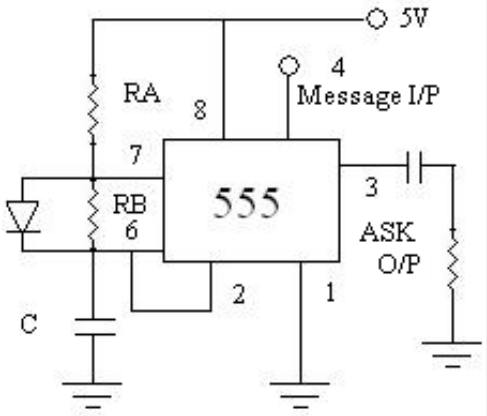
The product x(t) contains a series of AM waves with carrier frequencies that are harmonic multiples of the fundamental frequency f_c. A band pass filter is used to extract any of the harmonics, thus generating the ASK signal.
Second Method :-

The second form of ASK modulator utilizes a square law device which may be a diode. Here the base band signal is added to the carrier oscillations and squaring the sum gives the cross product, which is the desired modulation term. That is

$[F_b(t) + \cos \omega_c t]^2 = F_b(t)^2 + \cos \omega_c t + 2F_b(t)\cos \omega_c t$

ASK Generation Using 555 Timer

Simple ways to generate ASK signal is using 555 timers as an Astable mode. The R_C network (R_A, R_B and C) will determine the Carrier frequency(i.e. T =1/f= 0.69.C.(R_A + R_B)) of ASK. The principle is very simple. Pin No. 4 of 555 timer is RESET bar. That means if this PIN is high the IC will be activated. Other wise if this pin is grounded output will be absent. Thus Appling the message information in 4th pin we can get ASK signal.



ASK DETECTION ::

ASK detection can be of two types, either coherent or incoherent. Coherent demodulators maintain precise timing (phase) of the incoming carrier. Incoherent demodulators do not maintain this phase and essentially perform a non-linear operation on the modulating signal to retrieve the base band amplitude.

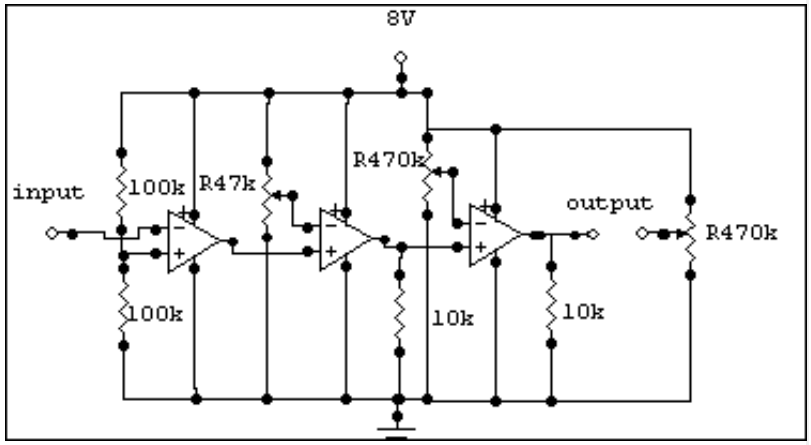
First Method :-

The synchronous demodulator is an example of Coherent Detection. It simply retranslates the frequencies of the incoming waveform down to the base band. This is done by multiplying or heterodyning the incoming ASK waveform with a **local oscillator** matched to the carrier. The output of the multiplier is,
Fb (t) {[cos(ωct)]2} = +
The low pass filter will remove the cos (2ωct) component. The output of the filter having response in ωc, which exactly matches that of the transmitter carrier oscillator.

Second Method :-

The square law demodulator is an example of Incoherent Detection. Here a square law device is used whose output is passed through a low pass filter. The output of the filter is then fed to a non-linear device to take its square root so that the base band amplitude is retrieved.

ASK Detection Using Comparator:



In practical field ASK detection, incoherent detection is **more** preferred than coherent detection because generating same carrier signal in the receiver side requires complicated circuitry and added cost. An envelop detector is sufficient to detect ASK signal. Envelop detector is a combination of a diode and a parallel RC network. Signal is rectified in diode and the RC network is designed in such a way that it keeps the peak amplitude voltage for small amount of time for proper detection. After this, for taking decision fo logic 1 or 0, comparators are used.

Comparators are Op-Amps operated is differential mode. One of the input terminal is kept at reference voltage and signal is applied at the other terminal. There are two type of comparator Positive and Negative comparator. If signal is applied to Non-inverting terminal then it is Positive comparator. Positive comparator gives high when signal level is greater than reference voltage. If signal is applied to inverting terminal then it is Negative comparator. Negative comparator gives high when signal level is less than reference voltage. The operation of comparator is simple. It either works in Inverting (Positive comparator) or Non-Inverting mode (Negative comparator) with very high feed-back resistance means very high gain i.e. either is Positive saturation or Negative saturation.

In our project we uses simple envelope detector followed by three-stage magnitude comparator and a level translator. After the envelope detection signal is fed to three-stage magnitude comparator. Three-stage comparator is used for reliable signal detection and noise rejection. At the last stage a level translator is used to get output voltage in unipolar or bipolar mode.

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