





### Peak Envelope Detection

An ideal peak envelope detector is a device which samples the peak of each positive (or negative) carrier cycle and holds the peak value until the next carrier cycle occurs. Figure 10.1–12 illustrates a typical set of input and output waveforms for an ideal peak envelope detector. It is apparent from Fig. 10.1–12 that a considerable amount of ripple appears on the output signal  $v_o(t)$  unless the carrier frequency greatly exceeds the maximum frequency component  $\omega_m$  of  $g(t)$ . Consequently, unless subsequent filtering is employed, the use of the envelope detector is restricted to situations where a very wide separation exists between  $\omega_m$  and  $\omega_0$ . However, when a wide separation between  $\omega_m$  and  $\omega_0$  exists, it is apparent that  $v_o(t)$  closely approaches  $g(t)$  for  $g(t) \geq 0$ .

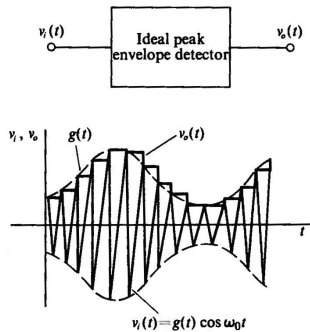


Fig. 10.1–12 Ideal peak envelope detector.

Most practical peak envelope detectors employ a diode to drive the holding network (usually a resistor in parallel with a capacitor) to the peak value of each carrier cycle, as shown in Fig. 10.1–13. Once  $v_o(t)$  has reached the peak value of  $v_i(t)$ , the diode becomes reverse biased and  $v_o(t)$  decays slowly toward zero with a time constant  $\tau = RC$  until, near the peak of the cycle,  $v_i = v_o$ , which again turns the diode on and brings  $v_o(t)$  to the peak value of  $v_i(t)$ . The resistor  $R$  in the holding network obviously has the effect of increasing the ripple; however, it is required in most practical detectors to ensure that  $v_o(t)$  decays more rapidly during every holding period than the envelope of  $v_i(t)$ . If the decay in  $v_o(t)$  is insufficient, the diode does not turn on at the peak of every cycle of  $v_i(t)$ , and "failure-to-follow" distortion results. Clearly the time constant  $\tau$  must be chosen to meet a compromise between ripple and "failure-to-follow" distortion.

It is apparent that the peak envelope detector, like the average envelope detector, produces an output proportional to  $|g(t)|$  which results in distortion if  $g(t)$  is not always positive; hence suppressed carrier AM demodulation and SSB demodulation are