

A SIMPLE V.C.O.

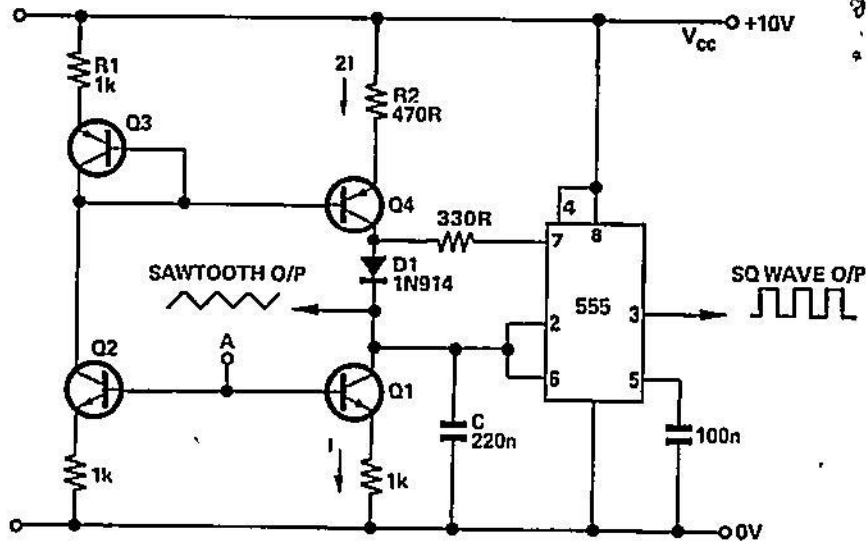
This circuit generates sawtooth and triangle waveforms at a frequency set by an external control voltage.

Current source Q1 draws a current I from timing capacitor C. Simultaneously current source Q2 draws the same current from current mirror Q3, Q4; this is set up (by R1 and R2) to deliver (from the collector of Q4) twice the current leaving Q2.

Hence C receives a current 2I from the top rail, at the same time delivering I to the bottom rail, the net effect being that the capacitor is charged by a constant current I, its voltage rising linearly until the 555's upper trigger point (at $2/3V_{cc}$) is reached.

The output (pin-3) then goes low, as does the open-collector output at pin 7. The latter shunts the output of the current mirror to earth, D1 becoming reverse-biased and isolating C.

Now only current source Q1 is connected to the timing capacitor which is now linearly discharged by current I. In this way C is alternately charged and discharged. When the voltage on C falls to the 555's lower trigger point at $1/3V_{cc}$, the output and discharge pins go high, and the



cycle recommences; the repetition frequency is determined by the magnitude of I, which is set by the voltage applied at the input point A.

With the component values shown, the frequency range is from approx.

2.5 kHz to less than 10 Hz, as the control voltage varies from +10 V to zero; the frequency is directly proportional to the control voltage. Other ranges may be obtained by altering the value of C