Frugal buzzer

Four components make this very simple buzzer. Some n-p-n transistors oscillate at audio and low ultrasonic frequencies when polarity is reversed. Lowest working voltage depends on power rating, but it is about 7-8V for devices such as the *BC109, BC337* and *BC238*, 12V for the *BD139* and around 16V for power transistors *2N6543* and *BUX22*.

Oscillation frequency for the circuit shown is given by the empirical equation

$$f = (V_b - 5.5)/RC$$

and is constant for devices of the same type. Power requirements are 5mA at 9V, 10mA at 12V; increasing R and decreasing C reduces power drain and also sound output. Higher voltage supplies can be used with increased values of R.

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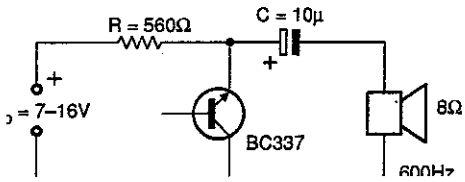

Buzzer using reversed-polarity transistor as oscillator. Since the base is left open, it could be used to gate the buzzer.

10pF-10µF capacitance meter

A very simple circuit using a *555* timer and a few passive components forms a capacitance meter measuring full-scale ranges of 100pF-10µF.

Figure 1 shows the meter circuit, in which the *555* is connected as a free-running multivibrator, the frequency of the output rectangular wave being determined by

$$f = 1/T = 1.44/(R_A + 2R_B)C,$$

and

$$D = R_B/R_A + 2R_B,$$

T being the period and D the duty cycle, which is made assymetrical by setting $R_A = R_B$, since charging through the meter takes longer then discharging via the diode.

Unknown capacitors connect points A and B and C takes the form of six components selected by the switch in **Fig. 2**. If V is the amplitude of the *555* output, current through the meter is $I = VCf$, capaciatnce being therefore proportional to current for a constant frequency. The table shows the ranges and frequencies for a 10V supply. Without the damping components $R_{1,2}$,C_1, the meter bounces a little on the highest range, since the frequency is 1Hz; at higher frequencies it is steady.

The charge-pump power supply shown in **Fig. 3** also uses a *555* to double the input voltage and produce a 10V output, filtered sufficiently by C_3. A regulated supply would give better stability.

Calibration in the original was by the use of known capacitors, adjustment being by the trimmer for one range.

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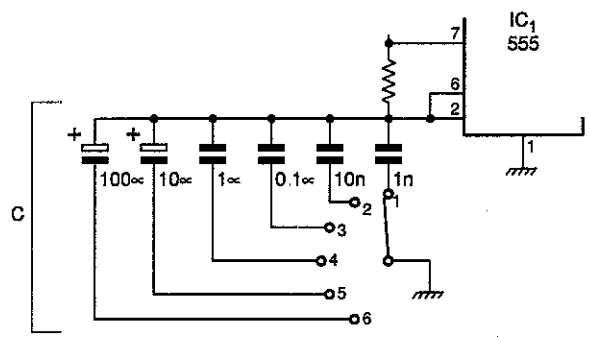

Fig. 2. Range-selection switch.

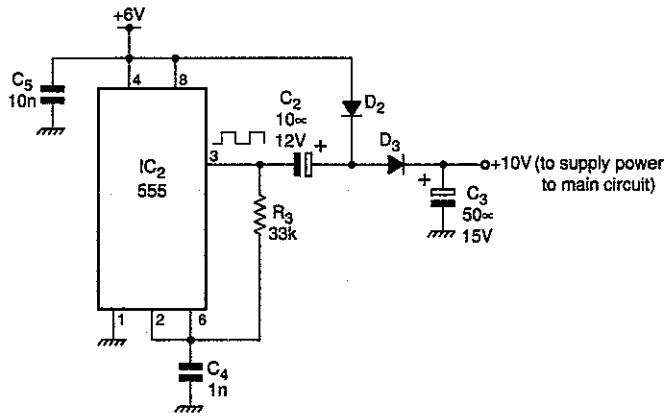

Fig. 3. Another 555 forms the power supply, a charge-pump voltage doubler to give 10V from the 6V supply.

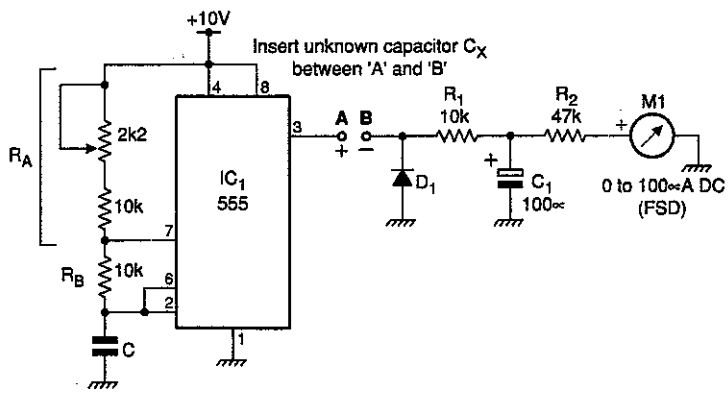

Fig. 1. Linear, direct-reading capacitance meter for values of 10pF-10µF.