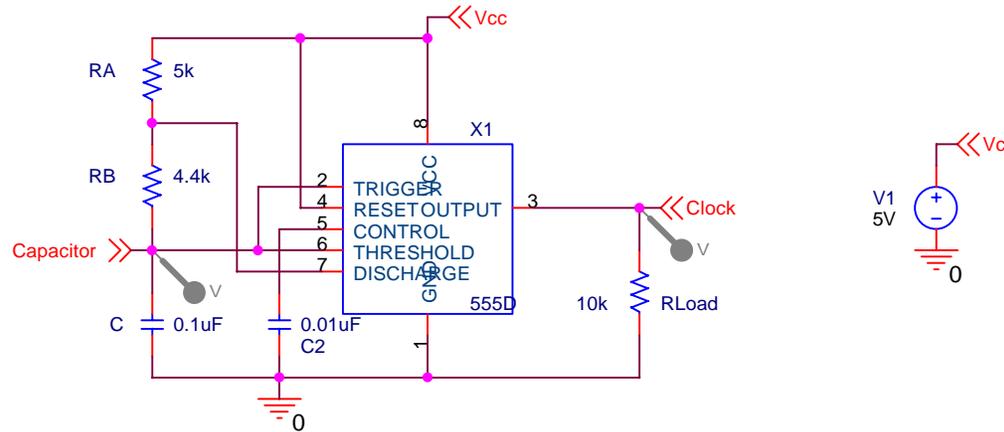


Using a 555 Timer as a Clock (astable multivibrator)

Purpose: A 555 Timer circuit can be easily configured as a clock (astable multivibrator) by adding two external resistors, RA and RB, and an external capacitor, C. The following relationships apply:

$$\begin{aligned}
 T_L &= 0.693(R_B)C = \text{length of time that the clock output is LOW} \\
 T_H &= 0.693(R_A + R_B)C = \text{length of time that the clock output is HIGH} \\
 T &= T_H + T_L = 0.693(R_A + 2R_B)C = \text{period of the clock output} \\
 f &= 1/T = 1.44/((R_A + 2R_B)C) = \text{frequency of the clock output} \\
 D &= T_H/T = (R_A + R_B)/(R_A + 2R_B) * 100\% = \text{the duty cycle of the clock output}
 \end{aligned}$$

Analysis: For this example, RA = 5k, RB = 4.4k, C = 0.1uF, so
 TL = 304.9 us, TH = 651.4 us, T = 956.3 us, f = 1046 Hz, and D = 68.1%
 If three cycles of the clock output are to be displayed, then a TRANSIENT analysis for 3T (or about 3 ms) should be performed.
 The capacitor voltage and the clock output will be graphed after analysis.



Notes:

- 1) Best results are obtained using RA > 1k and RB > 1k.
- 2) The capacitor C2 always has a value of 0.01uF.
- 3) The timer circuit essentially works by using the external resistors and capacitor to charge the capacitor to (2/3)Vcc while the output is HIGH and then to discharge the capacitor to (1/3)Vcc while the output is LOW.
- 4) Voltage markers (from the PSPICE menu) and OFFPAGE symbols (<<C from the toolbar) were added to clearly label the capacitor voltage and output clock voltage.
- 5) The 5V power supply was connected using an OFFPAGE symbol. This is unnecessary, but is often convenient since the supply voltage may be connected to many points in the circuit.

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