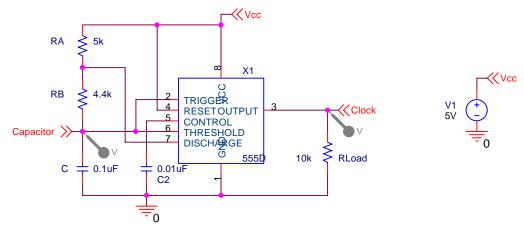
EGR 270 Fundamentals of Computer Engineering File: Clock555.opj

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:

- $\begin{array}{l} TL = 0.693(RB)C = \text{length of time that the clock output is LOW} \\ TH = 0.693(RA + RB)C = \text{length of time that the clock output is HIGH} \\ T = TH + TL = 0.693(RA + 2RB)C = \text{period of the clock output} \\ f = 1/T = 1.44/((RA + 2RB)C) = \text{frequency of the clock output} \\ D = TH/T = (RA + RB)/(RA + 2RB)*100\% = \text{the duty cycle of the clock output} \end{array}$

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:

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1) Best results are obtained using RA > 1k and RB > 1k.

2) The capacitor C2 always has a value of 0.01uF.

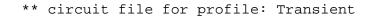
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3) The timer circuit essentially works by using the external resistors and capacitor to charge the capacitor to (2/3)Vcc while the output is HIGH and then to discharge the capacitor to (1/3)Vcc while the output is LOW.

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.

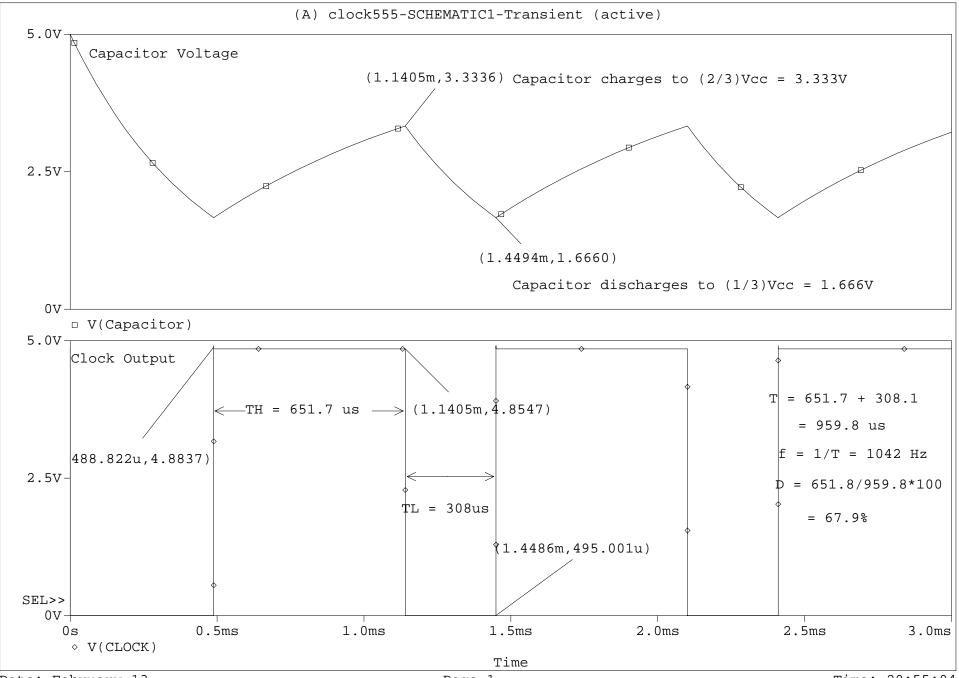
5) The 5V power supply was connected using an OFFPAGE symbol. This is unnecessary, but is often convenient since the supply voltage may be connected to many points in the circuit.

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Date/Time run: 02/13 17:38:33

Temperature: 27.0



Simulation Settings - Transient		×
General Analysis Include Files	Libraries Stimulus Options	Data Collection Probe Window
Analysis type: Time Domain (Transient) ▼ Options: General Settings Monte Carlo/Worst Case Parametric Sweep Temperature (Sweep) Save Bias Point Load Bias Point	<u>Run to time:</u> 3ms Start saving data after: 0	seconds (TSTOP) seconds seconds point calculation (SKIPBP) Output <u>F</u> ile Options
	OK Cancel	Apply Help