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Introduction To Digital Electronics – Lesson 7: Clocks and Oscillators

FORMULAS

The following formulas and information are meant to go with the online lesson found here:
http://www.pyroelectro.com/edu/digital/clocks_oscillators/

USING THE 555 TIMER AS A CLOCK SIGNAL GENERATOR

The 555 timer has a lot of applications and the single one that we explored in this lesson was building an a-stable multi-vibrator, which luckily is an extremely easy thing to build with the 555 timer and very common usage.

To be able to intelligently design the oscillating signal coming out of the 555 timer you need to understand a few formulas which dictate the timing of the resulting signal. It starts with the On and Off times of the output pulse. The On time is how long you want the pulse to be +5-15v and the Off time is how long you want the pulse to be +0v.

	$Time_{on} = 0.693 * (R1 + R2) * C1$ $Time_{off} = 0.693 * (R2) * C1$ <hr/> $Period = Time_{on} + Time_{off}$ <hr/> $Frequency = \frac{1}{Period}$
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The On and Off times then plug into a Period formula, which finally leads to a formula for calculating the frequency of the output pulse. In our experiment the output pulse was a very slow 0.5 Hz coming from $\frac{1}{2 \text{ Seconds}}$.

ADDITIONAL INFORMATION

If you have any questions about the formulas or information found in this document, please feel free to head on over to the forums and ask us some questions!

<http://www.pyroelectro.com/forums/viewforum.php?f=21>