Circuit Bodging

Atari Punk Console

Circuit bodging is back! Maxwell is proud to present small, simple, but ultimately lovable little circuits to build for your own, personal pleasure. In this edition we are featuring: The Atari Punk Console. The Atari Punk Console (or APC) is a 555 timer-IC based noise maker circuit. The original was designed by Forrest M. Mims III, and published in his book "Engineer's Mini-Notebook - 555 Circuits" (Siliconcepts, 1984). It uses two 555 timers to create a variable pulse width oscillator with a similar sound to the infamous Atari 2600.

Author: Ben Allen

If you take a look at the schematic you will see that there are two 555 timers involved. The first is an astable oscillator, which produces a rectangular waveform. The second 555 is a monostable oscillator and is triggered by the first 555. This means that R2 sets the first oscillator's frequency, and R3 sets the pulse length. The pulse length can be longer than the period of the first 555 which means that when this occurs the frequency will drop by half.

To calculate the IC1's frequency we use the following formula:

$$f = \frac{1}{ln(2) \cdot (R_2 + 2R_1) \cdot C_1}$$

This gives us a minimum frequency of 305 Hz (R2=470Ω) and a maximum frequency of 72,135 Hz (R2 = 0Ω). These values might seem high at first, but remember that IC2 acts as a frequency divider.

The waveform output of an astable 555 is not a perfect square wave, rather it has a variable duty cycle dependant on the ratio between R1 and R2. Because the second 555 is negative edge triggered, the duty cycle is irrelevant as we are only looking for when the output of IC1 goes from logical 1 to logical 0.

The length of the pulse delivered by the monostable 555 can be calculated as follows:

$$t = ln(3) \cdot R_3 \cdot C_2$$

Looking at this we can see that the pulse time can be set longer than the period of IC1's output. The 555 will not retrigger when it is delivering a pulse and the next pulse will only occur when the output has returned to 0 and the IC is triggered again. This means that when the pulse time is set to be longer than the astable oscillator's period, IC2 will have to 'wait' for another pulse thereby dropping the frequency by half, or one octave.

This circuit is very flexible, and the reader is encouraged to try applying various filters to the output. Another suggestion is to add a small amplifier to drive a speaker. As shown the circuit can be connected to either an instrument amplifier or HiFI system. The reader is once again encouraged to experiment and explore this circuit's capabilities and find out what has made this circuit so popular over the years.