Supervisor: Dr. Y. Singh

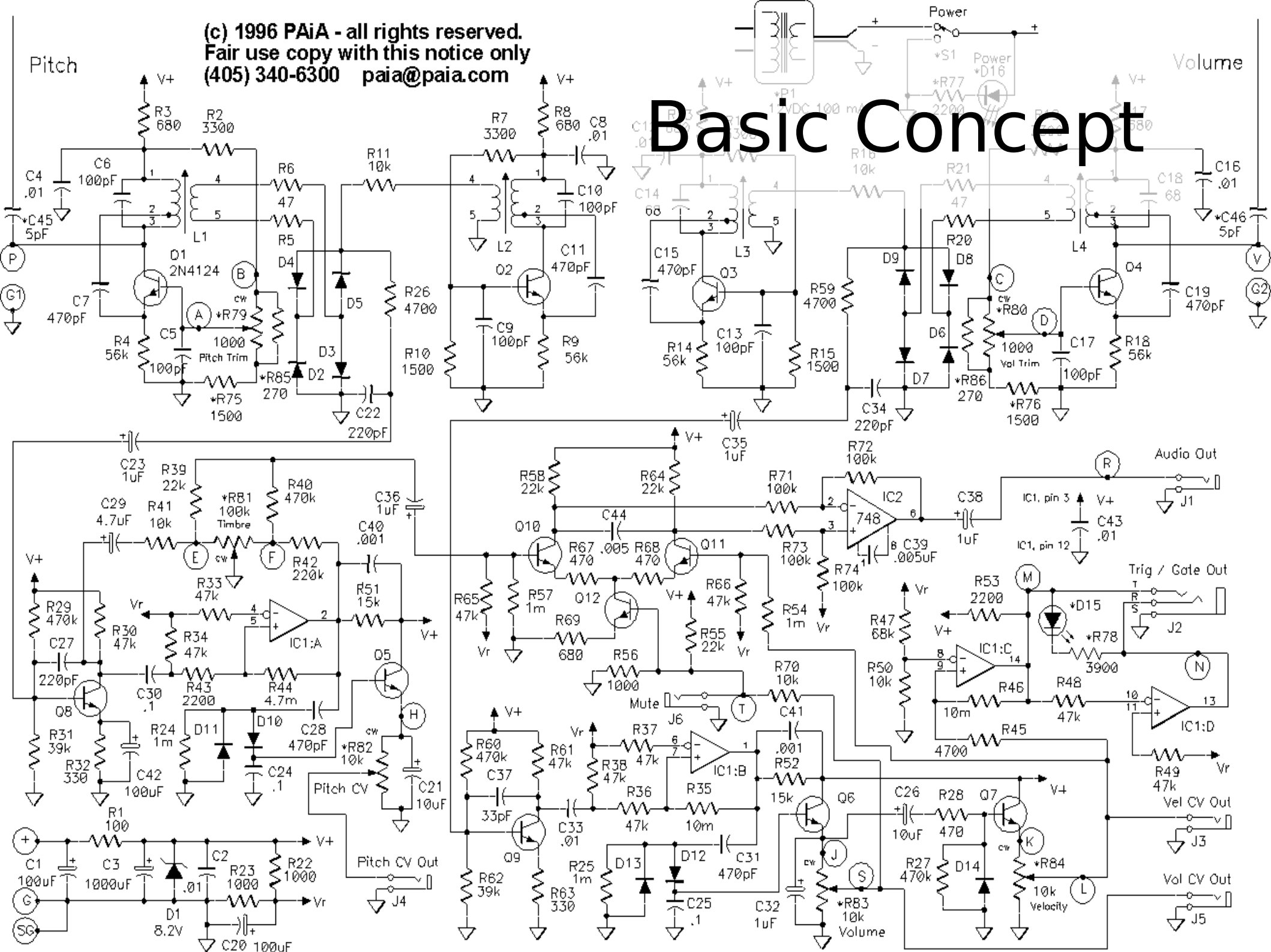
Building a Theremin

Tom Bryant and Josh Wainwright

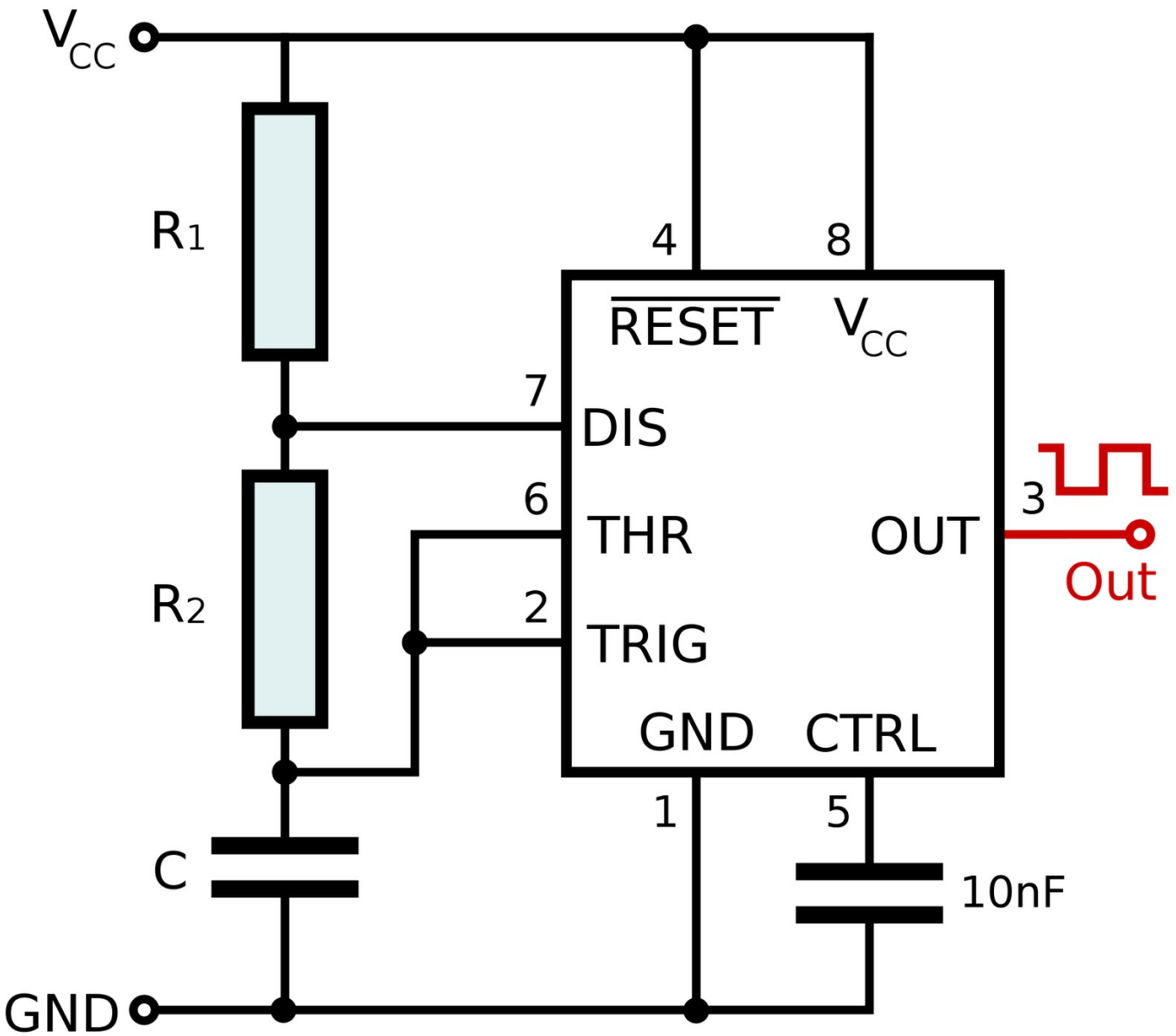
The History of the Theremin

- Lev Sergeivich Termen, known in Europe as Leon Theremin
- Invented in October 1920
- Displayed to Lenin
- Toured Europe to showcase the height of Russian technology

Basic Concept



555 IC Timer Circuit

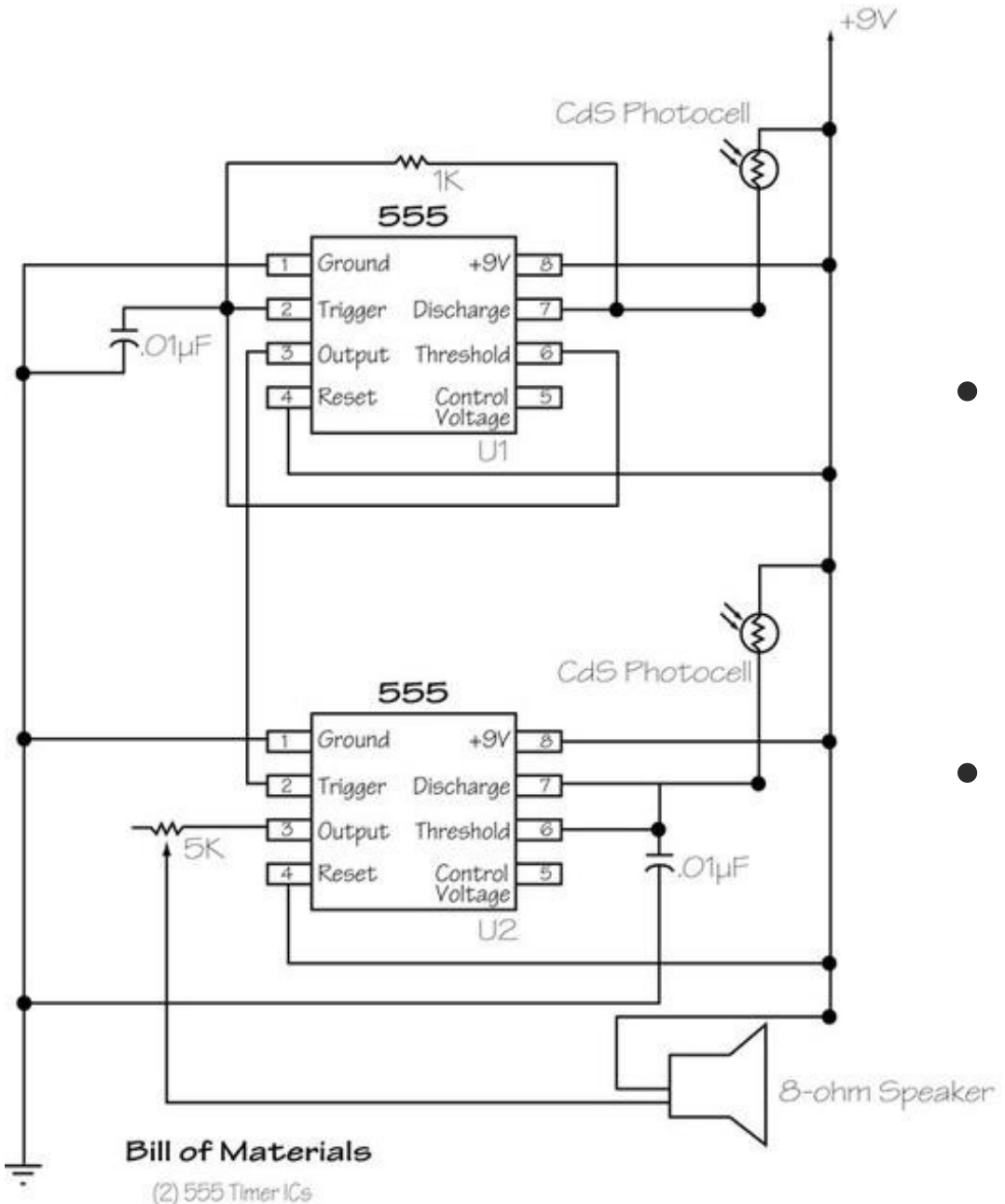


Two 555s

$$\text{Frequency, } f = \frac{1}{\ln(2)C(R_1 + 2R_2)}$$

$$\text{Low time} = \ln(2)R_2C$$

$$\text{High time} = \ln(2)(R_1 + R_2)C$$



Bill of Materials

(2) 555 Timer ICs
(2) CdS photocells
(2) .01µF capacitors
(1) 1K resistor
(1) 5K potentiometer
(1) 8-Ohm speaker
(1) 9V battery
(1) Switch (optional)

Pocket Theremin

First 555 (U1) acts as an oscillator, second 555 (U2) is a frequency divider. Change tones with light/dark exposure on CdS Photocells.

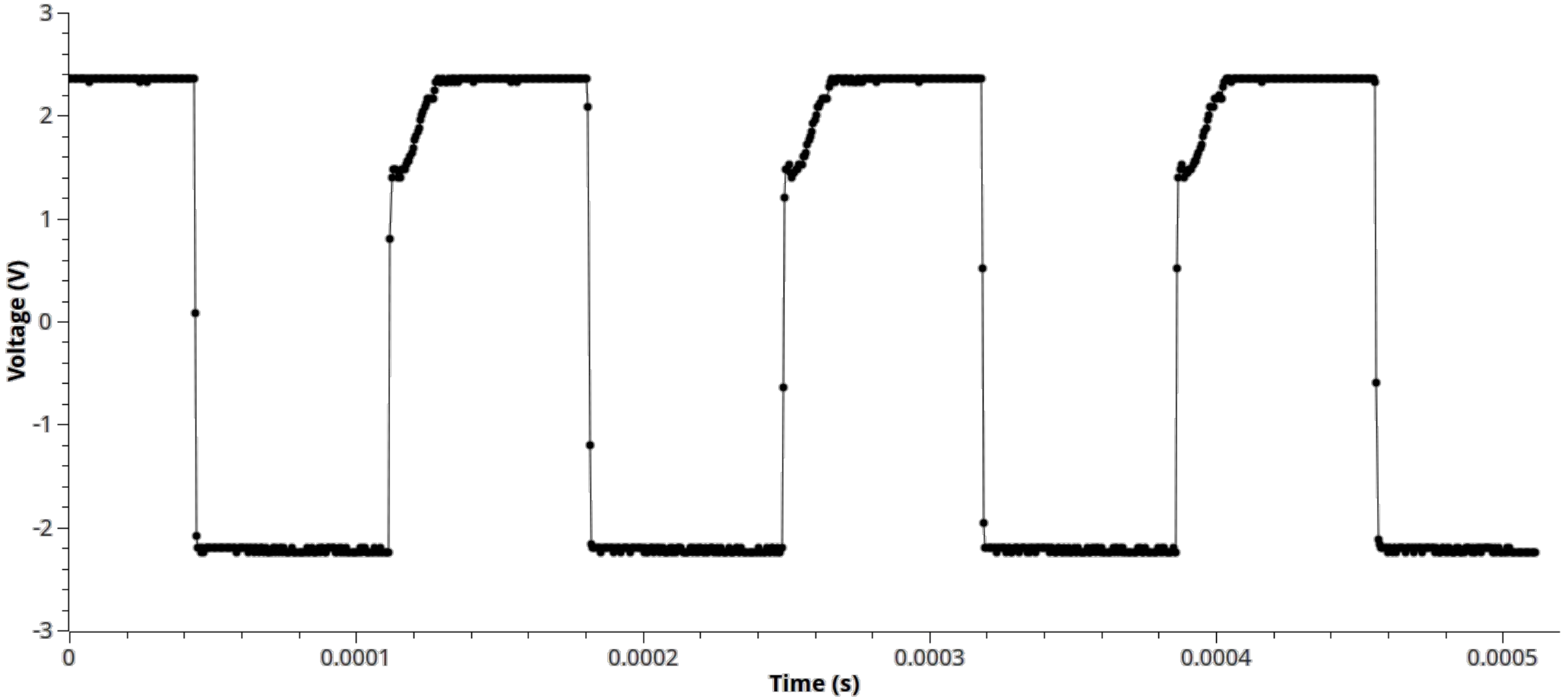
Sheet 1

"Adapted from 'The Forrest Mims Engineer's Notebook'"

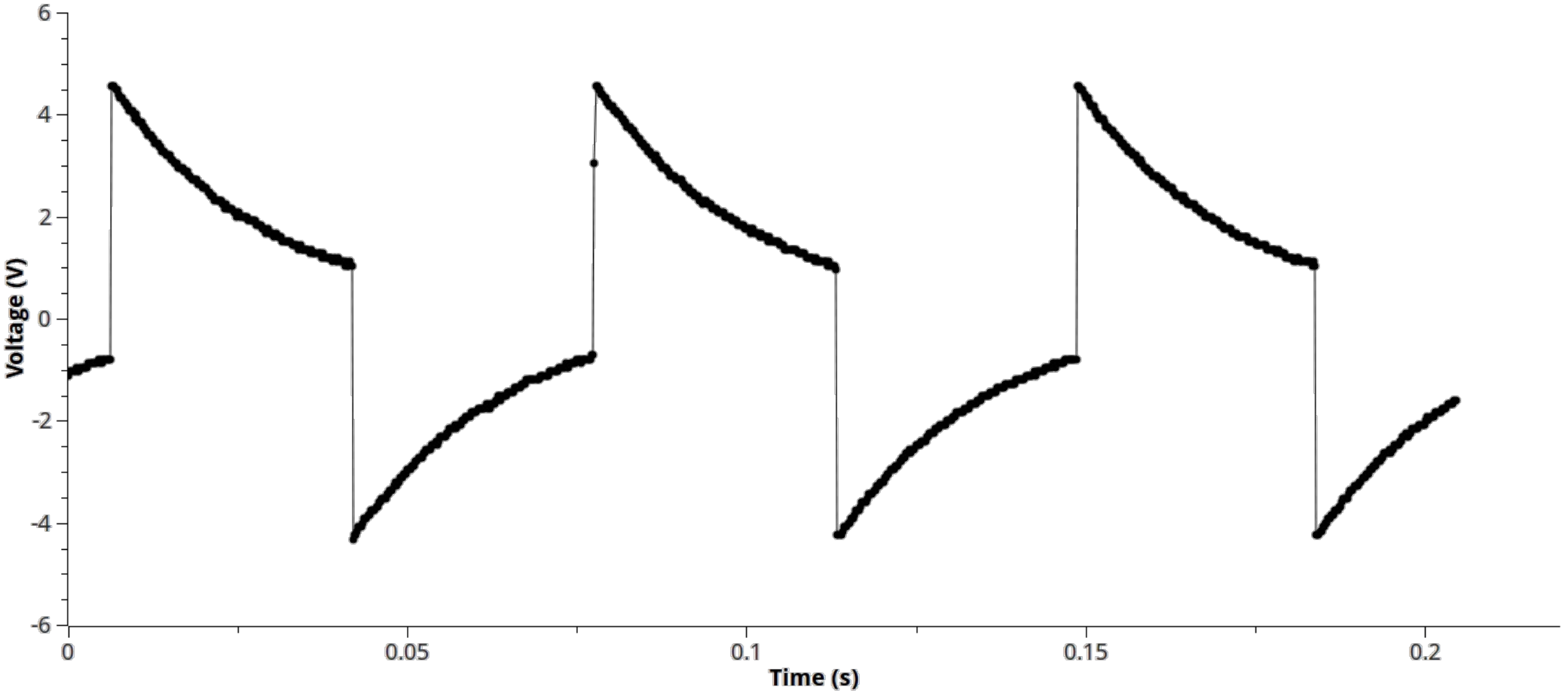
Two 555s

- Second 555 chip acts as the volume control
- LDRs control the resistances and hence the pitch and volume

High Frequency

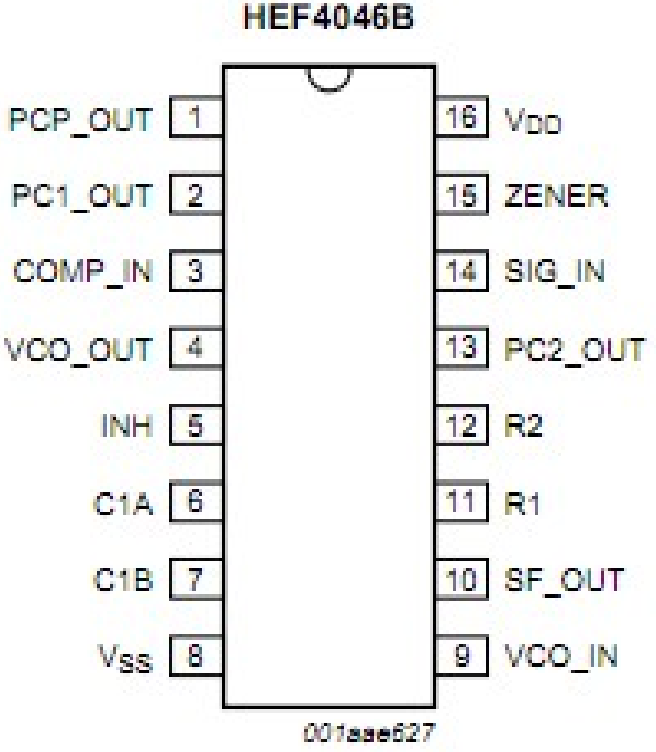


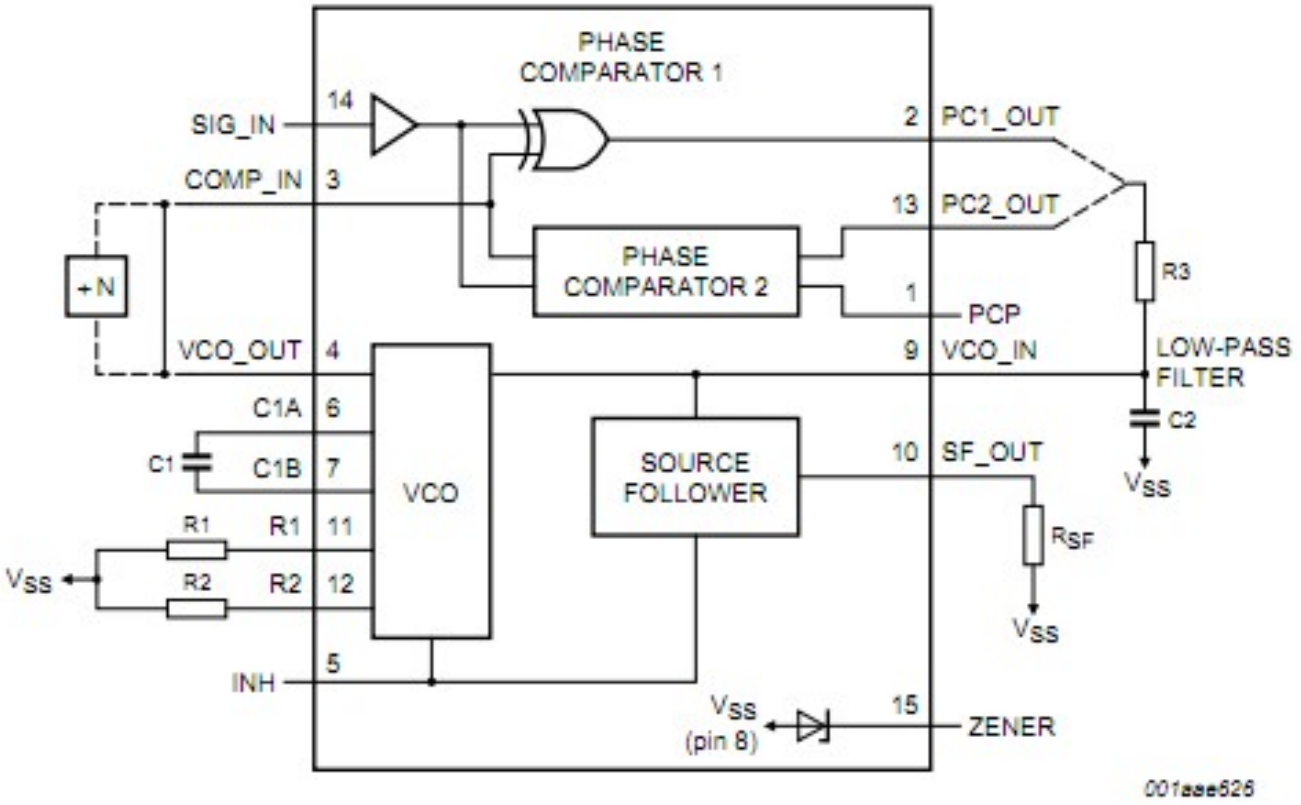
Low Frequency



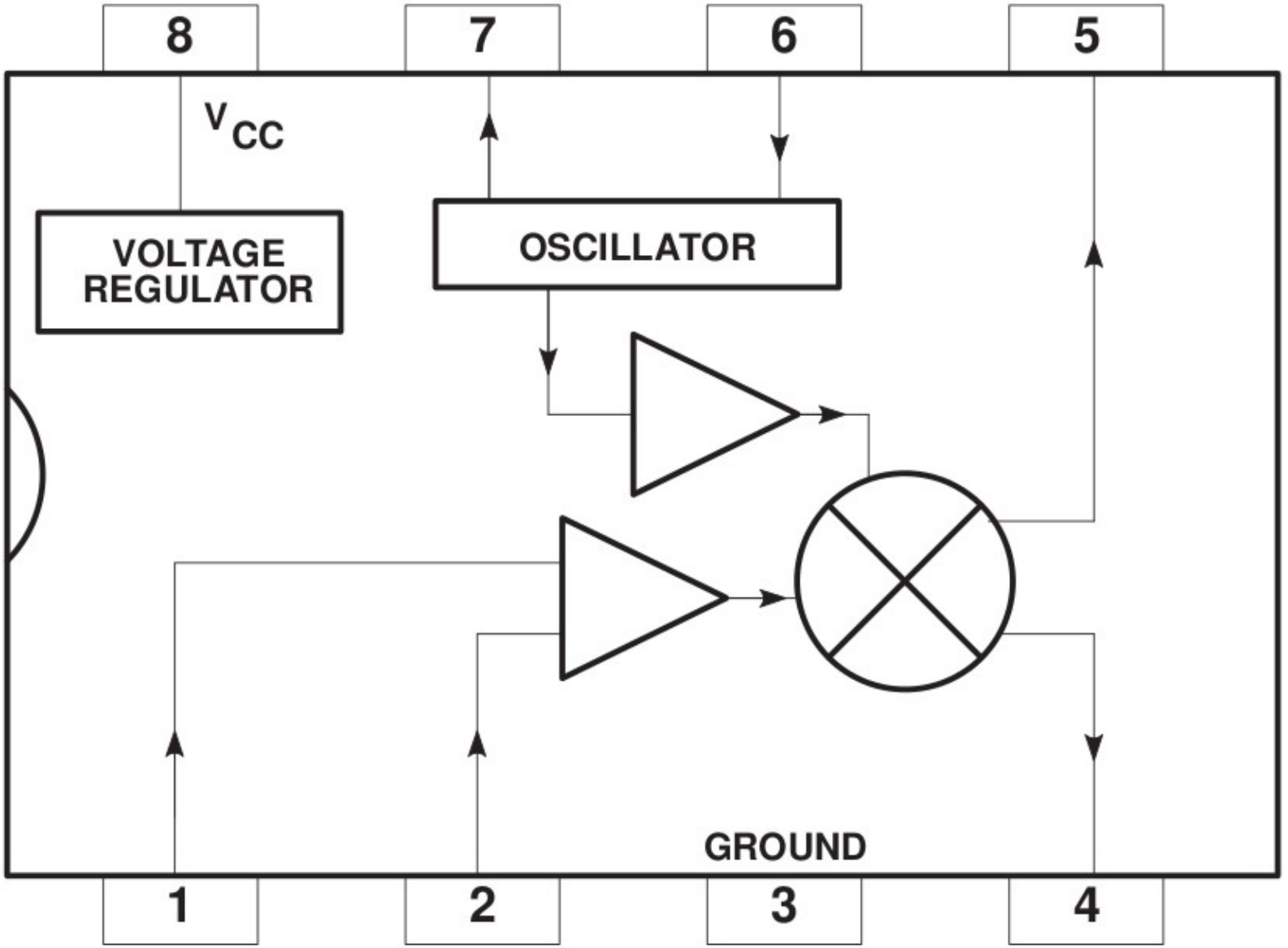
4046 VCO

- CMOS Chip
- Includes 2 phase comparators, a zener diode, and most importantly a Voltage Controlled Oscillator

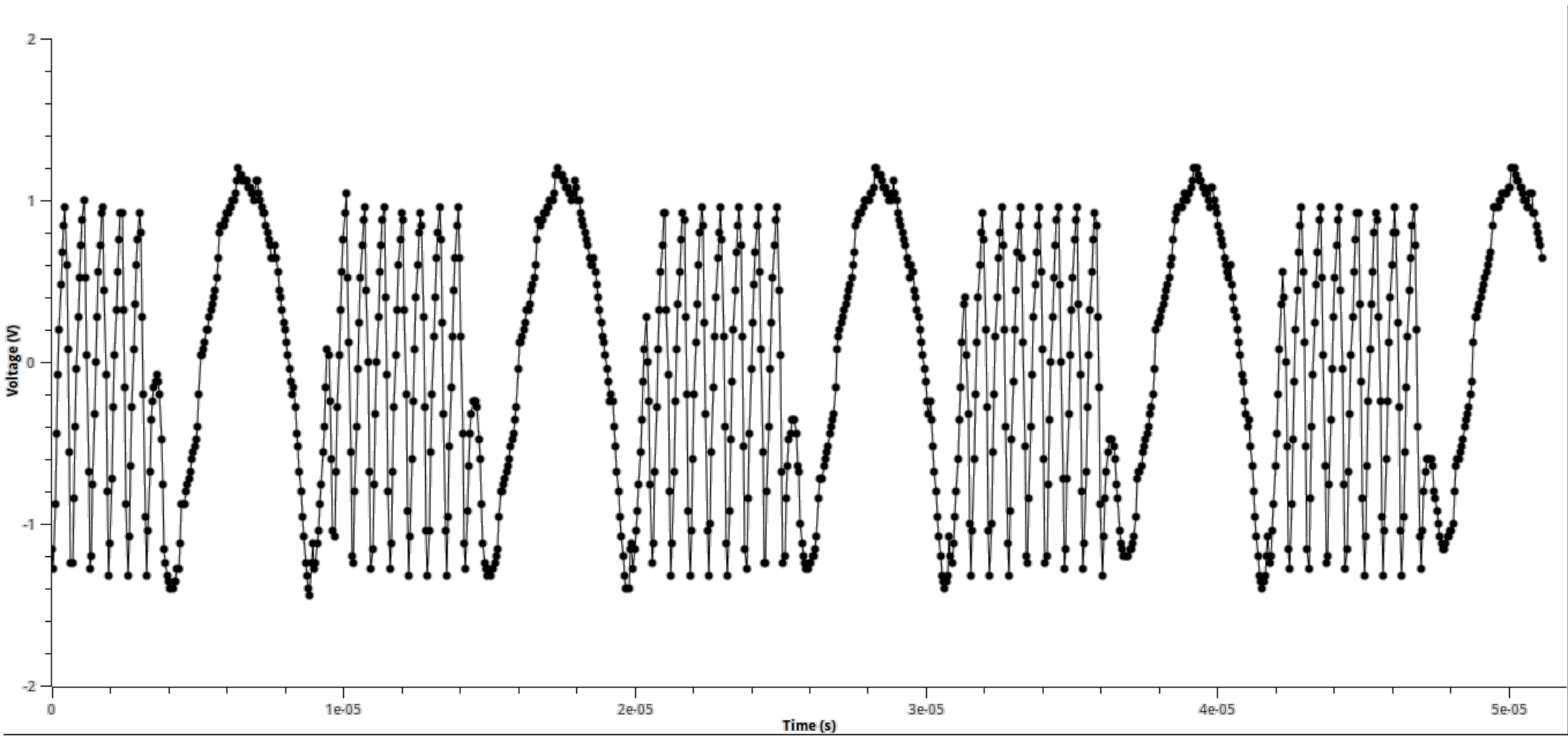




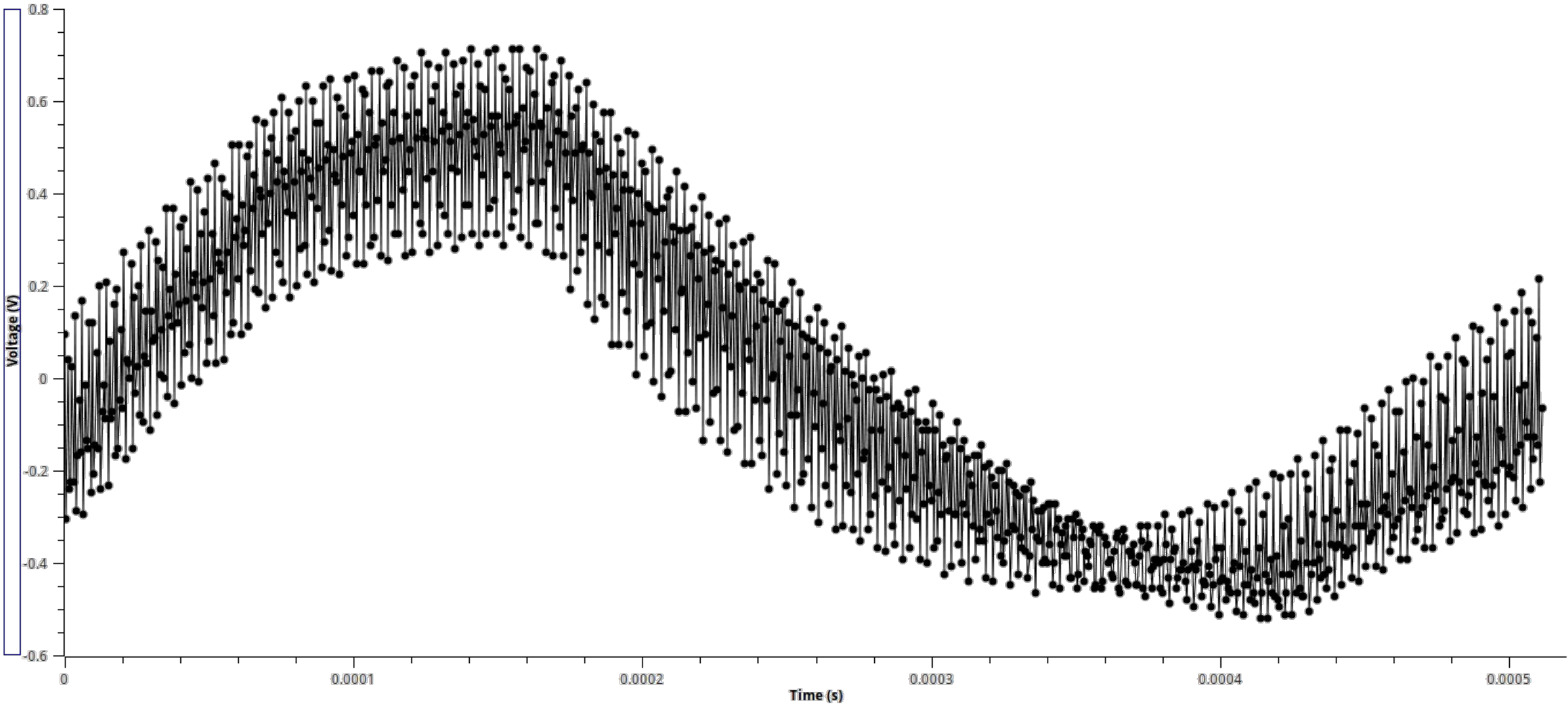
Mixer Circuit



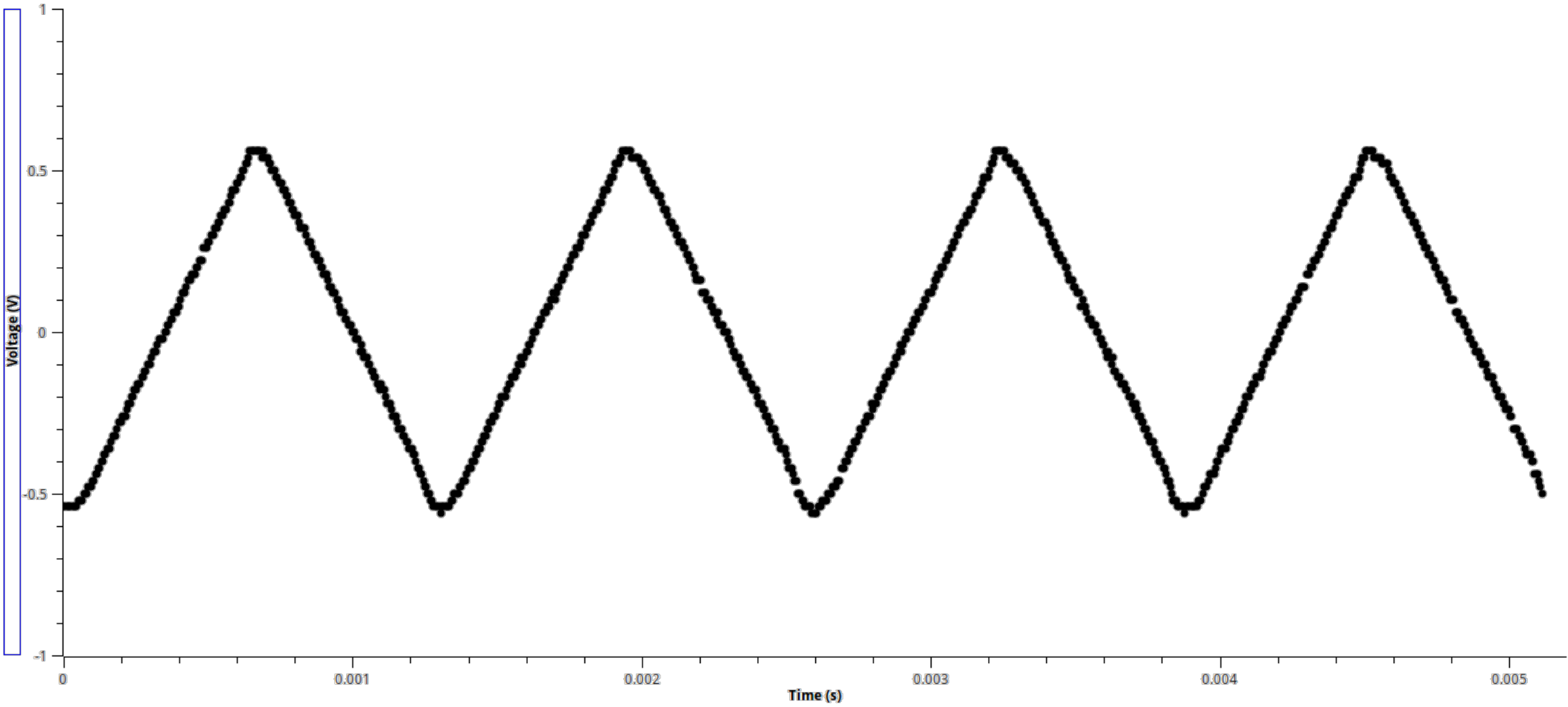
Mixer Signal



Need for a Low Pass Filter



Triangle Wave from Square



555 Again

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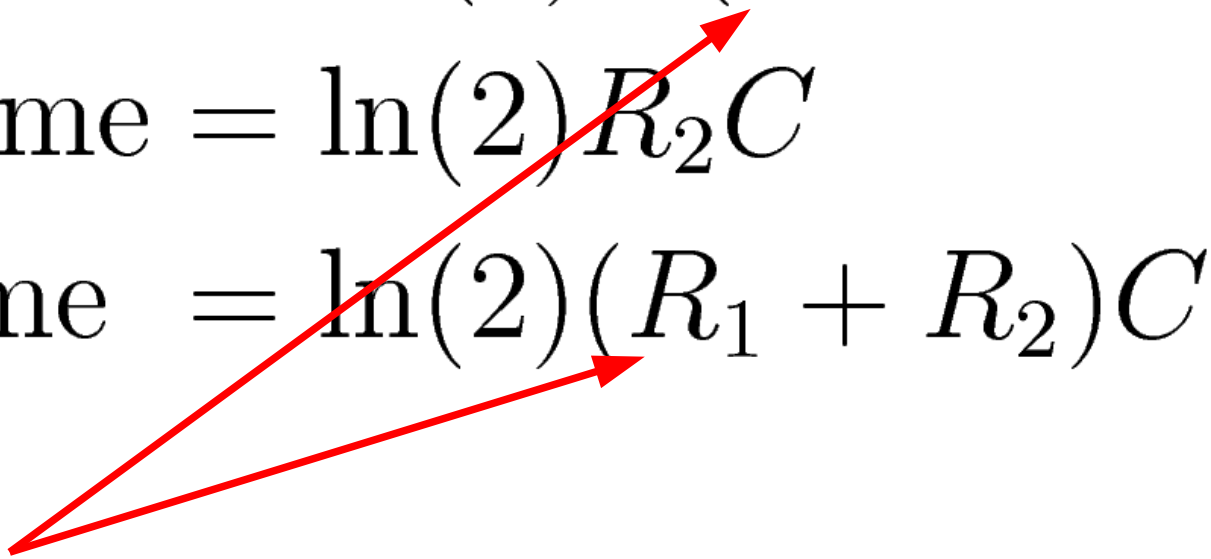

What if R1=0?

Conclusion – Where are we heading?

- Use the 7555 Timer IC to produce oscillator >1MHz?
- Build an LRC circuit to produce oscillations?
- Use a low pass filter as the input to the 4046 VCO?
- Produce a method of volume control