Simple Pulse Generator

Overview

This pulse generator is a very simple addition to your test bench. You may find the need for a tunable pulse generator when constructing or debugging digital logic circuits or even for triggering own homebrew radar system. The pulse generator circuit shown here is based around the common 556 "dual 555" timer chip and the schematic is adapted from an old *Popular Electronics* article from 1974.

One timer section of the 556 is wired as an astable oscillator whose output frequency can be varied over a 10–to–1 frequency range by the 100 kohm **Frequency Adjust** potentiometer and a 5–position **Frequency Range Select** switch which chooses the proper timing capacitor. The astable frequency output can be varied from around 1 Hz to over 10 kHz.

The output of the astable–side of the 556 is sent to one pole on a SPDT **Trigger Mode** switch. This switch allows selecting between an external trigger signal input or the 556's own oscillator. This trigger signal is used to enable the second timer side of the 556, which is wired for a monostable "pulse" output. The output pulse width can also be varied over a range of 10–to–1 by the 100 kohm **Pulse Width Adjust** potentiometer and a 5–position **Pulse Width Select** switch. The pulse width ranges vary from around 10 µS to over 100 milliseconds.

Almost any *negative* going signal can be used as an external trigger input. The 1000 pF series capacitor and 10 kohm / 1N914 diode will help to pre–condition and clip the input trigger pulse.

Low–leakage tantalum capacitors should be used for the large–value timing capacitors (10 µF) and polystyrene, Mylar, or even silver mica capacitors for the lower value capacitors for the best temperature stability.

The use of multi–turn potentiometers is not really necessary for the frequency and pulse width adjustments, but can be handy for fine tweaking.

The circuit's PC board should have a large ground plane and there should be very short leads on all the timing capacitors and resistors. Stick to surface mount components for the best performance. The DC power supply should also be well–regulated and noise free. To increase the output voltage of the pulse, just increase the 556's DC power supply up to 16 volts.

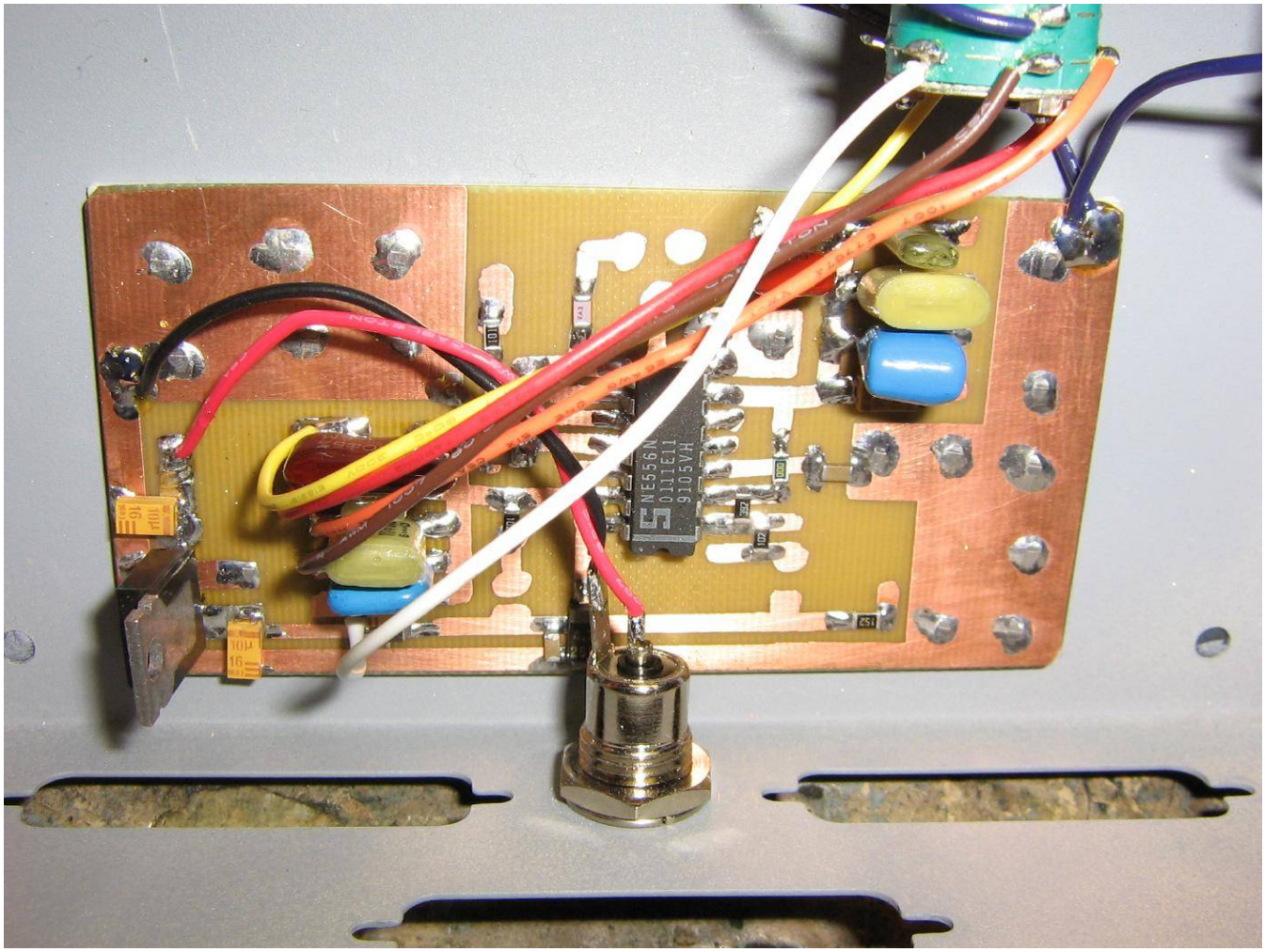
The approximate frequency ranges for each setting on the **Frequency Range Select** switch:

1. 1 – 10 Hz
2. 10 – 100 Hz
3. 100 – 1,000 Hz
4. 1,000 – 10,000 Hz
5. 10,000 – 100,000 Hz

The approximate pulse width ranges for each setting on the **Pulse Width Select** switch:

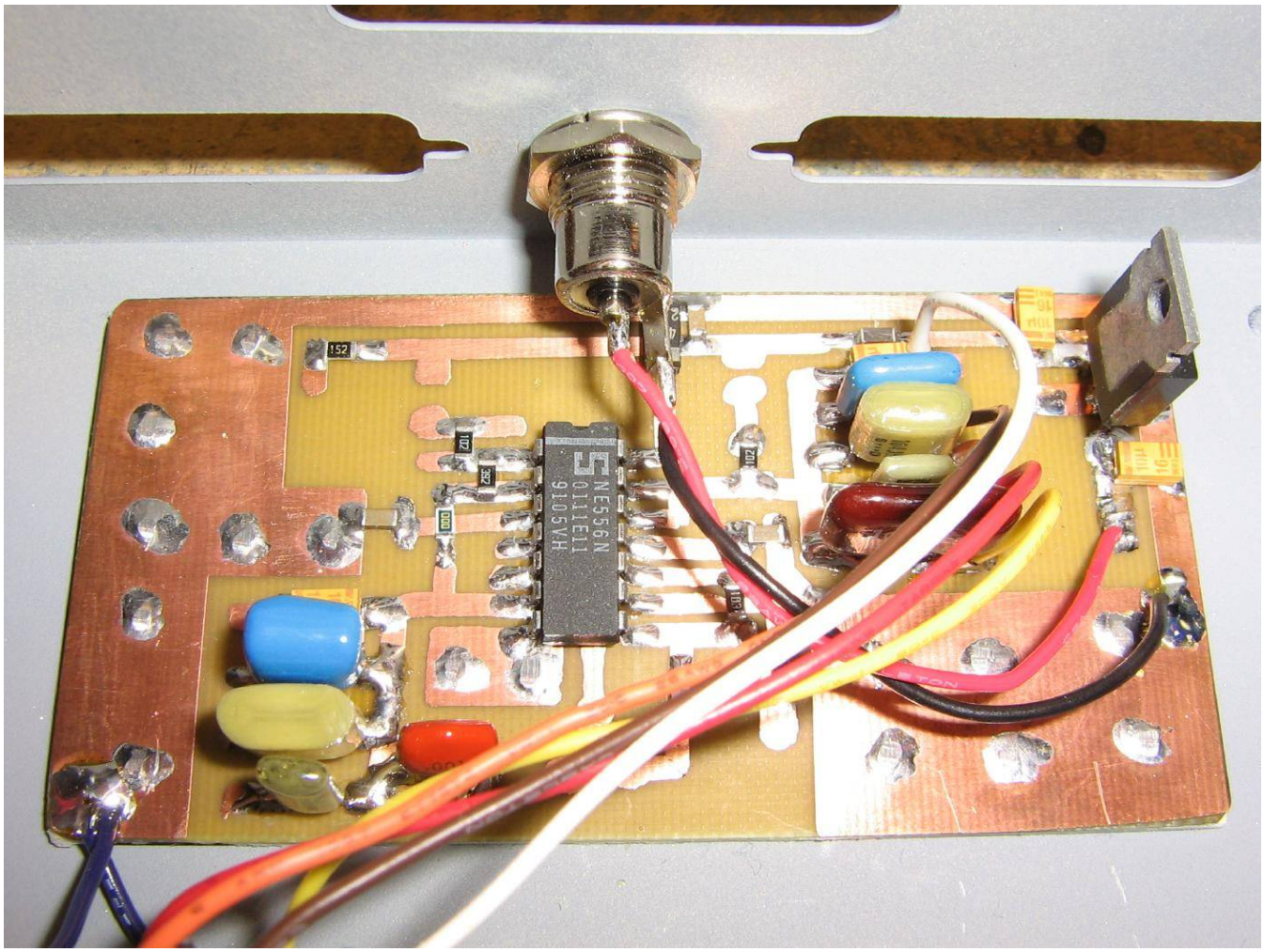
1. 100 – 1,000 mS
2. 10 – 100 mS
3. 1 – 10 mS
4. 100 µS – 1 mS
5. 10 – 100 µS

Pictures & Construction Notes



Overview of the pulse generator circuit board.

Dual CMOS 555 timers can be used to increase the overall frequency range.

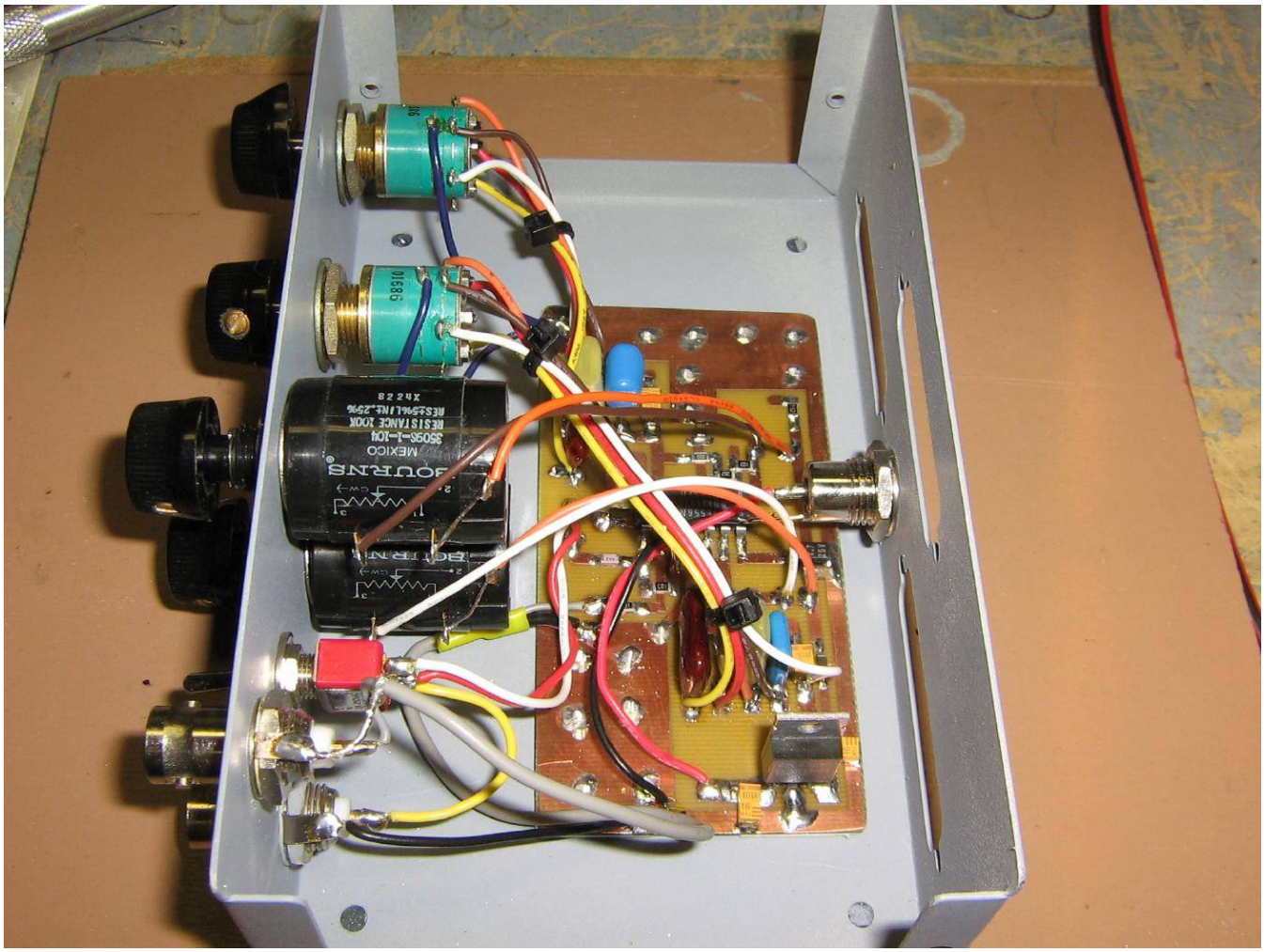


Alternate view.

The case is from an old printer switch.

The frequency range determing capacitors are on the lower–left, the pulse width determing capacitors are on the upper–right.

Note the use of non–polarized timing capacitors, except for the 10 µF, which is are low–leakage tantalum electrolytic capacitors.



Internal view showing behind the front−panel.

The multi−turn panel−mount potentiometers are a bit of overkill.

The connector on the rear−panel is for DC power input. A 7812 voltage regulator is used to clean up and regulate the incoming DC power.

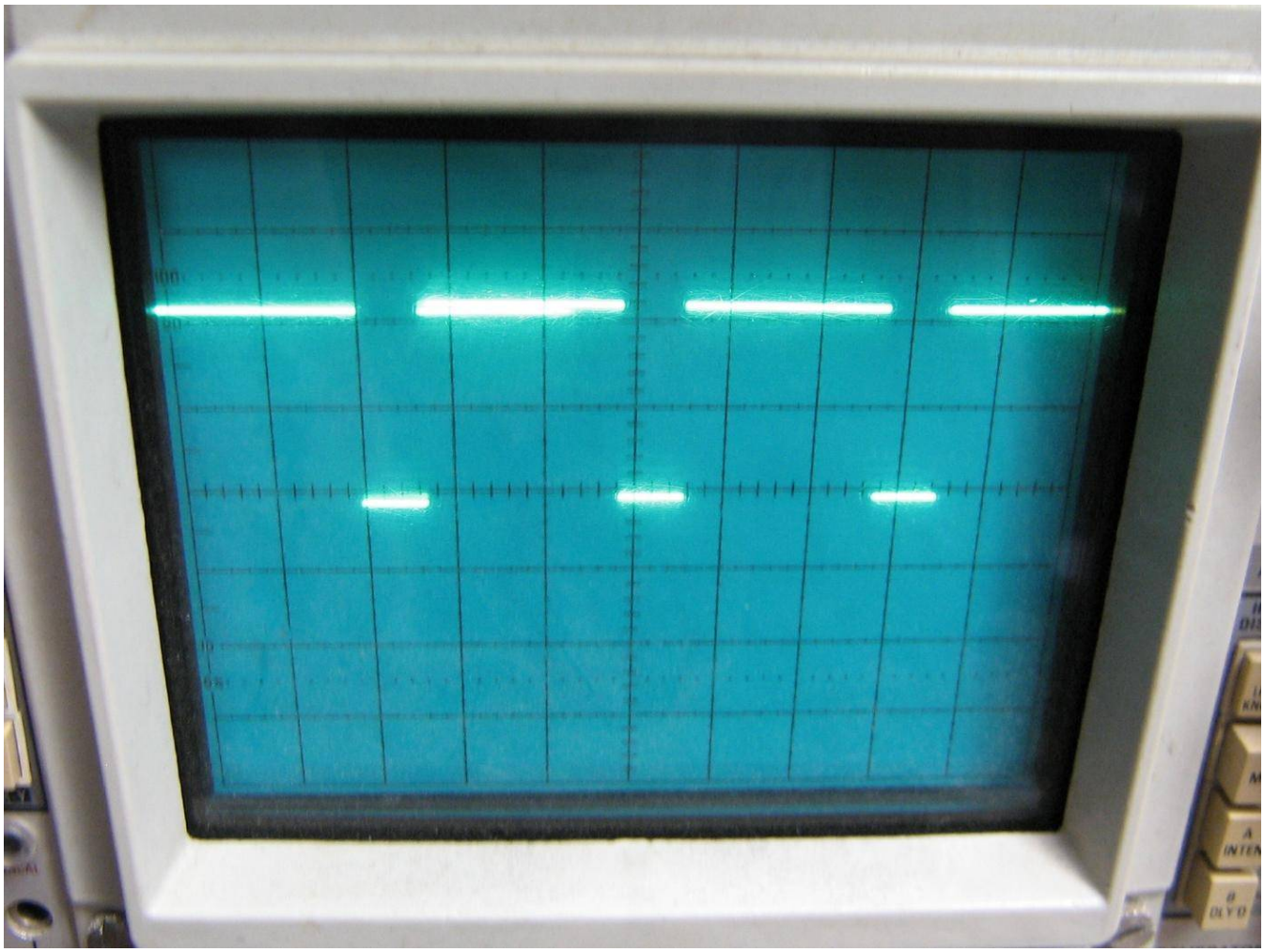
Internal top view.

Frequency range select switch is on the left. The pulse width select switch is next to it.

The frequency range adjust pot is on top, and the pulse width adjust pot is below it.

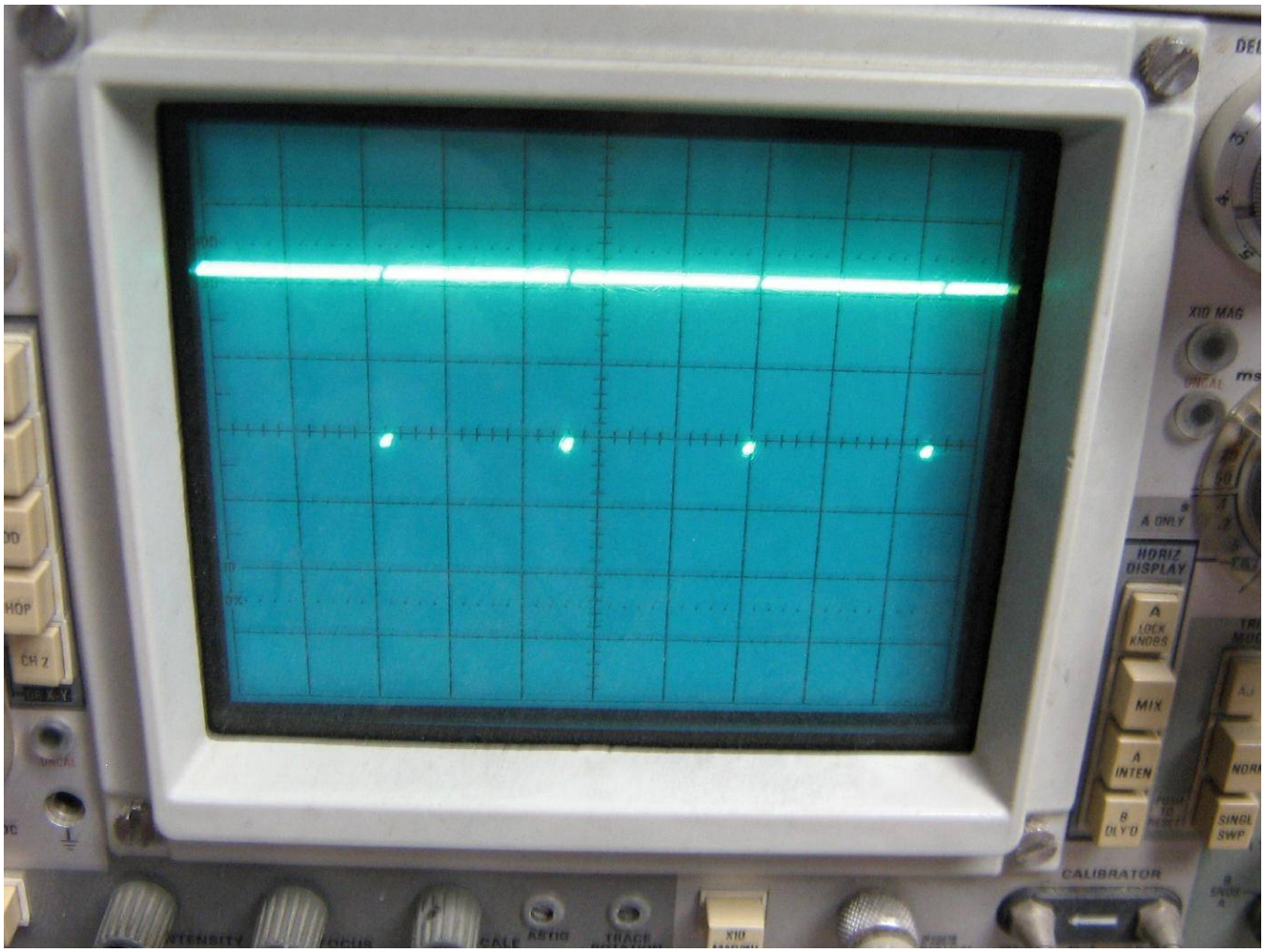
The toggle switch selects between the internal or external trigger.

The pulse output BNC connector is on the top–right, and the BNC for the external trigger input is below it.



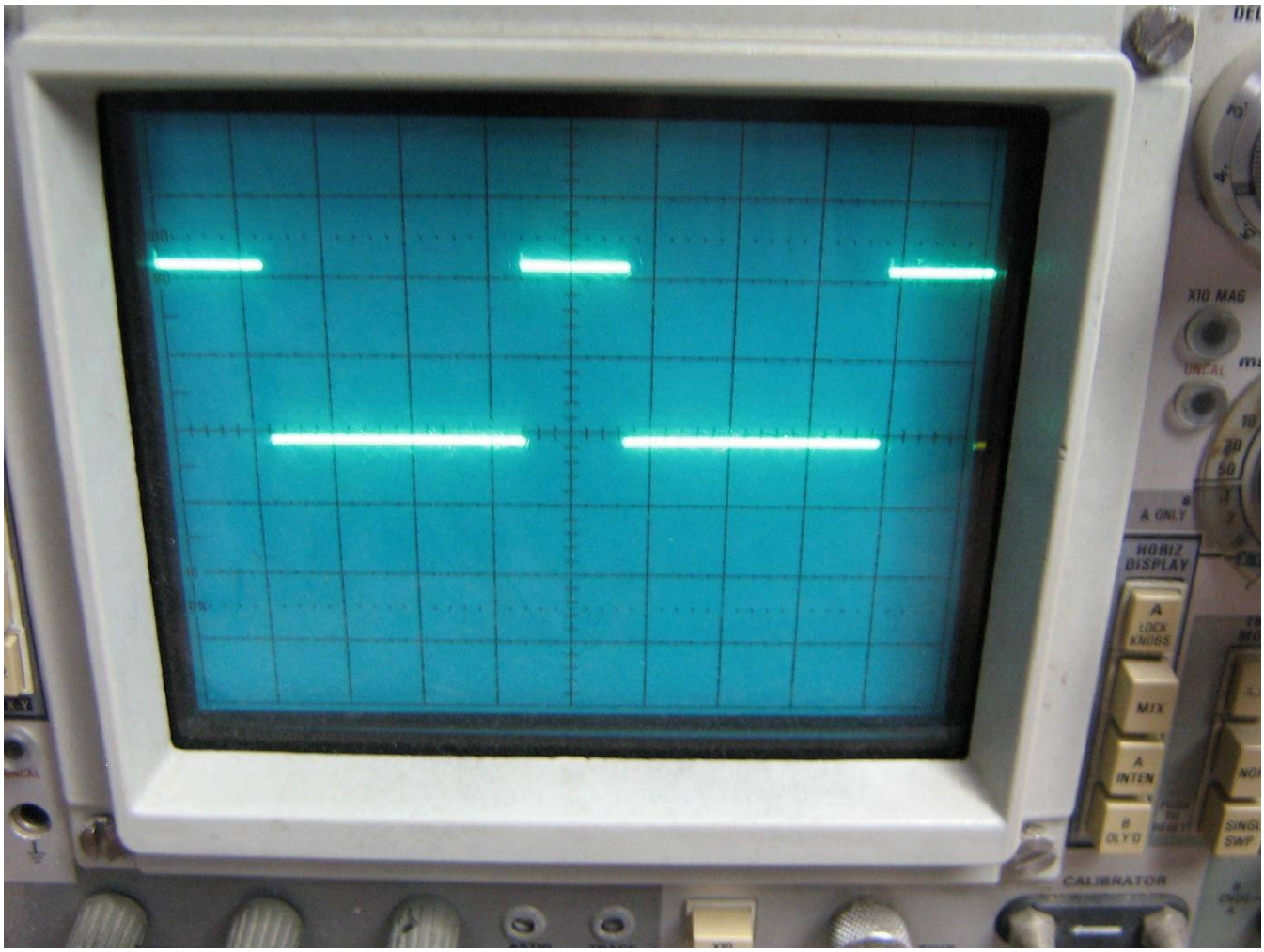
Example oscilloscope screen grabs of the adjust pulse width generator in use.

2 milliseconds / 5 volts per division.



Example oscilloscope screen grabs of the adjust pulse width generator in use.

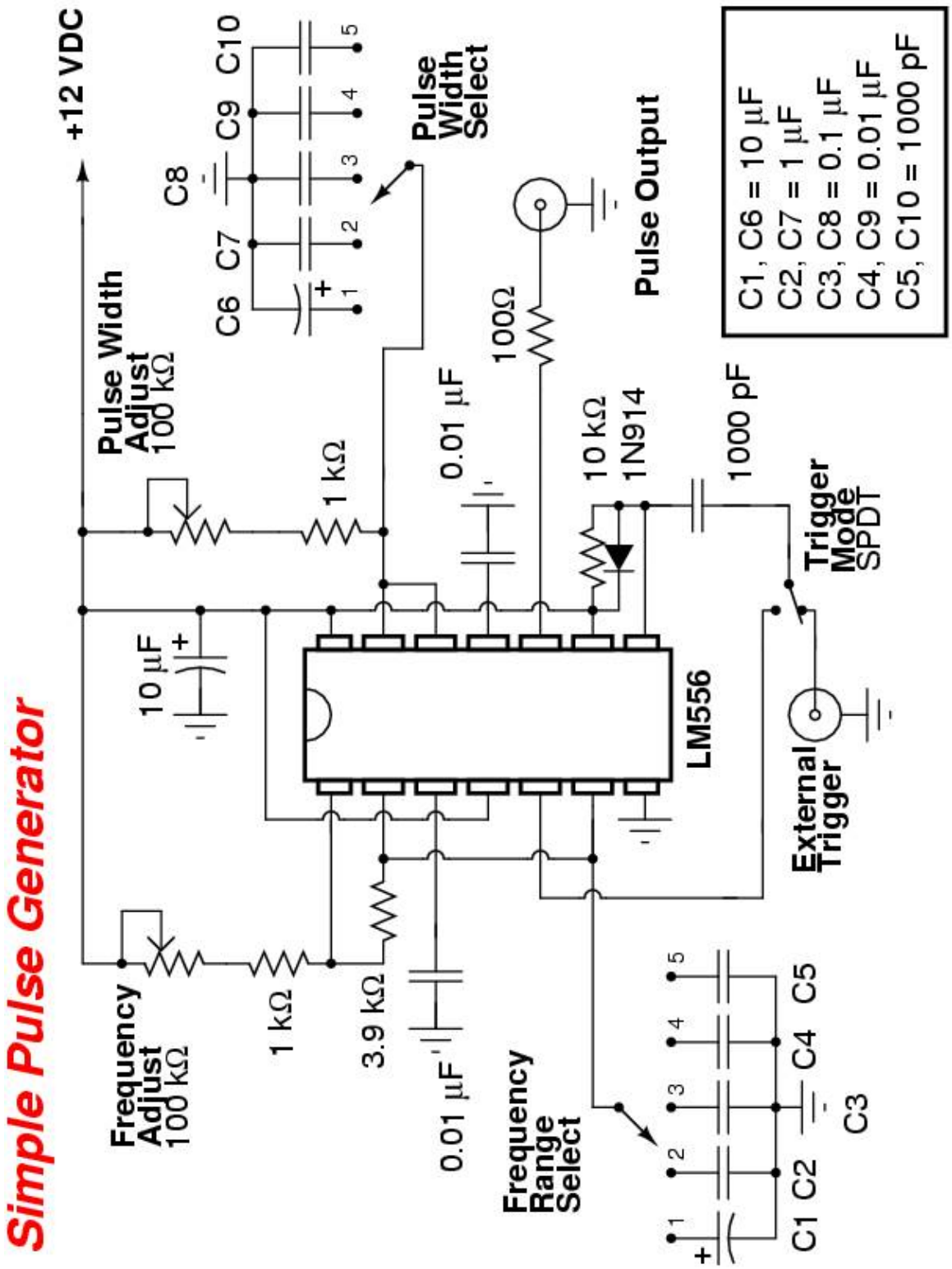
2 milliseconds / 5 volts per division.



Example oscilloscope screen grabs of the adjust pulse width generator in use.

50 microseconds / 5 volts per division.

Schematic


Simple Pulse Generator
+12 VDC
Pulse Width Adjust 100 kΩ
1 kΩ
0.01 µF
100Ω
Pulse Output
10 kΩ
1N914
1000 pF
Trigger Mode SPDT
External Trigger
LM556
10 µF
Frequency Adjust 100 kΩ
1 kΩ
3.9 kΩ
0.01 µF
Frequency Range Select
C8
C9
C10
C6
C7
Pulse Width Select
C1
C2
C3
C4
C5
C1, C6 = 10 µF
C2, C7 = 1 µF
C3, C8 = 0.1 µF
C4, C9 = 0.01 µF
C5, C10 = 1000 pF