SDR Receiver – Part 2

Limiting the tuning range of the VCO

I published a construction article in the February 2022 publication of Practical Wireless Magazine.

Electronic viewing of the magazine, as part of a subscription, is here: https://pocketmags.com/eu/practical-wireless-magazine

If you build a single band VCO and want to take advantage of RA and RB to limit the range covered by the VCO then here is how to do those calculations.

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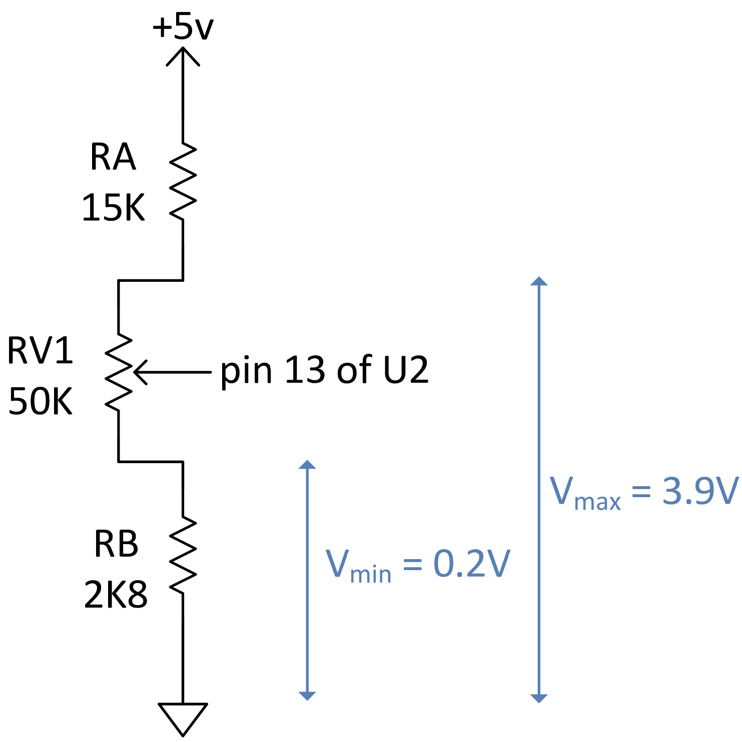
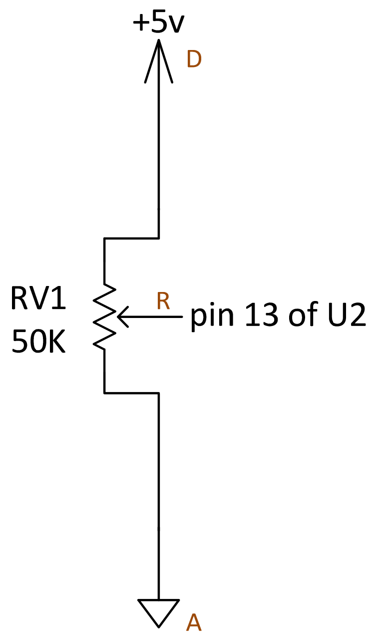
Here is figure 6 from the article:



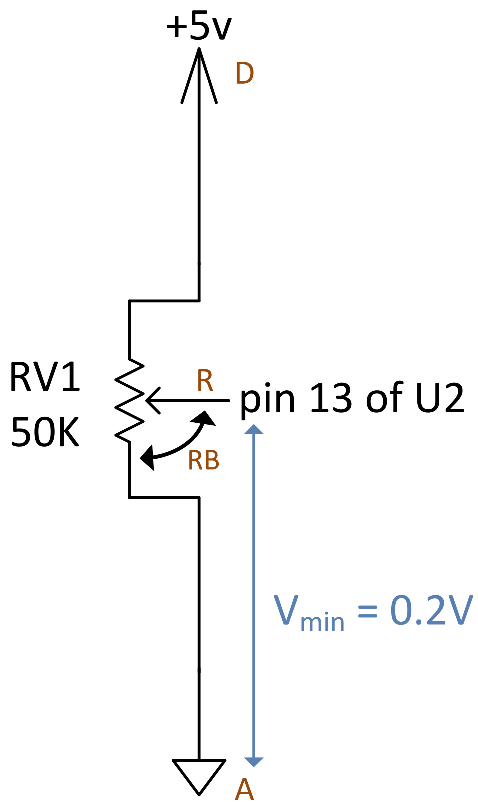
In my example, and using a capacitance of 384 pF (C1, C2 and C3 in parallel) I put in temporary shorts across RA and RB.

The circuit now looks like this:



I set RV1 so that the output of the oscillator was 560 kHz, making it 140 kHz after being divided by 4 – this is the lowest frequency I want the VCO to tune to.

From A which is ground to R which is the wiper of the potentiometer I measured 0.2V as shown below:

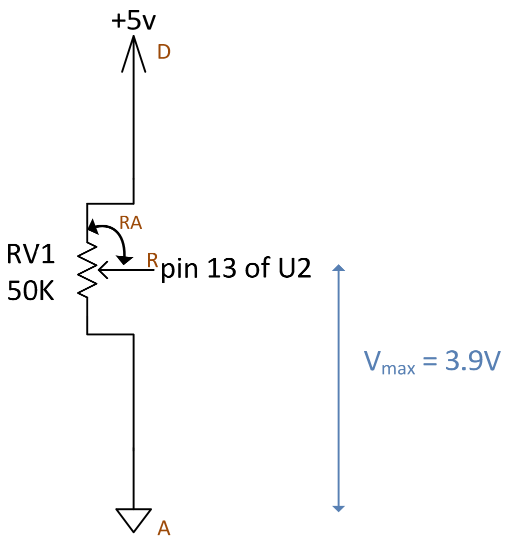


The idea is to replace that part of the potentiometer (marked RB) with a fixed resistor RB.

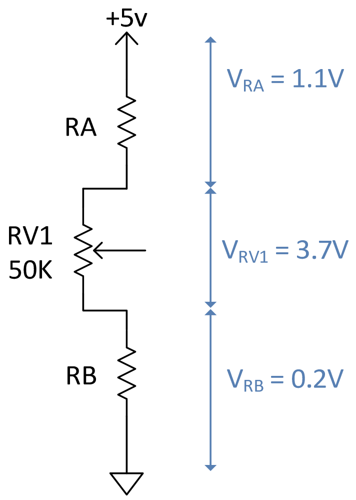
I then set RV1 so that the output of the oscillator was 1.2 MHz, making it 300 kHz after being divided by 4 – this is the highest frequency I want the VCO to tune to.

From A which is ground to R which is the wiper of the potentiometer I measured 3.9V.

The idea is to replace that part of the potentiometer (marked RA) with a fixed resistor RA.



The required voltage drops are then as follows:



Now we can apply Ohms law to determine the value of the resistor RA and RB.

As RA, RV1 and RB are in series we know that the amount of current flowing through them is identical. So to achieve a total voltage drop of 3.7 V across RV1 (the only resistor value we know) let us calculate how much current is required to flowing through it:

$$I = \frac{V_{RV1}}{RV1}$$

$$= \frac{3.7}{50000}$$

$$= 0.000074\ A$$

$$= 74\ \mu A$$

Now we know how much current is flowing through RA and RB and we know the voltage drop across each we can now calculate the required resistance of each:

$$RA = \frac{V_{RA}}{I}$$

$$= \frac{1.1}{0.000074}$$

$$= 14\,864\ Ohms$$

$$RB = \frac{V_{RB}}{I}$$

$$= \frac{0.2}{0.000074}$$

$$= 2\,703\ Ohms$$

I selected a 15K resistor for RA and then found that 2K7 for RB was a little low and used a 2K8 resistor instead.

Be aware that the input resistance of your voltmeter/multi-meter may slightly skew the results, so some empirical fiddling may be necessary.