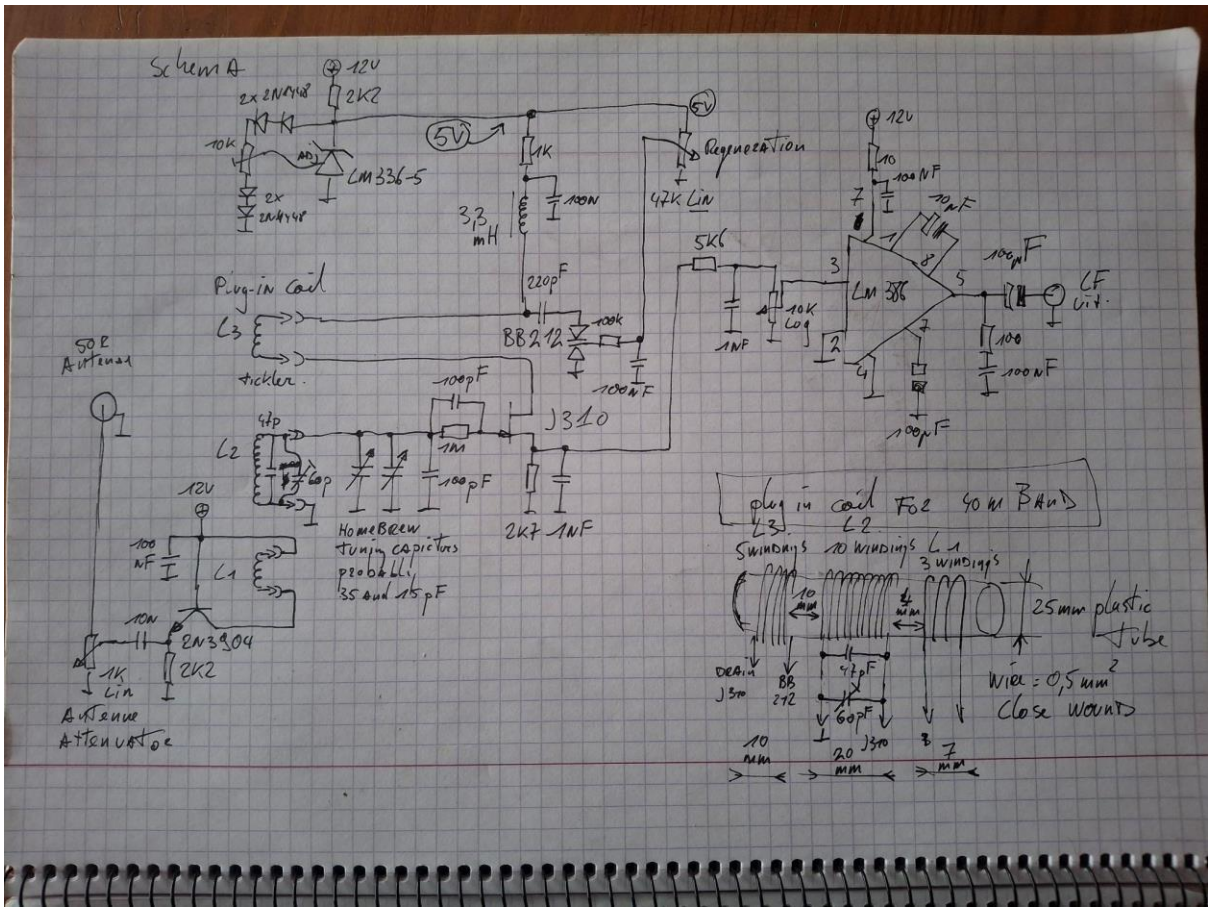
Homebrew one band regenerative receiver.
on1mws

Based on N1TEVs high performance regenerative receiver design. However, I wanted a receiver that is as stable as possible. Otherwise it is hard to listen to a HAM band when you constantly have to re-tune. Hence, a narrow band receiver/oscillator is the way to go. I ended up with only 100 KHZ of tuning bandspread, but that's enough for a Ham band. The original NTEV receiver is easily recognised in the schematic. This receiver might look simple but is a really hard build.



Differences with the original circuit? I used a LM386 for the audio amplification and a J310 for the regenerative oscillator. The HF amplifier is done with a 2N3904. After the set worked with a classic tuning capacitor for the regeneration I swapped it for a BB212 varicap. The coil is plug-in. So far only a 40M band coil is made. I will probably never make coils for other bands as the 40M band is my favorite.

Drift is less than 20Hz/minute, which is pretty good. This means you can at least listen for 5 minutes to an amateur station before you need to re-tune. I followed the advice of F5LVG and K0IYE to build the most stable oscillator.

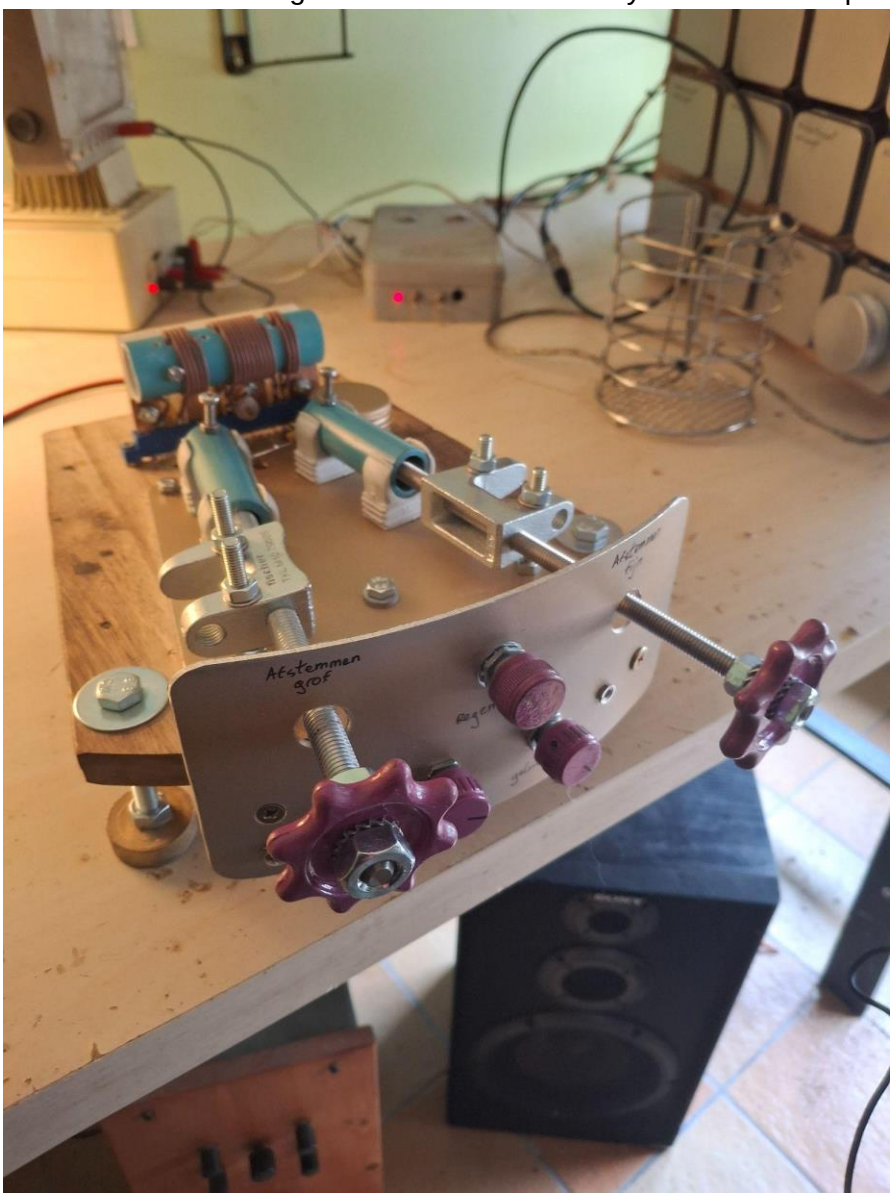
The tips?

-Use an air coil with thick wires.

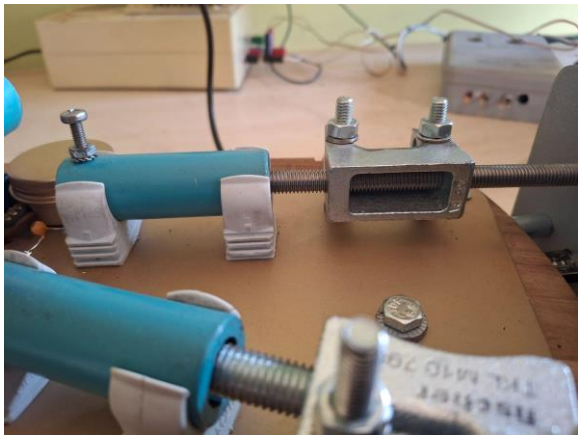
-Large diameter coil and the length of the coil should be less than the diameter (lots of air coil calculators on the net) My diameter is 25mm and the length is 20mm.

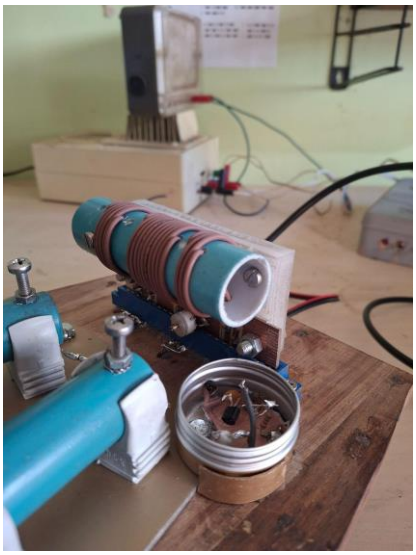
-Use the largest possible practical capacitance in the tank circuit (in this case about 200pF, tuning range is only 100KHZ)
-K0IYE tips are to use a high precision voltage supply for the oscillator. For this a LM336-5 is used.
-Only the oscillator should be fed by this voltage regulator.
-Use the lowest possible voltage for the oscillator.
-Build any heat source (HF amplifier, voltage regulator and audio circuits) in a separate enclosure.
F5LVG has a website with an article about oscillator stability and you need to locate chapter 10 from “Crystal set to sideband” of K0IYE for more info about oscillator stability .

Regeneration receivers are very tricky to build! The regen radio was overwhelmed with hum at first from my power supply. But it worked fine with a battery. The hum problem was solved by using another tip from F5LVG. According to F5LVGs papers, radiation from the regen can modulate 50HZ in the power supply. Four 10NF capacitors parallel over the four rectifier diodes cured the hum completely. This was a pleasant surprise! The separate power supply is located about 30 Cm from the regen. I have not noticed any radiation if it is placed closer.



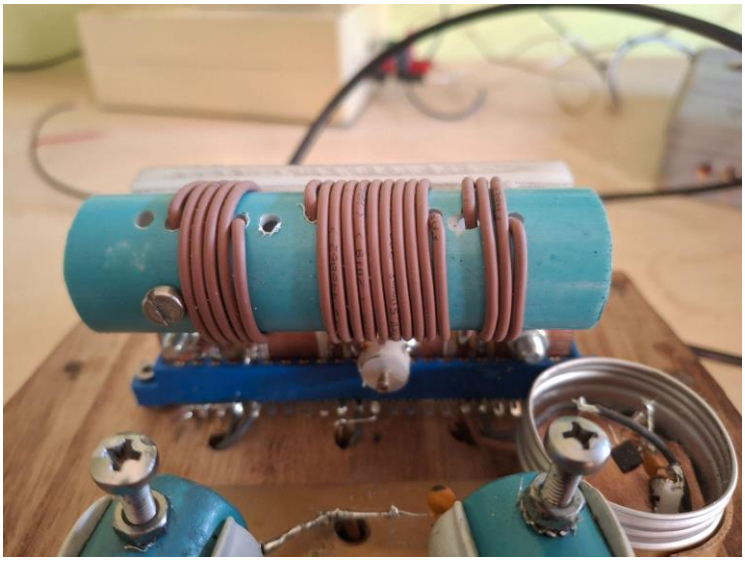
The homebrew capacitors are basically a threaded rod that are being driven in or out a metal tube. One is M10 in a tube that is about 12mm. This is the coarse tuning and is probably about 35 pF. The other one is a M8 rod in a 17 mm tube. Probably around 10pF. The rods are driven through a M10 and M8 steel beam clamp. These provide gear reduction. About 1/40.

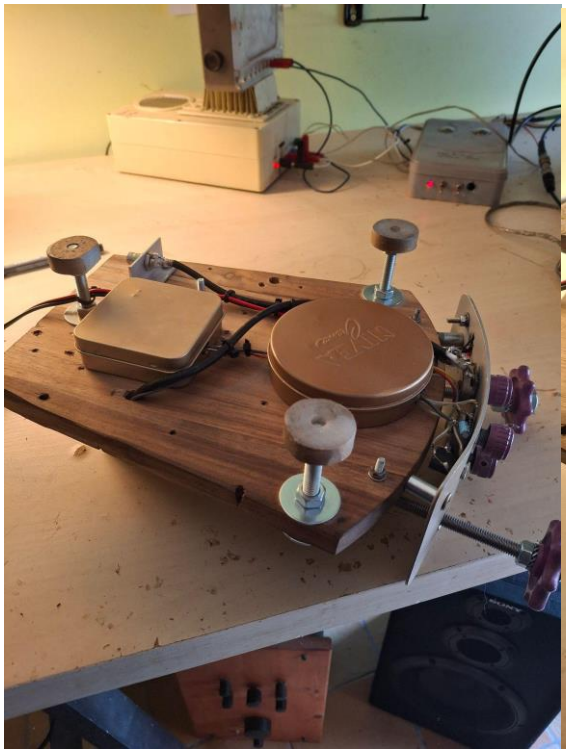


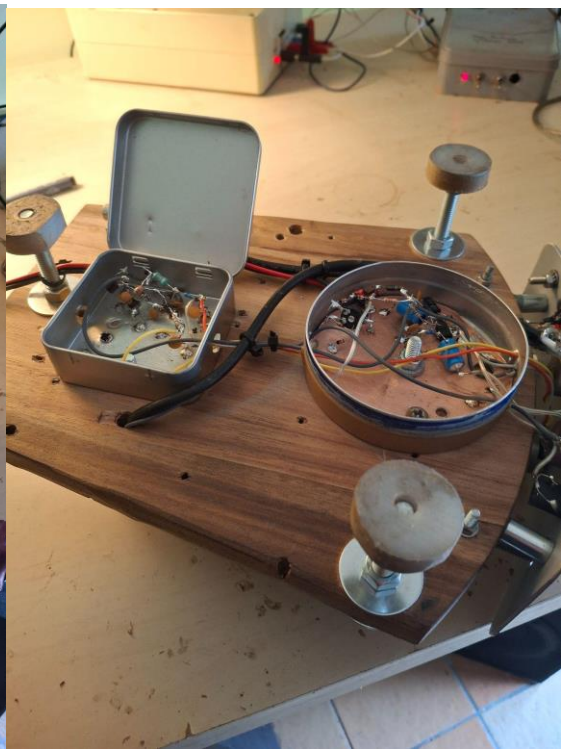


Any other capacitor will also work and the easiest is probably to use a 1N4001 as a tuning varactor.e ground of the homebrew capacitors acts as a ground plate.
The coil is placed more than one diameter above the ground plate to avoid coupling. Read this in N1TEVs article.

It will also be much easier to use a normal tuning capacitor for the regeneration control. I used my last BB212 because a potentiometer is easier to mount on a front panel. But it was tricky to make it work.
More capacitance is oscillation and less capacitance is less or no oscillation. The oscillation must be easy to regulate in and out. The oscillation can be measured on the hot side of the regen capacitor. For this you need to set your oscillator probe on X10. Set on X1 the probe will always trigger oscillation. For receiving CW and SSB you only need a tiny bit of oscillation. For AM obviously no oscillation. Finding the right combination of regen capacitor and tickler coil dimensions takes some effort.







The set works really well for such a simple schematic. Sensitivity is amazing, however, selectivity is not up to modern standards. If I would include audio filters for CW and SSB between the oscillator and LM386 the performance would be quite ok. Equal to a good DC receiver. I expect that it would have a better S/N ratio then a DC receiver. However, I won't bother and keep it as it is and experience the full "1920s experience"

The radio is so stable that I figured that it would stay long enough on frequency to use it for a QSO. For this I built a T/R relay. One contact switches the antenna to the regen in receive and to the transceiver in transmit. This is obvious.
The second relay contact switches the regen set completely off in transmit mode. The question is naturally how far off frequency the regen is after you go back to receive? Well, if the antenna attenuator is on full signal, the frequency is slightly higher than before but not far. If the antenna attenuator is slightly attenuating, the regen is completely on frequency after switching back to receive. Spot on to my amazement. My first ‘regeneration’ QSO was in March 2025 and I worked M0KRI for about 25 minutes without re-tuning much. Amazing. M0KRI had some trouble coming to grips with the fact that I was working him with a homebrew two-transistor radio.

This regen is far from high performance but a lot of fun and actually practical. It is Anno 2025, my most used receiver. I would have never believed this in advance.

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