

# Beat-frequency oscillator on XTAL

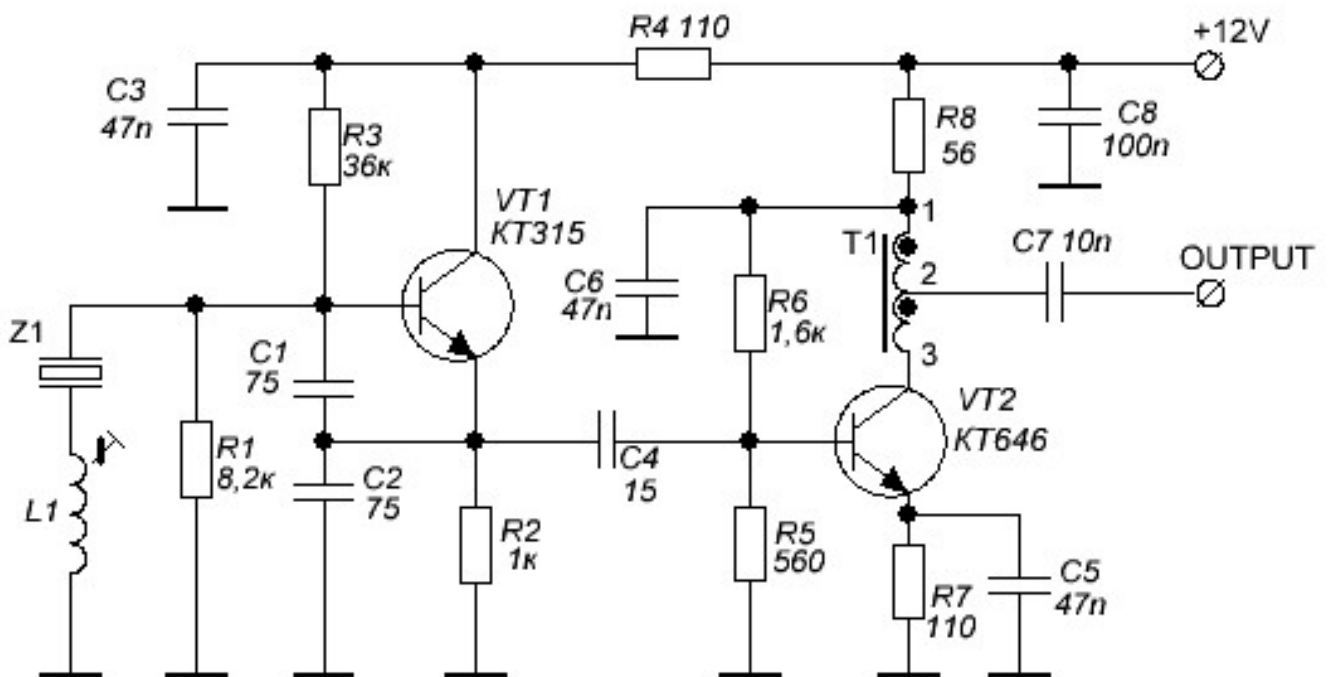
Many readers will know that, although they have a short-wave radio which covers at least one of the amateur bands (e.g. 7MHz or 14MHz), they are unable to listen to SSB or Morse signals. This is because the receiver lacks a Beat-Frequency Oscillator (BFO). We need the 'carrier' frequency of a BFO to replace the carrier that has been removed from the signal at the transmitter. When listening to Morse signals, the BFO signal 'beats' with the incoming signal to produce a note in the loudspeaker. If you are a musician, you will be familiar with the method of using 'beats' to tune one musical instrument from another; in the BFO, the beat frequency produced is the tone signal you hear.

In the more complex amateur radio receiver, a BFO is incorporated as part of the whole system. In our model, it is an external circuit that sits alongside your radio. In a radio receiver, a beat frequency oscillator or BFO is a dedicated oscillator used to create an audio frequency signal from transmissions to make them audible. The signal from the BFO is mixed with the received signal to create a heterodyne or beat frequency which is heard as a tone in the speaker. BFOs are also used to demodulate single-sideband (SSB) signals, making them intelligible, by essentially restoring the carrier that was suppressed at the transmitter. BFOs are sometimes included in communications receivers designed for short wave listeners; they are almost always found in communication receivers for amateur radio, which often receive CW and SSB signals.

The BFO has mainly two RF oscillators. One of the oscillator gives a fixed frequency and the other one produces variable frequency. The variable frequency will be slightly different from the fixed frequency. The fixed and variable frequency outputs are fed to a heterodyne or mixer device. The sum and difference terms of frequencies  $f_1$  and  $f_2$  are obtained as the output of the mixer.

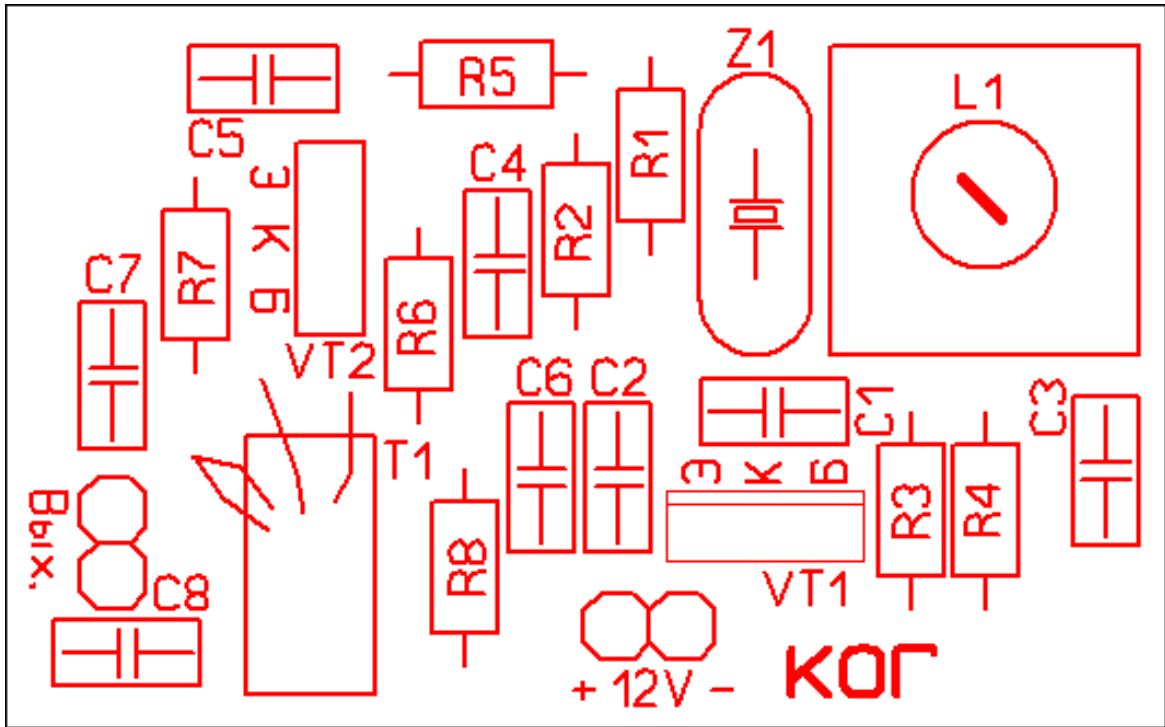
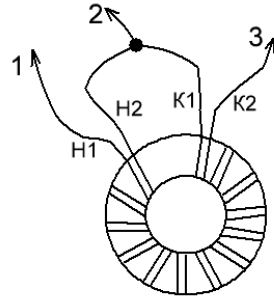
The RF output is 3V. Recommended XTAL range for this unit is 5-15 MHz.

## Beat-frequency oscillator on XTAL (BFO)

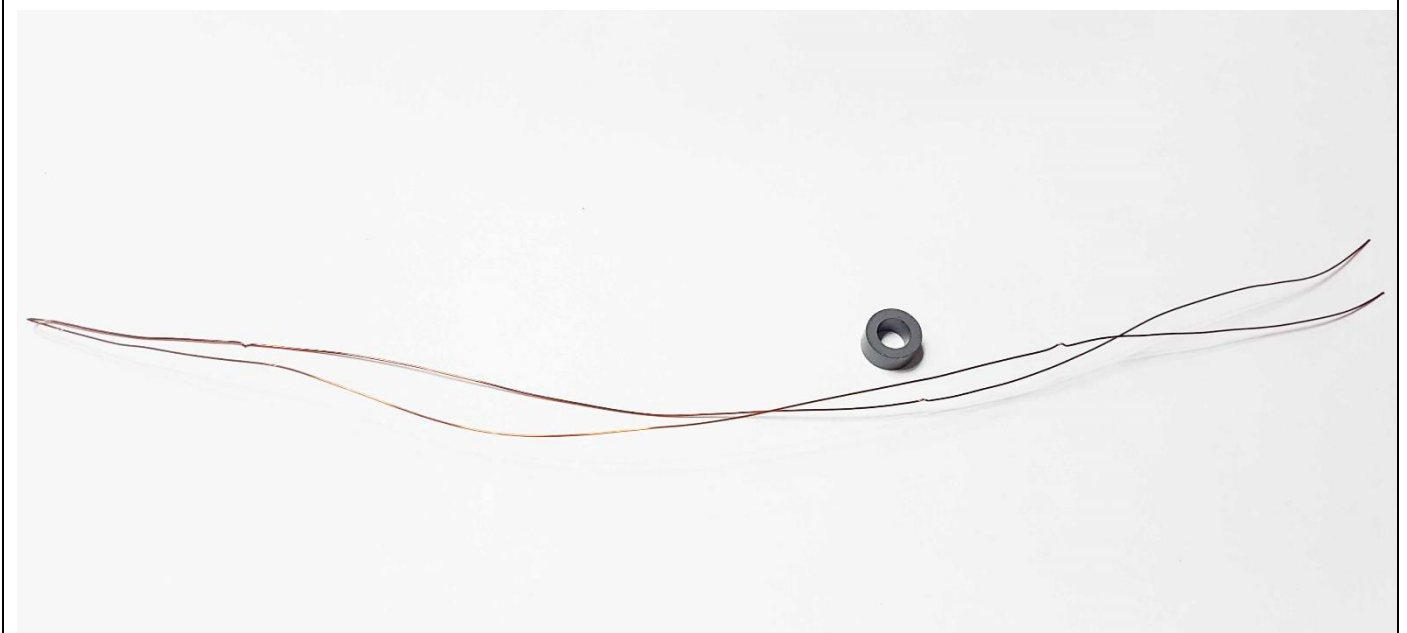


## Assembly details

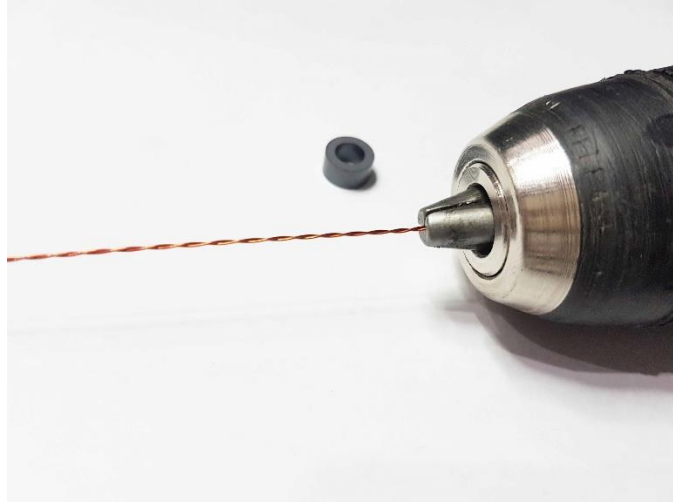
- Coil L1: skeleton 5-6mm, 25-35 turns, 0.16mm wire
- Transformer T1: toroid 10x6x5, 2 twisted 0.35mm wires, 5 turns (see picture below)



**Step 1. Take the toroid and piece of wire (50cm). Fold the wire in half as shown**



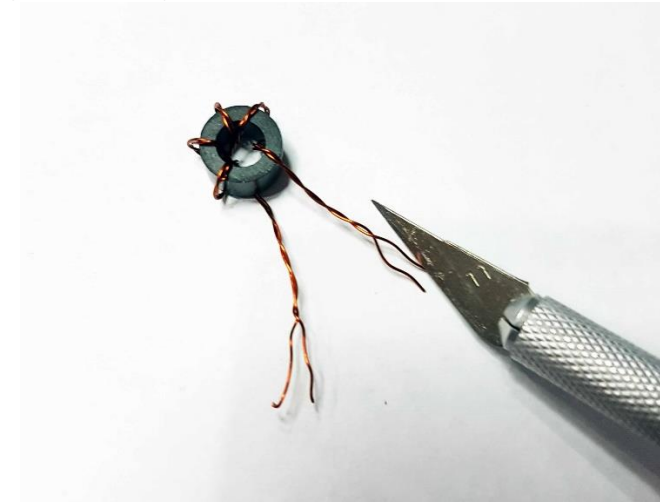
**Step 2. Make a wire twisted. Easy to do it my drill.**



**Step 3. Make wiring (5 turns)**



**Step 4. Cut the isolation from the ends of the wire. Find the ends of wire 1 and wire by using diode tester (multi-tester)**



**Step 5. The end of the first wire should be connected to the beginning of the second wire (see illustration on page 1).**

