

80 Meter VFO

Using a Variable Capacitor and 10.7 MHz IF Can

Paul R. Jorgenson KE7HR NSS 39382FE

While working on an 80 meter DSB transceiver project, I became less than satisfied with a kit VFO that I built and was using with the radio. This particular kit had some peculiar problems such as a shift in frequency between transmit and receive, a VHF oscillation that heated up the buffer transistor (causing drift), and microphonics when bumped even though the torrid coil was glued securely to the PC board. Changing transistors, putting ferrite beads on the leads, changing capacitors and inductors - nothing seemed to tame this VFO. Something different was needed for the project.

My first solution was to use a crystal oscillator with a crystal that I had for the phone band. It works quite well except for the fact that being rock bound means that any QRM cannot be avoided. When working one evening from underground to a station on the surface, I was able to copy the surface station just fine but, due to a distant conversation going on only 800 hertz away, the surface station was having a hard time copying my transmissions. I could only be heard in lulls in the distant conversation.

The next solution was to try a brass screw tuned PTO (permeability tuned oscillator) that I had seen used several times in other QRP equipment. The circuit looked simple enough and went together fine on the breadboard after scaling for the frequency change from 40 meters. The PTO worked pretty well except for my mechanical mounting, which can be improved upon. I will revisit the PTO in the future and have a better plan for keeping the coil and brass screw more stable.

I next tried to use the same basic circuit as variacator diode tuned with a 10.7 MHz IF can as an adjustable inductor. The IF transformer seemed to work fine using the primary coil (no attached capacitor on this can and the secondary windings are unconnected) and gave a large amount of adjustment, but the diodes that I tried all gave tremendous amounts of frequency drift. This was not acceptable.

The solution I came up with was to replace the variacator diode circuit with a variable capacitor from the junk box. A 100 pF air variable unit made with a ceramic insulating base was at hand and pressed into service. It works great. The drift, after a warm up period, is quite acceptable. SSB signals only need to be retuned after 15 minutes or so to keep them sounding normal in the receiver.

The circuit is built 'dead bug' style on a piece of single sided copper circuit board which was cut to fit the small aluminum box that was to house the VFO. All ground leads are soldered directly to the copper foil. Components either bridge between themselves or are supported by small pads of circuit board material. All of the capacitors are either silver mica or NPO ceramics for stability. The transistors are a variety of 2N2222A with a heat sink built in (not needed but this was the transistor at hand). The voltage regulation for the circuit is handled by a 78L08 three terminal device. RF decoupling capacitors are on both the DC input and output of the regulator. The RF out of the VFO is coupled to RG-174 coax via a 100 pF capacitor. The main tuning capacitor is 'padded' by a 12 pF capacitor for less tuning range. With the values given, the tuning range was about 40 KC. Most of the tuning tends to stack up on one end of the capacitor range and using a wider tuning range makes for difficult tuning. The tuning range is easily shifted anywhere in the 3.5 to 4.0 MHz range by adjusting the slug in the IF can with a non-conductive tool. I adjusted the range initially to cover 3.915 to 3.955 MHz so that the crystal oscillator module would be in the same range (3.930 MHz).

