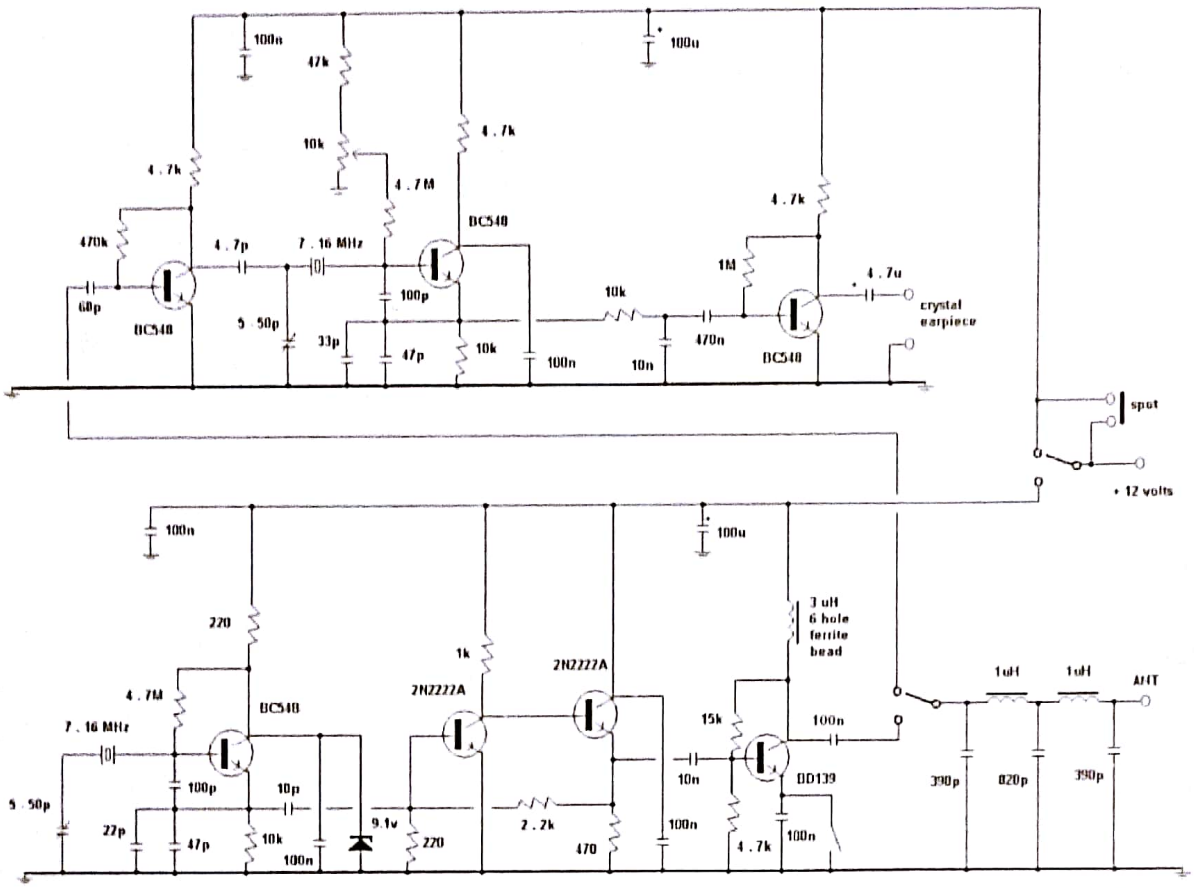
The CRTR: A ceramic resonator regenerative transceiver for 7 MHz

Peter Parker, VK3YE

CRTR: Ceramic Resonator Transmitter-Receiver for 7 MHz



VK3YE

I've always thought of regenerative receivers as being more for casual listening than on-air working. Shortcomings compared to the more commonly used direct conversion technique include the risk of frequency pulling, overload on strong signals, and, if independently tuned, poor resettability and band spread.

Previous experiments with VXO and ceramic resonator regenerative receivers showed promise but it was not until seeing F5LVG's 'New High Performance Regenerative Receiver' (Sprat #158, #165 and at http://oernst.f5lvg.free.fr/rx/1v2-tran-2013/rx-1v1-2013-en.html) that I arrived at one worth building as a permanent project.

I made no basic changes to the F5LVG circuit except to suit available parts and simplify the circuit by leaving out the RIT. Replacing the tuned circuit with a 7.16 MHz ceramic resonator (available from www.minikits.com.au) and series variable capacitor allows stable coverage of 7.000 – 7.120 MHz. This covers the entire CW portion and some SSB frequencies as well.

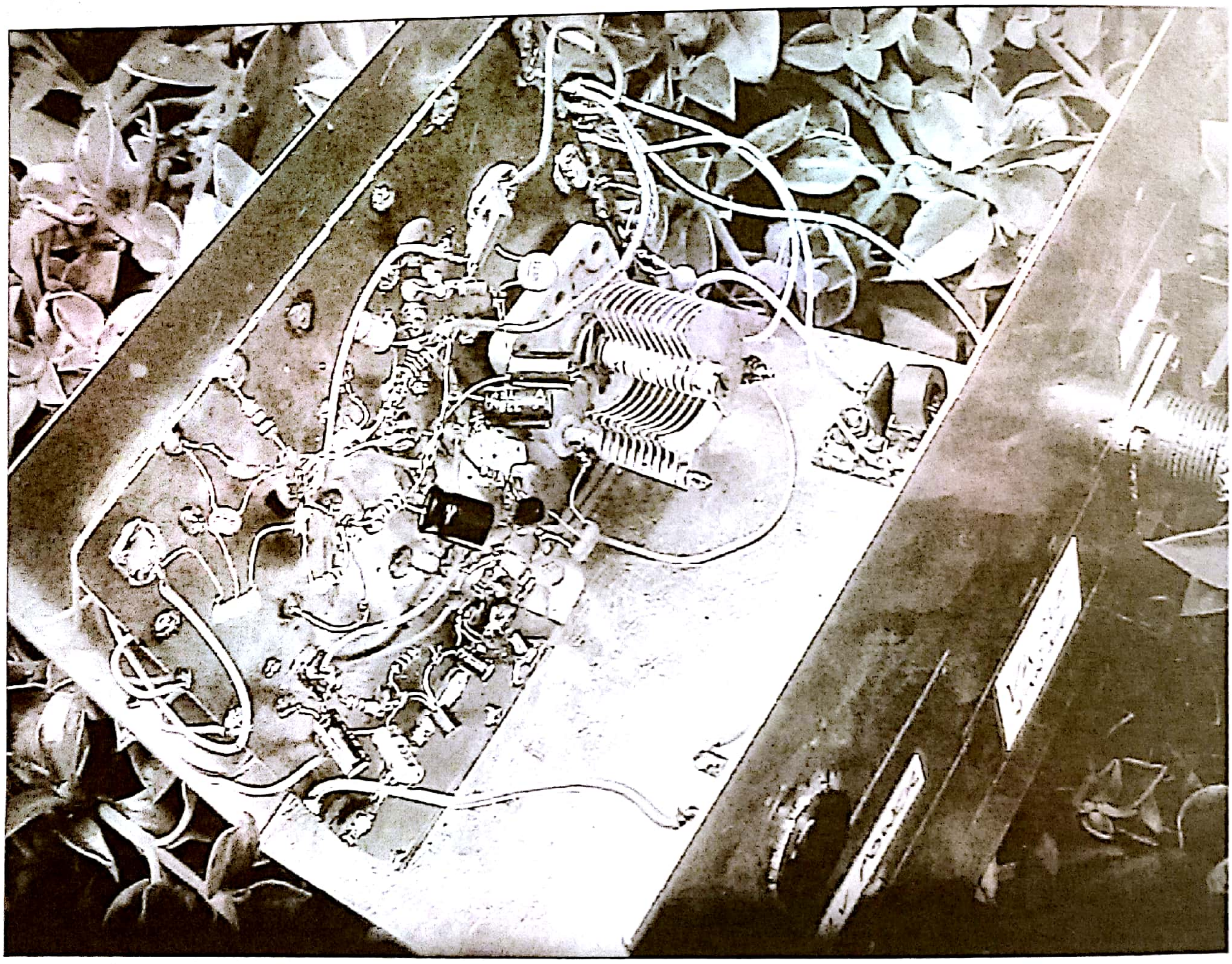
Performance is excellent and it handles like a direct conversion receiver. Regeneration is smooth and it can be so finely set that the set can be oscillating on one side of a CW signal but not the other. It can be tuned across the entire CW segment with a need to adjust the regeneration control only one or two times. There is also no frequency pulling when the regeneration control is adjusted.

I suggest starting with F5LVG's design. Then substitute the ceramic resonator. You'll be amazed at what a regenerative receiver containing not a single inductor to wind can achieve. A demonstration appears on my YouTube channel at www.youtube.com/vk3ye . Multiband operation with resonators for other frequencies eg 3.58 MHz is potentially possible but hasn't yet been tried.

Making it a transceiver was the next step. My initial thought was to tap a little RI from the emitter of the reger detector's transistor and fed it to a two transistor buffer via a 10pF capacitor. This buffer is the same that N3ZI uses for his DDS VFOs. Loading caused some transmit/receive frequency offset but this was not easily controllable. Also, when the set was just oscillating (as you'd have it for CW reception) the RF output was low. Advancing the regeneration control greatly increased output. I overcame this by changing the base bias with a smaller resistor (switched in on transmit only) to increase output but there was still the issue of the frequency offset. Also a fixed frequency offset is a disadvantage with simple direct conversion and regenerative receivers with limited or no opposite sideband rejection because you will sometimes wish to change the receiver's frequency to dodge strong unwanted signals.

While using the receiver's oscillating detector in the transmitter portion is no doubt feasible, this is one of those cases where using fewer parts makes a project harder rather than easier. So I instead opted for a trans-receiver with the only common circuitry being the low pass filter in the antenna line. The transmit signal generated by another 7.16 MHz ceramic resonator oscillator. A spot button turns on this oscillator while in receive mode, allowing the transmitter to be brought on frequency. Transmitter power output is approximately 1w – enough to reach over 1000km if conditions are good.

On-air use is a little harder than a direct conversion or superhet transceiver with shared local oscillator and fixed transmit/receive offset. Think of it as like driving a manual rather than automatic car or operating a WWII military set. However the trans-receiver arrangement gives you the flexibility of operating split frequency or independently varying the receiver frequency for best reception. If calling a station you should zero beat the receiver on their signal, press the spot button and set the transmitter oscillator to zero beat then retune the receiver to hear the incoming signal again. You will now be set up on their frequency, ready to call the station being heard. The transmitter is less stable than the receiver and stations worked may notice slight drift. This is the main part of the transceiver which has yet to be optimised. The other alternative is to tolerate a smaller frequency range on transmit by substituting a crystal VXO or twin crystal 'super VXO



I regard this as a novelty project, though with coverage of the entire CW portion of the band (along with the potential for crossmode contacts by calling SSB stations) it will be capable of far more contacts than crystal controlled kits. It is no doubt capable of refinement but even as presented it is a fun rig to use.