

Frequency Stabilization in Older Kenwood Transceivers – Using the X-Lock

By Bob VK2ZRM

Introduction

The Kenwood TS-520 / TS-820 series of transceivers were very popular with Hams of 30 years or so ago, “down-under” here in Australia. These old rigs, (affectionately known as “Boatanchors”), remain popular with enthusiasts and I have several Kenwoods in my Boatanchor collection.

Now, whilst these rigs are great fun to operate and unlike many modern rigs can be maintained and repaired by their owners, one of their less endearing features is frequency drift. This is due to their free running VFO's (Variable Frequency Oscillators), which are subject to frequency drift due to temperature variations and mechanical factors.

Both my Kenwood TS-520S and TS-820S are “drifters”. I find this annoying and recently decided to do something about it. After some time spent researching the topic on the Internet and in RSGB publications, I decided on a “Huff and Puff” solution and ordered an X-Lock kit from Cumbria Designs;

<http://www.cumbriadesigns.co.uk/x-lock.htm>

I have to say, that during my initial investigations into the X-Lock kit and during the subsequent construction and installation phase, I found Ron Taylor of Cumbria Designs extremely helpful and responsive.

Construction of the Kit and Installation in the TS-520S

The X-Lock consists of two parts, the X-Lock PCB module, and the varicap (red LED) which is installed in the VFO. The kit went together easily, simply by following the excellent assembly instructions in the user manual. On the initial power up, the X-Lock worked straight off and went through its diagnostic routine.

For evaluation purposes I chose to install the X-Lock into my VFO-520, the optional external VFO for the 520 series of transceivers. The VFO unit in the VFO-520 is electrically and mechanically identical to that of the TS520 transceiver. The Kenwood VFO assembly is housed inside a metal can. I considered two possible strategies for implementing the X-Lock with the Kenwood VFO; Open up the VFO unit and install the additional compensation varicap (a red LED) or apply frequency compensation via the existing RIT varicap.

I believe it should be possible to avoid opening the VFO can by sacrificing the RIT circuit and connecting the output of the X-Lock to the RIT varicap. However, not feeling particularly brave or foolhardy, I decided to play safe and to go the whole hog retaining the RIT and installing the varicap (red LED) and the associated R/C filter inside the VFO can. The end result was excellent, but it did require re-adjustment of both the variable inductor and the variable capacitor in the VFO oscillator circuit. I found this adjustment “fiddly”, but I was able arrive at a setting where the frequency once again tracked the mechanical dial of the VFO. I found that if variable capacitor

TC1 in the VFO was adjusted to zero capacitance (completely out of mesh), then L1 could be adjusted (very carefully and in small increments) so that the VFO tracked correctly once again.

Whilst I chose to install the X-Lock in the VFO-520 external VFO unit, the procedure will be exactly the same when installing X-Lock into the internal VFO of the TS520.

The installation of X-Lock with the Kenwood VFO, requires the following:

1. A small PCB, or tag strip mounted inside the VFO can, to mount the varicap (red LED), resistor and capacitors. The “VAR” output of X-Lock is connected to this PCB. Component values were all as recommended in the user manual, with the exception of the coupling capacitor. This is recommended as 68pf in the user manual. I found 17pf to be best (I used 10pf + 6.8pf in parallel).
2. Tapping into the VFO output with a short length of miniature coax. This is connected to the RF input of X-Lock.
3. Supplying a DC voltage to power the X-Lock. This is nominally +12V DC, but in the absence of a convenient 12V supply within the VFO520 I elected to use the regulated +9V DC VFO supply. This has enough “headroom” to supply the X-Lock’s 5V regulator which feeds the processor and logic but is too low to supply the X-Lock’s 8V regulator which supplies the analogue stages. Fortunately the modification for 9V operation is trivial, I simply omitted the 78L08 8V regulator and instead installed a wire link between its input and output pads. The analogue output stages are now supplied directly by the 9V regulated VFO supply.

Conclusion

In closing, I can wholeheartedly recommend the X-Lock kit from Cumbria Designs. It does exactly what it is meant to do and my TS-520S is now rock steady on the set frequency and will retain this setting over extended periods.

I have included several photographs illustrating my X-Lock implementation:

1. Photo 1. – This is the small PCB that I made to mount the components installed inside the VFO. The additional PCB is at the rear right of the photo.
2. Photo 2. – This is the test rig I used to test the X-Lock and VFO for function and stability, prior to reinstallation of the VFO. X-Lock is sitting on top of the power supply. X-Lock held the VFO rock stable during a 10 hour test period.
3. Photo 3. – This is the final installation of X-lock, mounted on the side of the VFO can.

I will be very happy to assist anyone wishing to install X-Lock in their Kenwood transceiver. My email is vk2zrm@optusnet.com.au

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Photo 1 – The Varactor PCB mounted inside the VFO enclosure

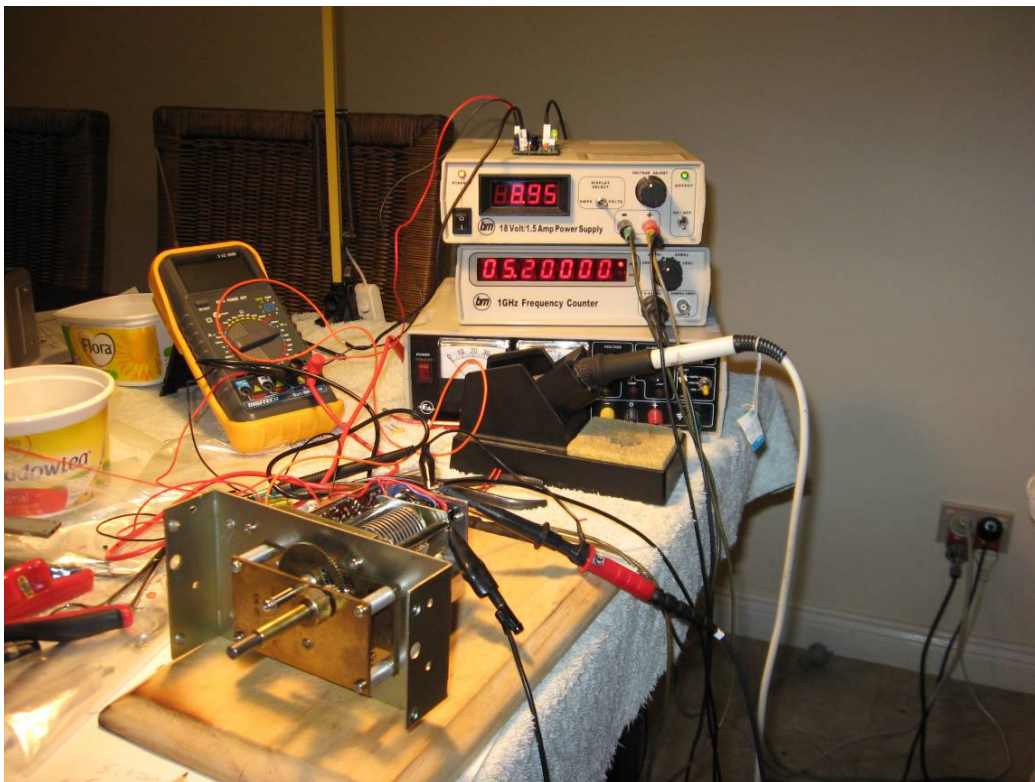


Photo 2 – Testing the X-Lock

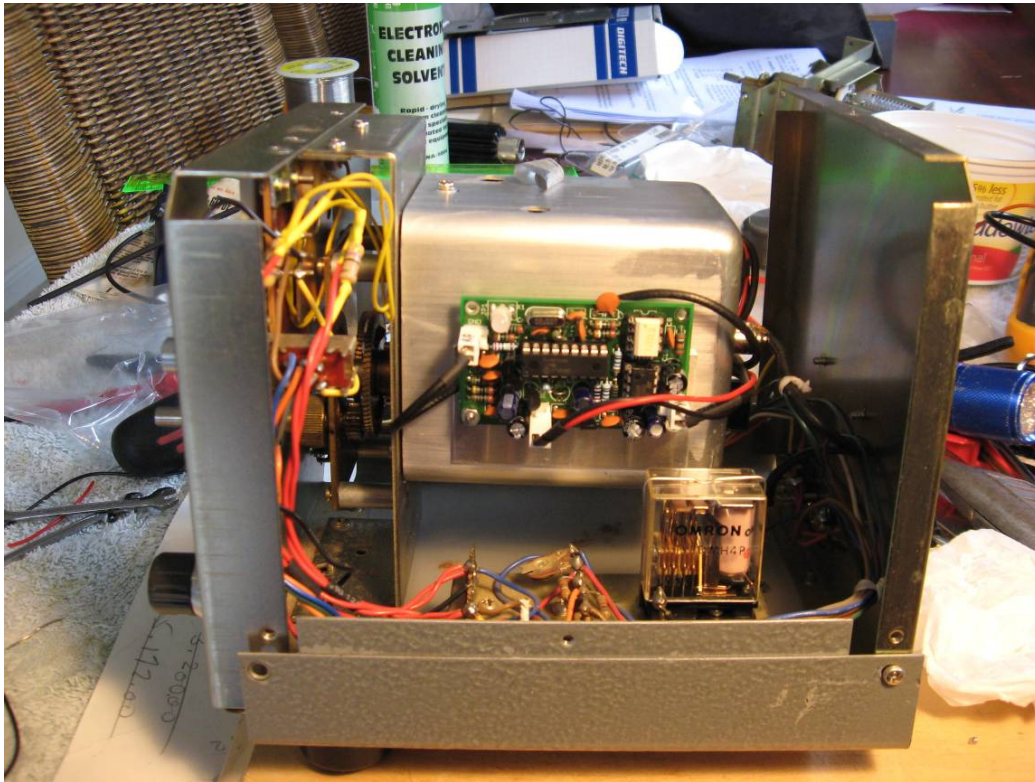


Photo 3 – Final assembly

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