Modifying The FRG-7

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Part 4

In this final part of the series on modifying the FRG-7 receiver we look at problems with b.f.o. drift and some of the points raised by readers.

BFO Drift

I mentioned in Part 1 of the series that one area of the receiver where performance was weak was the b.f.o. and its tendency to drift over fairly short periods of time. Sure enough it was the main point raised by those readers who wrote to me, in particular, Bob Marshall of Canterbury, Dr. Alan Bryce G4NCR and Bob Wilkinson G3VVT.

Everyone agreed that the close proximity (a mere 6mm) of the b.f.o. tuning coil to the heatsink of the audio amplifier i.c. was no doubt the main cause. Various suggestions were put forward but all involved fairly tricky modifications to the existing circuit. The philosophy of this series had been all modifications should be add-ons which could easily be removed and in fact by the time Part 1 was in print I was already working on a circuit that used ceramic resonators. I had chosen these in preference to quartz crystals which were expensive and bulky and not very easy to obtain.

Ceramic V Quartz

It has been known for years that oscillators could be made using standard ceramic filters as the resonating element and more recently manufacturers have been producing a range of ceramic devices intended specifically as inexpensive substitutes for quartz crystals. These ceramic resonators are not as accurately cut as good crystals and do not have the same temperature stability. Even so they are smaller than quartz equivalents at low frequencies and their stability is more than adequate for our purposes. Important as well from the point of view of this series, they cost pence and not pounds. Measurements made on the original b.f.o. showed that it was quite capable of drifting by as much as 200Hz over just 5 minutes whereas with the circuit presented here the drift is limited to less than 20Hz in the same period.

Although details are given only for u.s.b. and l.s.b. frequencies for the Toko MFL filter which has a centre frequency of 453·5kHz, it is possible to adapt the circuit for other i.f.s. A range of these devices is available from Cirkit and frequencies include 455, 460, 500, 560kHz and 1MHz.

Oscillator Design

Having decided on the method of curing the problem, the actual design proved a bit tricky. Several circuits for using ceramic resonators have been published and all involved using a standard Colpitts oscillator. When these circuits were tried they were rich in harmonics which appeared as very strong signals within the receiver's normal tuning range. Even including a 455kHz transformer for coupling had little effect as the circuits were radiating

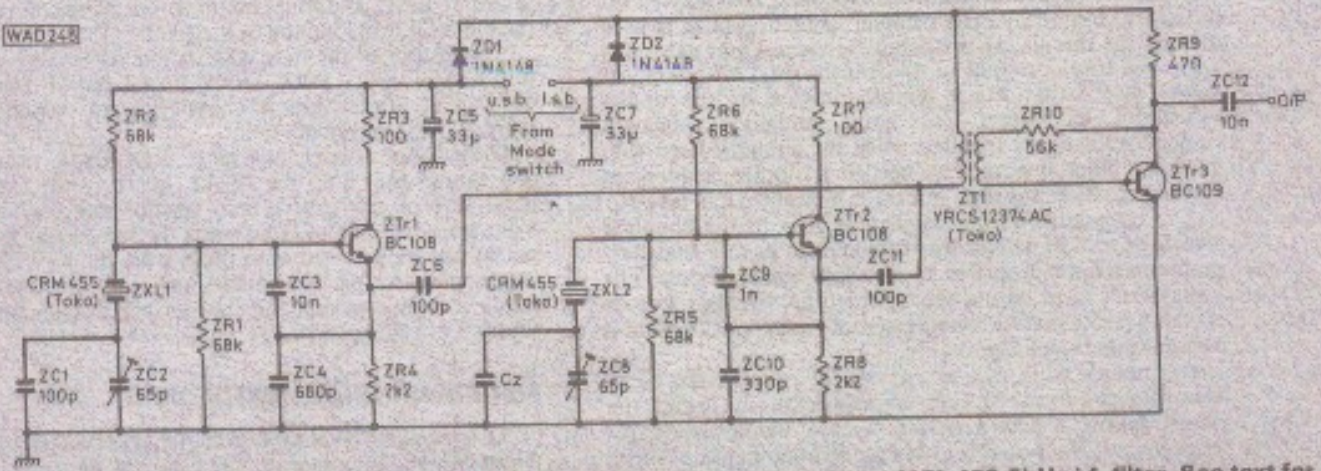

Fig. 4.1: Circuit diagram of the ceramic resonator b.f.o. for use with the Toko MFL 453·5kHz i.f. filter. See text for alternative centre frequencies