This change to the IF-Gain control wiring did not affect the audio distortion, nor did I expect it to. The cause of the distortion turned out to be the BFO itself (the level appeared to be 50% low). But I also discovered something odd about the secondary winding in the final IF transformer. This is actually two windings in series with a combined resistance of around 20-ohms. In this case the resistance was about 120-ohms. I removed the transformer and found that the wires in the secondary circuit showed signs of thermal stress. I replaced the entire transformer assembly with one salvaged from a MK2 100KHz IF assembly. This included the additional trimmer capacitor and slugging resistor. This would have no real effect on the performance. However it did not resolve the low level of BFO drive or resolve the audio distortion issue. Finally I removed the BFO from the MK2 IF module. As expected the resistors inside were not looking great but I ran it up on the bench and the level of BFO drive was good. I then temporarily wired it into RA17 N371. BINGO! No audio distortion and lovely clear SSB signals. It has to be said that the BFO in the RA17 etc. is a very rough and ready affair. The output signal is effectively a crude square wave. This is in stark contrast to the beautiful PTO-generated sine-wave in the Collins R-390 and R-390A.

I then stripped down the newly salvaged BFO, refurbished it and fitted it into RA17 N371. I have thoroughly checked out the components in the original BFO and cannot find anything wrong, though the damaged secondary winding in the IF transformer might provide a clue. It may be that the ceramic capacitor in the output of the BFO is ‘breaking down’ and thus providing an unwanted DC path to HT+.

With the audio distortion issue resolved I then moved on to the final sensitivity measurements and discovered that the actual audio level had dropped. Normally the maximum audio level from the RA17 is too loud to be comfortable. It can also be intolerably distorted at this level. This is partly due to the fact that Racal chose to use an RF pentode as an audio amplifier and then drive it into a tiny loudspeaker. Granted, the built-in loudspeaker is really only intended as a local monitor ... Hence the ability to switch off local audio. Final sensitivity checks are carried out at 1.4MHz, 14.5MHz and 28.5MHz, and involves measuring the level of audio on an AF Power Meter. I was lucky if I was getting 10mW of audio at the 50mW rear-panel connections (it is actually possible to get almost 300mW at these terminals). This turned out be caused by the failure of the 1nF capacitor across the primary of output transformer T2. This little ceramic capacitor had morphed into an 87K resistor. The MK1 circuit diagram shows this as a 10nF capacitor, however I have only ever seen a 1nF capacitor in this position ... So I replaced it with 1nF. All is now sweetness and light!!

Racal’s sensitivity specification for the RA17 is as follows ... 20dB s/n for 1uV CW or 3.5uV AM (30% modulation) with an IF bandwidth of 3KHz.

RA17 N371 performs thus...

	CW	**AM**
1.4MHz	26dB	22dB
14.5MHz	21dB	21dB
28.5MHz	23dB	22dB

Ian Ropper, GM0UHC
20 April 2019

Final Invoice on final page ...