An RF earthing problem with Eddystone receivers

Introduction

I have two Eddystone receivers – a Model 730/4 and a Model 940 – that are in daily use at my location because their combination of valves and multiple tuned circuits, in front of the mixer, appears to cope better with local interference than more modern receivers. The 940 is my first choice for SSB reception, especially now that I have modified the AGC system **(See article on 940 AGC modification in Restoration section of the website)**

When I had modified the 940 and drafted the article referred to above, I set out to test the receiver thoroughly, only to discover that it was not working properly on Range 1 and Range 4. On Range 1, there was a loss of sensitivity and a significant tracking error. On Range 4, there was an excess of sensitivity and the front end was prone to oscillation. Therefore, I delayed publication of the article and started to investigate.

Purpose

The purpose of this short note is to report what I found when investigating the strange loss of performance – of my 940 - encountered recently, to describe the work I did to resolve the issue and to recommend measures that other Eddystone users may wish to take.

These measures are applicable to most Eddystone valved HF receivers.

Investigation

Given that I had just modified the AGC system of my receiver, the first thing I did was to remove all trace of the modifications and return the receiver to its original/unmodified form. I did this to prove that it was not the modification causing the problem and, to demonstrate to myself, that the modification could be removed in only a matter of a few minutes. The second thing I did was to check carefully that the receiver was working correctly on Ranges 2, 3 and 5; it was. Therefore, I sat down and studied the circuit diagram; starting with Range 1 because that appeared to have less of a problem.

I concluded that the problem had to be associated with the combination of L16, C49 and C54; most likely C54 – the padding capacitor - which is virtually impossible to extract and replace on its own. Therefore, I removed the complete coil assembly from the coil box. This is quite easy because it only requires three joints to be un-soldered and one bolt to be undone and removed. I tested all the component parts and could find nothing wrong. I tested the complete assembly and confirmed that it was working as it should. Therefore, I cleaned the three connecting posts ready for re-soldering, cleaned the brass fixing pad at the bottom of the coil and re-installed the coil assembly in the coil box. On applying power to the receiver, I discovered that Range 1 was working again and the tracking issue had gone. Thus, I realised the nature of the problem.

The problem

The brass foot on the bottom of the coils serves two purposes: it provides a strong and rigid means of mounting the coil in the coil box; and, it provides the earth return for RF currents in the amplifier, mixer and oscillator circuits. If one or more of these earth returns is less than perfect, all sorts of strange things can happen. For example, a two-stage RF amplifier can turn into a tuned RF oscillator.

In order to prove that I had correctly identified the problem, I extracted the four Range 4 coils assemblies, cleaned their brass fixing pads – along with the bolts, washers and the coil box underneath them – and re-installed them in the coil box. Having done that, the receiver worked well on Range 4 without any sign of the excess sensitivity or oscillation that there had been an hour earlier.

There is no sign that my 940 has ever been stored in a damp environment. There is no sign of corrosion anywhere; let alone inside the coil box. Nonetheless, it was clear that sufficient oxidation had occurred to disrupt some of the earth connections between the coil assemblies and the inside of the coil box.

The solution

The full solution to the problem is to remove all the coil assemblies, clean all the mountings and re-assemble everything. That is what I did on my 940. It is a lot of work that has to be done very carefully to avoid causing damage. I think it was worth it because – apart from fixing the faults – the set works better. It is easier to align; the tracking is more accurate; it is a bit more sensitive; it feels 'newer'.

However, there is a much simpler solution. The coil assemblies are held in place with a bolt and a shake-proof washer which has sharp edges. If you undo the bolt sufficient for the washer to be able to move about and then re-tighten the bolt, the sharp edges of the washer will cut through any oxidation and make a new connection.

In order to prove this simpler solution, before going into print, I subjected my 730 to it. Firstly, I tested the set to ensure that it was working and within specification. Secondly, I did the 'undo, wiggle and re-tighten' procedure to each of the 20 coil assemblies. Thirdly, I worked carefully through the alignment and tracking procedure. As I expected, no adjustment was required but some of the tuning peaks felt a bit sharper. Finally, I put the receiver back into service and, again, like my 940, the 730 appeared to perform a bit better and felt a bit 'newer'.

Recommendations

Based on my findings reported above, I offer the following:

1. do not forget that those bolted connections at the bottom of the coil assemblies are critical RF connections
2. if you have problems on only one tuning range, check the coil fixings; just as you would the other components unique to that range
3. When refurbishing a receiver, consider employing the simplerof the two solutions as a preventative measure; just as you would change other components that are showing their age.

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