Feature

New Life for the RA17

Front panel view of the Racal receiver.

Rob Filby G0HJR describes how he worked on his RA17 receiver – restoring an old friend to its impressive full working order after many false starts!

After servicing my own Racal RA17, I thought I would share my experiences with *PW* readers. It's worth mentioning that I have been involved with Racal equipment in professional and Amateur Radio capacity for many years. Items I've repaired and serviced included quite a lot of RA17/117 receivers and associated adapters, transmitters, single sideband (s.s.b.), low frequency (l.f.) units and panadaptors, etc.

So, when a friend mentioned that he had an RA17 that needed 'looking at', I offered my services. After finally picking up the kit it turned out to be a Mk1, manufactured in 1957 and last refurbished in 1977.

Burnt & Brittle

On taking the covers off I could see that a lot of capacitors had started to leak and resistors looked burnt and brittle. At this stage I took off all three major modules and worked on them separately. On the intermediate frequency (i.f.) strip I replaced all the paper capacitors, together with anode, screen and high tension (h.t.) dropping resistors.

Then, I dismantled the LC and crystal filters, cleaned up the wafer switches and re-soldered the connections. Next, the beat frequency oscillator (b.f.o.) was dismantled and I replaced the anode and screen resistors and checked the paper capacitors. They seemed quite modern, so I left them in place but as it turned out that was a mistake!

Fortunately, I have a set of Racal Factory Test Jigs so I can test the modules outside of the set and after testing I was assured they were up to specifications. The i.f. strip seemed to work intermittently but then 'died' on me. Eventually, I traced the fault down to a bad earth connection in the LC filter.

Next, came the first variable frequency oscillator (v.f.o.) and I found that was totally dead as one of the vanes of the variable capacitor had been broken. It was easier to replace the whole section with a known working unit.

Last Module

The last module to be investigated was the second v.f.o. and that turned out to be a later version, not the original Mkl. Once again, I replaced all the screen, anode and h.t. dropper resistors and paper capacitors, then mounted it in to the test jig. It then seemed to work up to 550kHz on the film scale tuning display but above that frequency it 'died'.

After some head scratching, I remembered something an RAF technician had told me! I then checked the earthing clip on the oscillator section of the variable capacitor and found that when the v.f.o. was tried above 550kHz there was a bad connection. I cleaned that up and it seemed to work for a while.

I turned it off and on again. After that occasion the v.f.o. only worked up to 400kHz! The fault, this time, was an open-circuit choke in the anode feed of one of the valves. This was then replaced and the v.f.o. was soon operating. I then tuned and re-tracked it for equal calibration pips every 100kHz.

After completing my work on all three modules, I turned my attention to the main chassis. I replaced all the electrolytic capacitors in the power supply stage and changed the wire wound resistors to metal clad types.

Most of the h.t. dropper, screen and anode resistors were replaced and in fact two of the resistors fell to bits when they were unsoldered! I replaced the brittle insulated wire, damaged because there was no insulation left on it due to the heat generated from nearby components.

Dry Solder Joints

Next, I generally re-soldered dry joints of which there were quite a few. Finally, I got to the stage where I could re-assemble all the modules together. However, after connecting them together and powering the receiver up, there was a smell of a burning resistor from the 2nd mixer compartment, i.e. V9 and 10.

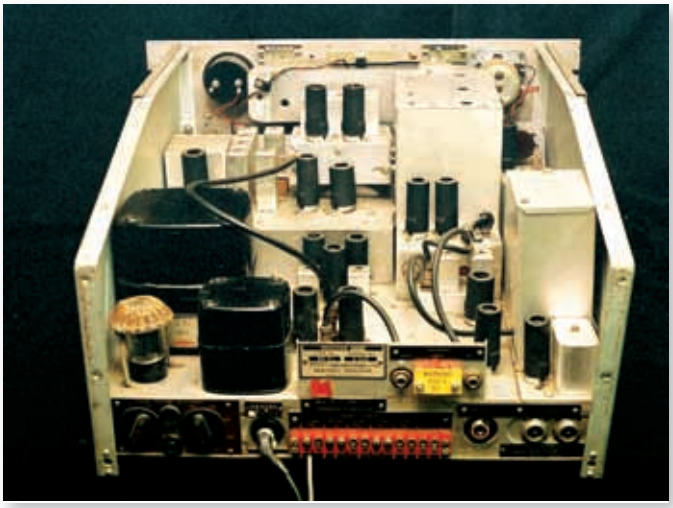
On closer examination in the 2nd mixer, I discovered that the main h.t. dropper had burnt out, this wasn't a surprise, as I know this happens when the vanes of the variable capacitor (C108) are shorted out due to inadvertent damage. On closer examination, I could see that the vanes were touching, so I carefully 'knifed' them apart.

The short circuiting usually happens when people try to adjust C108 with the cover on and miss the slot on top and hit the vanes instead, with the result the vanes are shorted out. So, I replaced the resistor and opened up the vanes, switched on again and the same thing happened, i.e. R66 burnt out! Lovely, it was turning out to be one of those faults!

Out came the board and I replaced it with another one. Yes, you've guessed it – the same thing happened again! After a mug of tea and some more head scratching I changed the last section of the 40MHz band-pass filter (b.p.f.) as that looked a bit burnt and only connected one of the wires back up to it. This time the resistor survived, so I connected up the other wire and there was

an immediate smell akin to bacon frying!

I switched the unit off and looked at the valves. The first valve, V9, was okay, but V10 had a horrible burn mark between pin 7 and earth, i.e. screen and earth. On checking the valve base of V10, sure enough the insulation had broken down between pin 7 and earth, resulting in a hairline conducting fracture. I changed the valve base and the valve, this time the resistor survived.



Inside view of the receiver, showing the substantial framing. *(Photography courtesy of Ben Nock G4BXD).*

Murphy's Law In Action

Then there was more trouble because – according to Murphy's Law – as soon as one fault is fixed another one shows its head! This time there was no gain on the 37.5MHz b.p.f., according to the wobbulator. This fault was due to a 'duff' silver mica capacitor within the inductor L28.

I then also decided to check out the 40MHz b.p.f. and found that one of the coils was not soldered! Once that was repaired I switched the set on for an hour, switched it off and then switched it back on an hour later – and once again the set failed.

After 20 minutes of signal injection and tracing I arrived at V9. Here I measured the screen and anode voltages and found they were about 70V too high and there was no cathode voltage. After V9 was swapped the set appeared to work.

Obviously, I still had a bit of fine-tuning to do and decided to leave the set on soak test for a while to see if any other faults occurred. Sure enough, after three days the h.t. fuse blew and on investigation I was greeted by the smell of another burning resistor. Yet another valve had developed an internal short and as a result the resistor burnt up!

Puzzled, I replaced the valve and fuse and switched on and was greeted by silence! This time the low tension (l.t.) side had developed an open circuit (i.e. a dry joint) and only half the valve filaments were glowing. I re-soldered it and got some noise, but no signals. Eventually, the problem was finally tracked down to the diode detector valve, which apparently was not working and when I replaced it the set sprang into life.

The set lasted for a couple more days until the sensitivity dropped. It turned out that three of the 33pF silver mica capacitors in the 37.5MHz b.p.f. had failed and had to be replaced and the filter re-peaked using the wobbulator. After several hours the amplitude had remained constant as displayed on the screen and all seemed well.

Anything Else?

After all the faults encountered I didn't think anything else could fail but again I was to be proved wrong! The next problem appeared when I was listening to 14MHz upper sideband (u.s.b.) one evening. I decided to listen on 7MHz lower sideband (l.s.b.) but I was unable to resolve any signals. Yet on the 20 metre band I could resolve u.s.b. using the ±1.5kHz tuning on the b.f.o.

I took the unit out of the receiver and changed the two .05μF capacitors, which I had originally left in place. Afterwards I was able to resolve both l.s.b. and u.s.b. It had been a real mistake not to replace them during the original service!

One other fault occurred after the set was moved from its rack to a bench. This one was caused by an unreliable pin connection on the base of V1. I took the offending pin out of the valve base and cleaned it up. After re-soldering all the other connections the set was okay. After a bit of fine-tuning the set's sensitivity was measured as 1μV for 10μA meter movement, which is not bad for a set that's 50 years old! ●