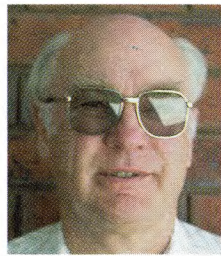


VINTAGE RADIO

By RODNEY CHAMPNESS, VK3UG



A killer – the set from hell

Vintage radio sets can be dangerous devices, as this story illustrates only too well. It certainly pays to keep your wits about you when servicing such equipment and to expect the unexpected.

Some months ago, a chap arrived at my house with a 4-valve Operatic TRF set, circa 1932. He wanted me to get it operating for him but not worry about cleaning up the chassis. He was in a hurry and left quickly without either of us really defining just what he meant by “getting it going”.

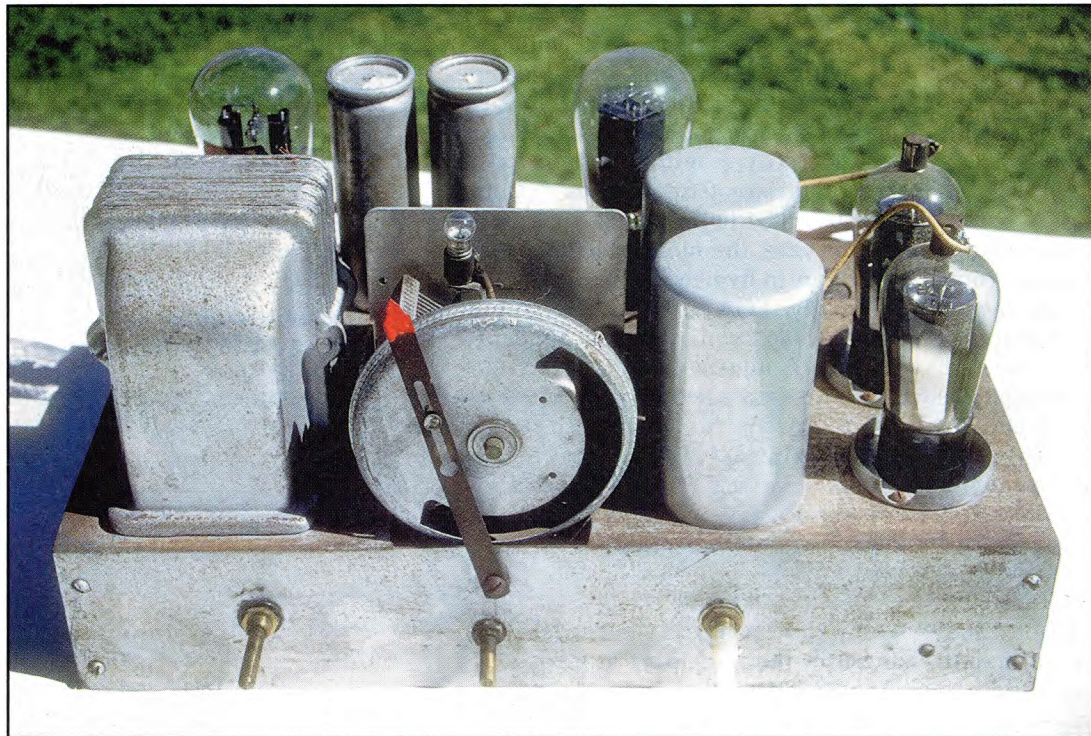
And that’s a big mistake. One should always make very sure that there is no misunderstanding as to what each expects of the other. In any case, I fully expected that the job would be

reasonably routine for a set of that vintage.

Sets of this age commonly suffer from a number of problems including wiring errors from previous service attempts, faulty components, perished wiring and one or more weak and/or inoperative valves. Once the faults have been corrected they also usually require a general tune up (not all that much to do in a TRF set) and they must be run for a few days to prove their reliability.

Replacement valves and transformers for sets of this vintage are quite expensive, so one always hopes that they are all in operational order. One of the first things to do is to look at the power transformer and hope that it too is in good condition. Fortunately, most are but if it is faulty, I leave the decision to restore the set up to the owner.

On closer examination, more and more things were noticed that needed attention. The power transformer leads were perished, although it checked out OK on a high voltage tester. However, safety must be a prime concern, so the transformer was removed from the chassis and dismantled. It had a form of terminal block inside it and it was possible to install a fresh set of leads. It was then reassembled and reinstalled on the chassis.



The Operatic is a 4-valve TRF receiver from the early 1930s. Vintage radio receivers are potentially lethal devices and this one was no exception.

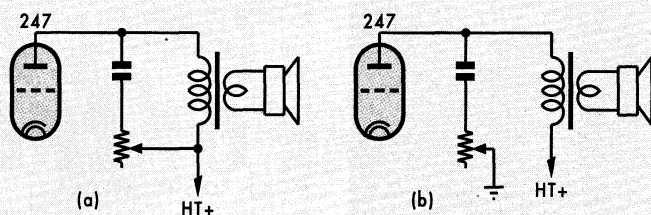


Fig.1(a) at left shows the original lethal tone control circuit, while Fig.1(b) (right) shows the modified "safe" circuit.

In addition, the perished twin-lead power cord was replaced with a modern 3-core brown fabric covered mains lead. I always try to keep sets looking as authentic as possible. The transformer was then run on no load to be quite sure that it had no hidden faults. It stayed cool and the voltages from the various windings were as expected, so it was pronounced in good order.

Next, the first high tension (HT) filter capacitor was replaced and the power supply tested with the rectifier in but with the speaker plug out. There was no output and the 280 rectifier valve proved to be faulty. The owner supplied an 80, which is a plug-in replacement, and the voltage was as it should be.

A wrong call

I still believed that there weren't likely to be too many more problems. Unfortunately, this assumption proved to be quite wrong.

To begin with, the schematic had to be traced out as no circuit was available. Initially, the set didn't look like it had been butchered but the evidence soon showed that it had been. When I checked around the 247 output stage, I found that it had no bias, as the heater was earthed at the centre tap of the 2.5V heater winding. I checked the data on the 247 (47) and soon worked out appropriate capacitor and resistor values to place between heater and earth. The grid coupling capacitor was also replaced to make sure that all was well.

Next, I turned my attention to a large multi-tapped adjustable resistor. This ran from HT to earth and various voltages were tapped off from it. It was broken but it was possible to measure the resistance of each section and replace it with several fixed resistors.

A check of the speaker transformer

revealed an open-circuit primary, so a more modern one was fitted. The loudspeaker itself was also checked over. The field and voice coils were intact but there was some poling so the speaker ended up in pieces (fortunately, it could be disassembled). It was full of dirt and all that was required was a thorough clean-out with a brush and a vacuum cleaner.

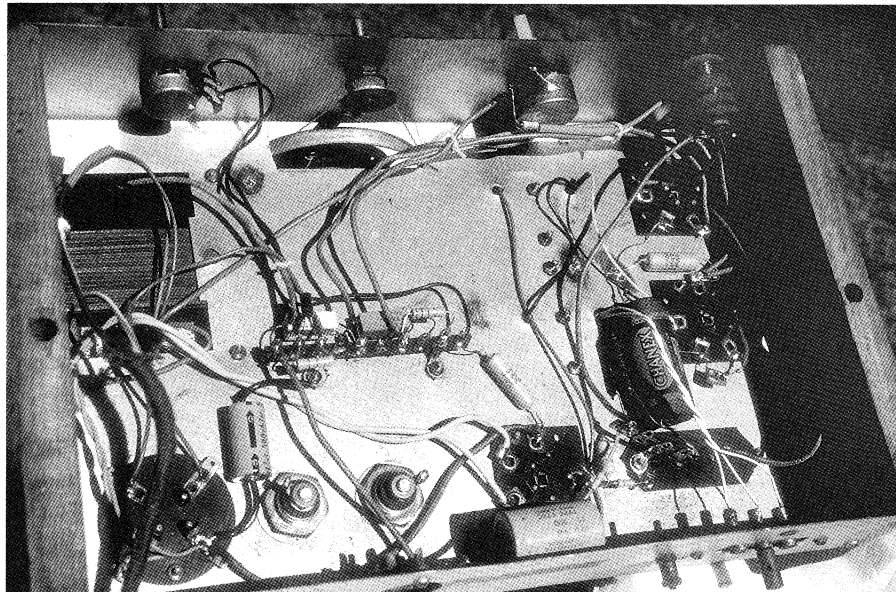
Putting it back together again was a challenge as the three main sub-assemblies must line up so that the voice coil doesn't rub on the centre pole of the electromagnet. It took quite some time but the end result was quite satisfactory.

A close call

Having cobbled together the circuit as best I could for a test, the set was turned on with the speaker in place and only the 80 and 247 valves in their sockets. And then, for some reason or other, I looked at the tone control circuitry, as it seemed a bit odd as far as the values were concerned. The moving arm of a 10kΩ pot was connected to the HT and a 0.1μF capacitor was connected to the plate of the 247. The values seemed to be all wrong so I switched the set off for a closer look.

An examination of the tone control revealed that it had insulating washers underneath the star washer and nut. It was largely covered and not obvious. I wondered why this should be so and so a check was made to determine why it was insulated. I soon found out – the shaft of the tone control was connected to the moving arm of the potentiometer (which, in turn, was connected to the HT)! Some early potentiometers were made this way.

I broke out into a cold sweat. I could have easily touched the chassis and the control shaft at the same time. Had I done so, I would have received 400V across my body and almost



The old Operatic is easy to work on, since all the parts are readily accessible as this under-chassis view shows. This particular set had more than its fair share of faults.

certainly would not be writing this if I had. This set was a potential killer.

Having realised how close to death I had come, the circuitry was immediately changed so that the moving arm was at earth potential. This involved changing the location of the lead going to the moving arm. Fig.1(a) shows the original tone control circuit, while Fig.1(b) shows the modified "safe" circuit.

It's only a simple modification but it's a much safer way of doing the same job.

I also found that the values in the tone control caused too much "top cut", so the capacitor and potentiometer were changed to correct this. The replacement pot also had its moving arm isolated from the control shaft. How anyone could have made such a death trap is beyond me. The strange thing is that so much of the set appeared to have original wiring and this part certainly did, so was it the manufacturer?

Having overcome the tone control problem, various other resistors and capacitors were tested and replaced as needed. The other valves, a 235 and a 224, were then plugged in and the set was tried out. It performed reasonably but on checking around the 235 and 224, I found that the screen voltage on both was 170V, well above the valve data recommendations.

To overcome this, the potential divider was modified to give the correct voltages to all stages and as could be

expected, the performance of the set deteriorated. The valves will last a lot longer though! The volume control was found to be like the tone control, with its shaft above earth potential – however, only by about 50V maximum as originally wired. This control was replaced as it was faulty and the new one didn't have the shaft attached to the moving arm.

Some perished wiring was also replaced and it was noted that the wiring to the coils was also in a bad way. As a result, the coils were dismantled and the wiring to the terminals was replaced.

Performance

When tuning across the broadcast band, it was found that the trimmer capacitor had to be altered to give reasonable sensitivity at both ends. The two tuned circuits were obviously not tracking and this meant that one coil had too many turns on it. After removing two turns from the tuned winding of the detector/RF transformer, the set tracked quite well. For the first time in its life, the set was working properly. In fact, one could argue that it now works better than new.

By placing a low-value RF peaking choke in series with one of the aerial terminals, the set now has even better performance right across the band – provided that the owner is prepared to change the aerial tap for best reception. The purists will probably not

agree with this modification. However, it is hidden inside the aerial coil can and can be removed if desired. The set isn't all that sensitive and requires 3mV of signal across 50Ω for good volume.

Back to the owner

The owner had great trouble understanding that it was imperative that the set had to be safe. He expected all the work on the set at a bargain basement price too. However, I'm sure he would not have been impressed if the set had destroyed an expensive old valve because I had not taken care to make it reliable and had simply "just got it going".

To prove this point, he claimed the set didn't work when he took it home. He left it bumping around in his car for some time before bringing it back. When it arrived, I found that the speaker transformer had come adrift (I probably hadn't got the mounting screws really tight). More seriously, the speaker cone had been damaged due to various odds and ends that had been left on the seat and had pressed against it. When these things were put right and one of the valves was pushed back into its socket (it was sitting at an angle), the set worked.

Some restorers give a "kerbside warranty" which means that the set goes OK as demonstrated but because of the radio's age its long-term reliability cannot be assured. I have found that old sets are remarkably reliable after they have been thoroughly serviced and I'm quite prepared to give them a warranty that's the same as when they were new. Very few develop troubles during this period.

Technically, many lessons were learnt through working on the "Set from Hell" and hopefully readers will not fall into the various traps that I did. The only things not requiring attention were the tuning capacitors and three of the valves that were in good order.

You could ask how could so many things be wrong with a set? It was a job that looked to be reasonable to start with and then it became a real monster, with one nasty problem after another. And having started work and gone so far, it wasn't really possible to stop without either the owner or me losing out. In retrospect, the question is, should the set have been restored at all?

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