# Vintage Radio

By Marc Chick

# Roberts R66 4-valve 2-band Portable Superhet


**Roberts is a British brand previously not often seen in Australia although Roberts DAB+ radios have been on sale in recent times. In essence, this is not a restoration story but a straightforward repair of a set that was in fairly good condition.**

The styling of the R66 portable is interesting and apparently the inspiration for the design came from the leatherette handbags owned by the wife of Harry Roberts.

Interestingly, Roberts are now producing a range of retro DAB+/DAB/FM radios with similar styling although they are not available on the Australian market (see www.robertsradio.com/uk/products/retro-radios).

Introduced in 1956, the Roberts R66 is 4-valve set which can be run from 230VAC mains or batteries. It was unusual in using selenium rectifiers for the HT and LT (filament) supply rails and it also employed a ferrite rod antenna at a time when most equivalent Australian sets used a wound loop antenna.

The four battery valves are unique to European sets, having been manufactured at times by Philips, Mullard, Siemens and Telefunken, but the circuit itself is a conventional superheterodyne with two bands: MW and LW.

The first valve is a DK96 pentagrid converter which functions as a mixer-oscillator, commonly referred to as a frequency changer. Its intermediate frequency is 470kHz; somewhat higher than the 455kHz used in most Australian sets. V1's plate drives the first IF transformer.

The ferrite rod antenna circuit's bandwidth is evidently wide enough to tune both the MW and LW bands. The oscillator circuit is switched to cover the two bands using a large wafer switch.

The secondary of the first IF transformer drives the grid of V2, a DF96 pentode and its plate, in turn, drives the second IF transformer and this drives the grid of V3, a DAF96 diode-pentode which functions as the demodulator and audio preamplifier.

The audio signal from V3's diode appears across capacitor C19 is fed via the volume potentiometer R8 to the grid of V3. Its output is capacitively coupled to the grid of pentode V4, operating as a class-A stage with transformer T1 which drives the loudspeaker. There is no negative feedback, probably because the circuit did not have a lot of gain to spare.

The demodulated audio is also used to apply AGC back to the input grid of V1 and the control grid of V2.

The AC power supply uses selenium rectifiers as noted above. The HT supply is a half-wave rectifier involving MR1 and capacitor C28 to produce about 90V DC.

The filament supply is DC as well, involving two selenium rectifiers, MR2 & MR3 and three stages of filtering with resistors R15 & R16 and capacitors C29, C30 & C31. The resulting low ripple supply is essential for filaments (cathodes) of these battery valves, otherwise hum would be a serious problem when operating from the mains supply.

This particular radio had apparently come from the UK to Australia, after a long stint in South Africa. While it needed some repairs, its overall appearance was not bad for such a traveller although the leatherette covering was coming off in a number of places and the carrying strap was quite frayed. The leatherette was glued back as necessary but that was the extent of any cosmetic repairs.

Note that the dial on this Roberts set looks a little odd since it reads in metres rather than kHz. Hence the medium wave (MW) band ranges from 182 to 590m (or 508kHz to 1.68MHz) while the long wave (LW) band ranges from 900 to 2000m (150kHz to 333kHz).

In spite of its generally good appearance, any temptation to just power it up was resisted and the chassis was carefully inspected. One should always carefully inspect a radio foreign to you (not because it's foreign) and of unknown provenance.

There are often hidden dangers lurking, for those who fail to look. Never forget that most of these old radios were dumped when they had failed and were replaced with something

Electrolytic capacitor C30 is shown above with a leak that solidified on the top of its can.

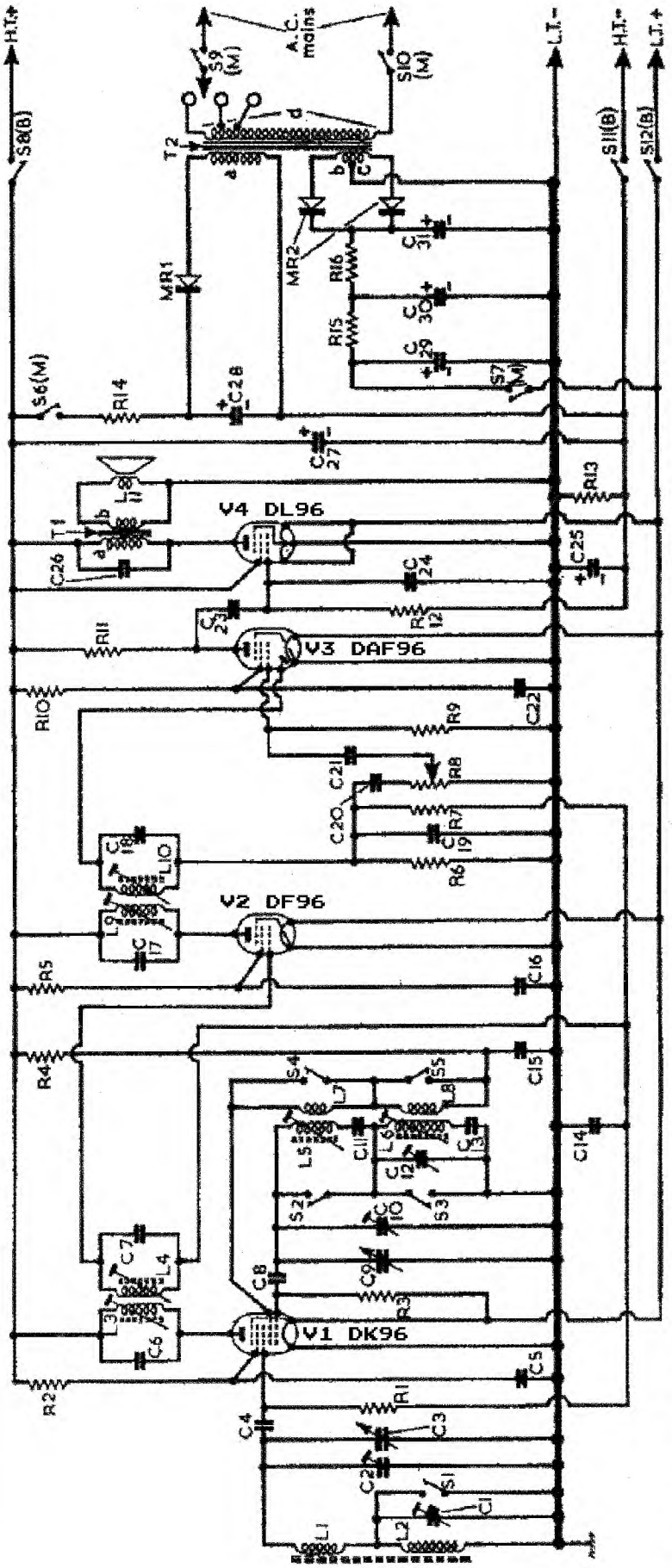
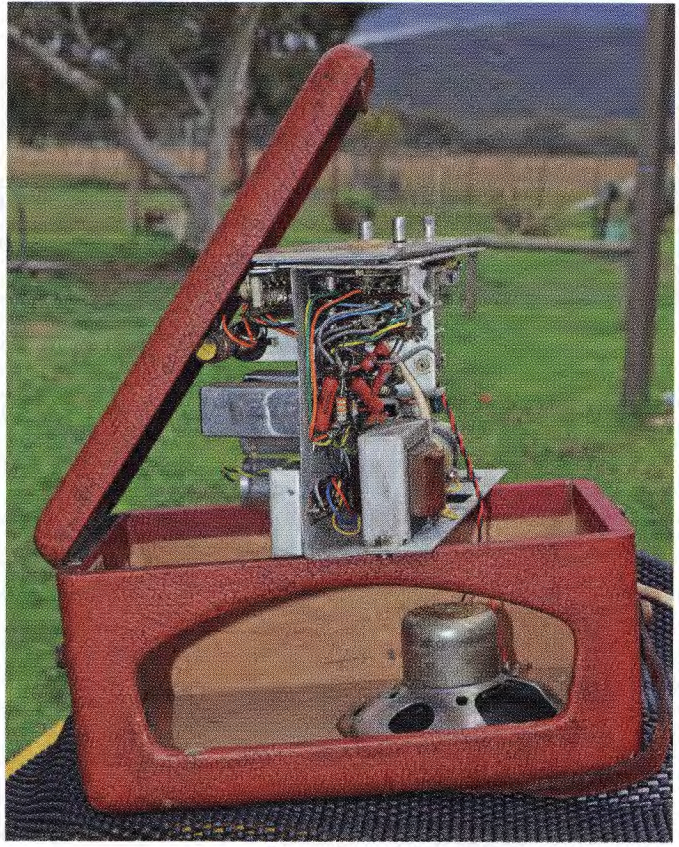


Fig.1: complete circuit diagram for the Roberts R66 radio. In this circuit, switches denoted with an (M) close for mains operation, while those with the suffix (B) close for battery operation, and are controlled by the leftmost knob on the radio. This knob also changes tuning over the MW or LW band, with switches S1, S3 & S5 closing for MW operation and S2 & S4 closing for LW. *Image source: Radiomuseum (www.radiomuseum.org/r/roberts_r66r_6.html); from the service sheet.*



**Shown above is the radio seated in its upright "playing" position. The speaker is located behind the grille, as shown in the photo to the right.**
**The radio can run from either 200-250VAC mains or two dry batteries, one rated at 90V for HT and the other at 1.5V for LT.**

much more modern, probably transistorised.

So I looked for any obvious tampering within the chassis, as well as the wire insulation quality. Then the mains and speaker transformers were checked. C30, one of the large electrolytic capacitors was leaking from the top of the can, so that was an immediate visual inspection fail. So powering up the radio was out of the question.

That capacitor and its mates, C29 & C31, all 2500µF 3V rated, were replaced and so were the rest of the electrolytics apart from C27 & C28 which was a twin capacitor (ie, two capacitors in one can).

They were checked for leakage and much to my surprise, they were comparable after a few minutes at 150V to a new 47µF 450V capacitor, drawing less than 1mA, so it was reconnected. The HT current is listed at 10.4mA.

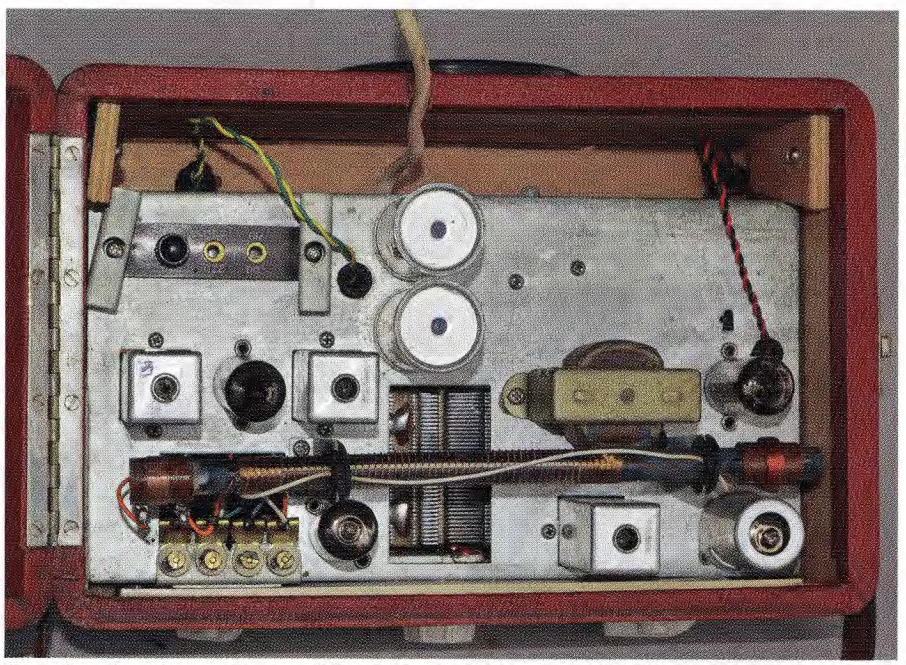
All the ceramic capacitors were fine but some of the resistors were replaced. Capacitor C14 (0.5µF paper) was lifted and tested at the closest voltage to its rating (350V DC) as I could apply with one of my insulation testers (250V DC). That gave a result of 700kΩ and so it was more of a resistor than a capacitor.

That would have the effect of shunting away the AGC signal which would otherwise be applied to the signal grid of V1 (DK96) and also to the grid of V2 (DF96).

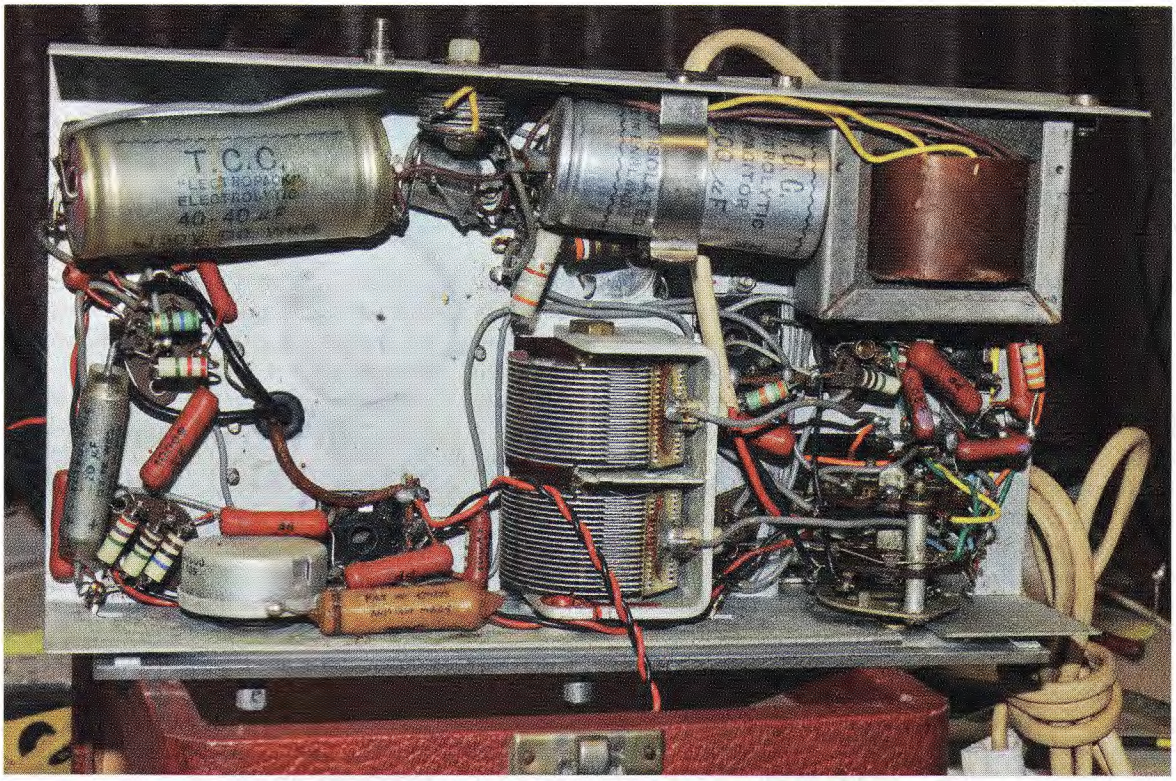
In addition, in sets like this, the control grids draw insignificant current and any leakage of positive voltage in coupling to the grid from a plate will impinge significantly on the bias. Anyway, the capacitor was replaced with a modern plastic dielectric type.

## Powering up

I noted before powering it that it had 230VAC mains switching via wafer switches. Often that is a bad idea but at least with this set both Neutral and Active are switched separately



**Opening the plywood case of the Roberts R66 shows the "top" of the chassis, including the ferrite rod antenna. L1 & L2 form the ferrite road antenna coils and are tuned via C3 as shown in Fig.1. The red/black wire is for the HT battery connections, while the yellow/green wire is for LT.**



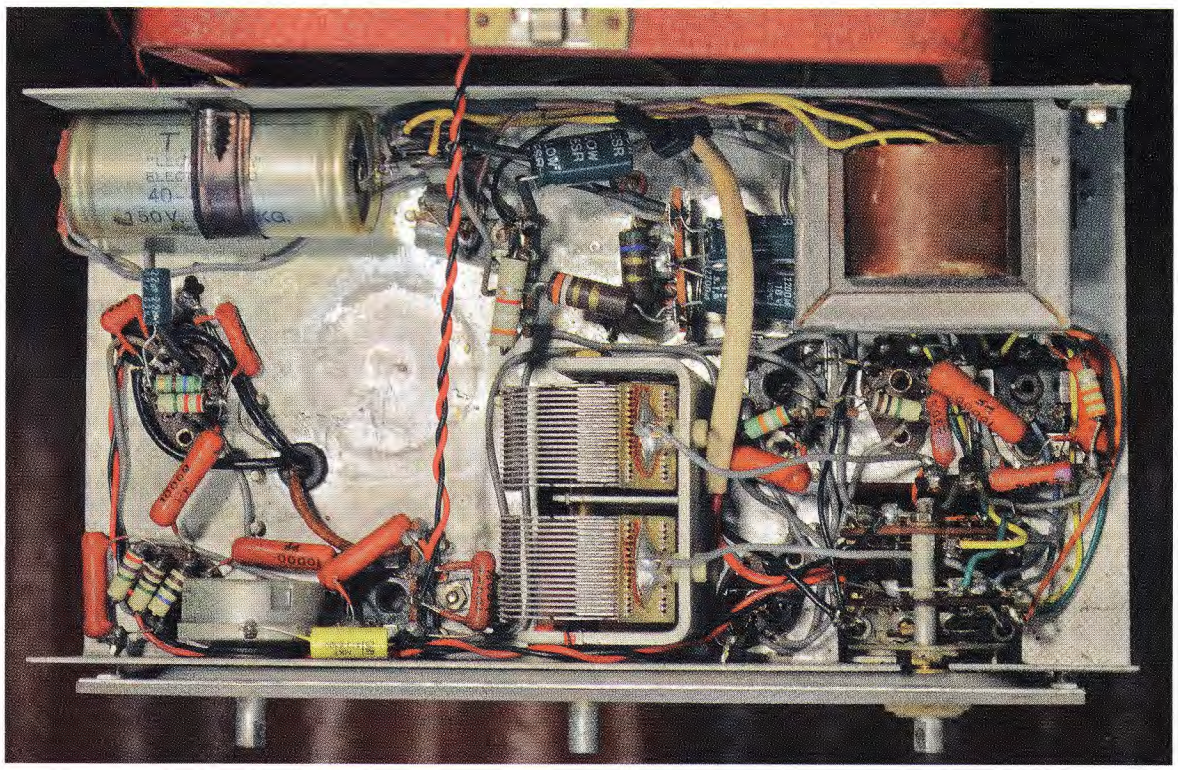

**Shown left is the "bottom" of the chassis before restoration work had begun. Since the speaker is attached to the case, its leads need to be desoldered to completely free the chassis.**

(ie, with a double-pole switch). The switching also provides for changeover to battery power.

The circuit diagram reveals that because the set uses battery valves, with directly heated cathodes, it is important that the filament supply has the correct polarity since it forms part of their grid bias. So one always needs to check to see that things have not been changed on this point.

Ultimately, after all the checks and component replacements had been completed, the set powered up without problems. Then it was on to check the alignment.

It would be folly to assume that the alignment would not have changed after 60 over years, and so it had. The MW coil had slipped on the aerial rod and both bands were out of calibration. They were re-adjusted to the manufacturer's specifications. Its performance is quite impressive. **SC**



**The underside of the chassis after repair, with the replacement capacitors in place. All the electrolytic capacitors, except for twin capacitor C27/28, were replaced. All ceramic capacitors checked out OK and only a few resistors needed to be replaced.**