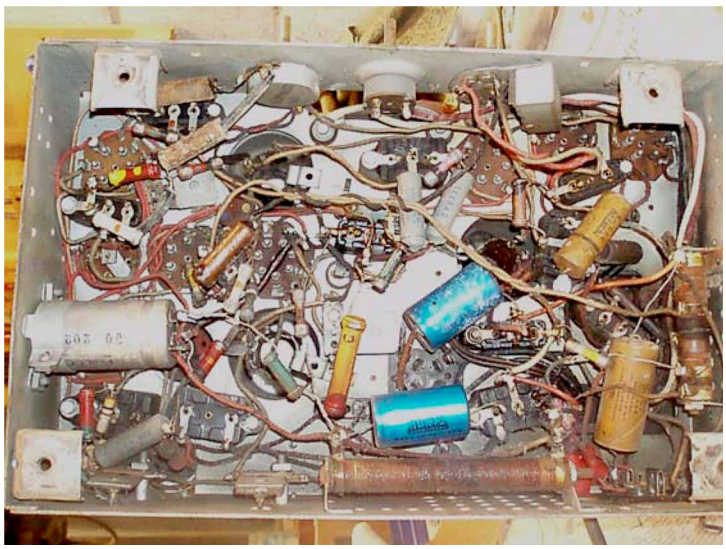
Restoration of a Philco Model 18 (Code 124) Cathedral Radio

I purchased this radio via Trademe in November 2010. It was described as needing "lots of TLC". How true that was! This model is a single band, eight valve superhet using valve types: RF-78, Mixer/oscillator-6A7, IF-78, Detector/1st audio-75, Audio driver-42, Output-push pull 42s, Rectifier-80. The three 42s are triode connected and, according to Ron Ramirez, produced a "Super Class A" audio with an output of fifteen watts which gave the radio better fidelity. I suspect it hadn't been heard for a long time! It is equipped with a shadow meter.

The cabinet was missing veneer and some of the laminate on the front and back of the front panel, the moulding around the bottom was badly mutilated and the bakelite escutcheon had pieces missing around the shadow meter. The ply had also delaminated in many places. The chassis was badly corroded and, as I was to find out later, most of the components were faulty. A 5Z3 had been substituted, incorrectly, for the original 80 but the rest of the valves were at least correct. The power cord, 2 core only, and plug looked like the originals and were very unsafe. The whole set looked as though it had sat in the corner of a barn for many years. Inside the cabinet was the original chassis layout diagram and a service label from Begg's, Christchurch. Unfortunately only the dates are readable.

'To Work'

First up was to carefully document and strip the chassis. Once again Nostalgia Air provided valuable circuitry, layout and alignment information. From the photo below it is evident that over the years faulty components, mainly the bakelite block capacitors and power supply electrolytics, had been replaced with individual units. The underside of the chassis was a mess. Fortunately all the original cans and blocks were still present. There are two wire wound resistors, one in the bias chain and the other in the main HT line, both of which were open circuit. The mixer and oscillator coils both had open circuit primaries, the shadow meter coil was open circuit and most of the carbon resistors were wildly different from their stated values. There wasn't one capacitor in the whole set that was able to be reused!

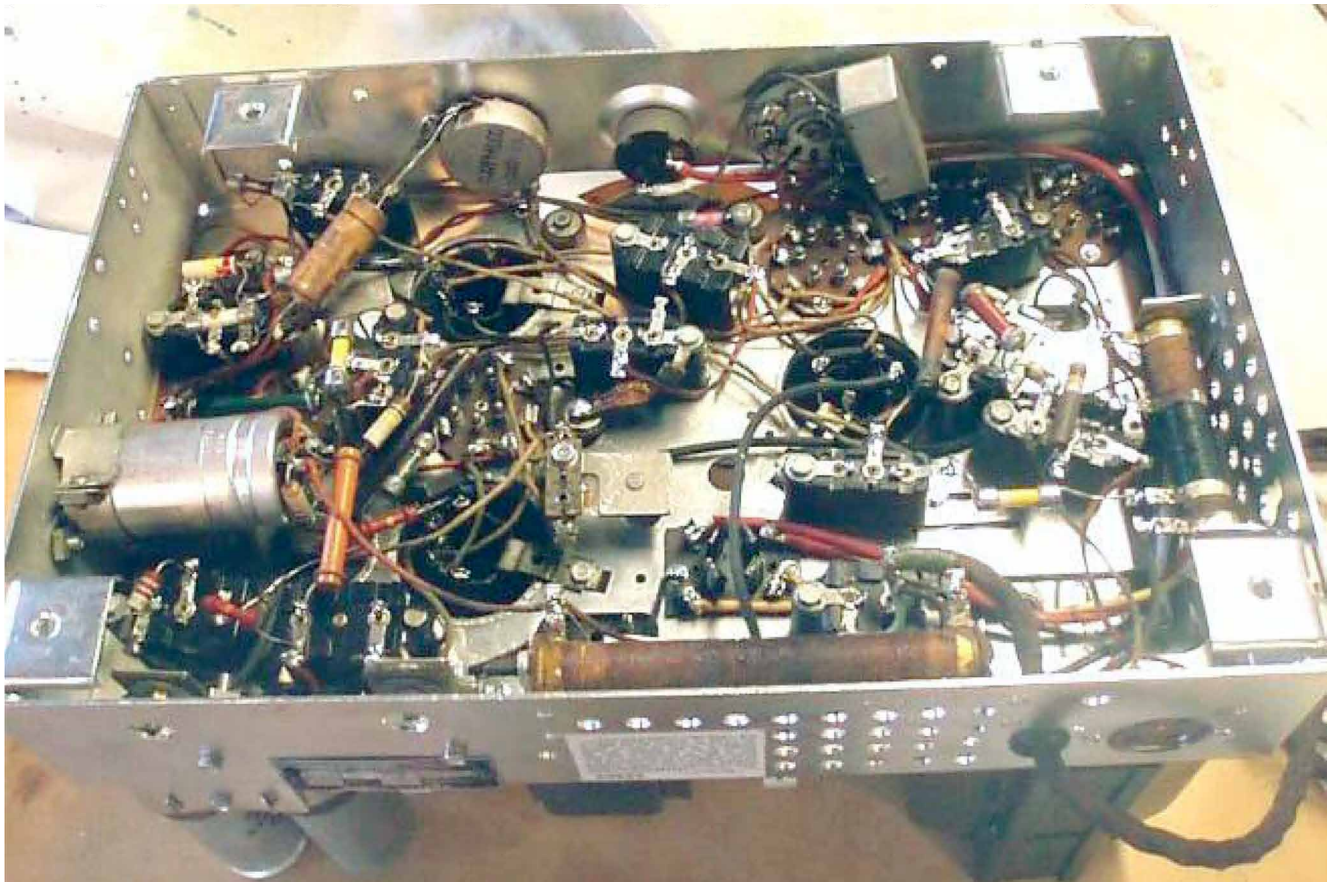


All the transformers, the power supply filter choke, the IF and aerial coils and the speaker magnet coil were continuous and tested well for insulation with my 500V megger. Later at initial switch-on, the primary of the audio driver transformer went open circuit after about 2 minutes of operation. This necessitated a complete rewind because the primary winding was the first on the former. – of course!

After removing all the components and dismantling the speaker completely, the chassis and speaker frame were sent off to a local electroplater for bead blasting and re-plating with tin. The plating is a two-fold process. The chassis is nickel plated first then tin plated, tin sticking better to nickel than mild steel. While this was being done, all the block and electrolytic capacitors had their old contents removed and they were repacked with new capacitors. Rewinding the shadow meter coil was a tricky job. It has 10,800 turns of 0.071mm wire on a very small former. A special mandrel had to be made so that it would fit into the winding machine. After reassembly it was necessary to re-adjust the meter vane to get it to move freely. – a very delicate operation. The reassembled unit, with its original wires was then re-sprayed black and a new screen

fitted because the original one had become completely opaque. I used a piece of opaque plastic from an ice cream container. The primaries of the mixer and oscillator coils were relatively easily rewound. After putting them in the drying oven at work for a week, the new windings were sealed by melting wax over them with the soldering iron. The power transformer leads, which were originally rubber insulated, had become completely perished so they were replaced with new, replica leads and the cover shells were re-sprayed black. The output transformer, power supply choke and audio driver transformer were also cleaned up, re-sprayed and re-assembled. The aluminium coil cans were cleaned up with wire wool and now look "as new". For a restoration such as this, I like to re-use as many of the original parts as possible, including wiring. Where this was not possible, I substituted parts that were as close as possible to the originals. Exceptions were the repacking of the block and electrolytic capacitors where I used new components and placed them in the original housings. I guess it is a bit of "what the eye can't see"! For electrolytics there isn't much choice and modern capacitors are so much better than the old ones ever were.

On return of the brand new looking chassis, re-assembly began with the installation of the valve sockets, cans, transformers and tuning condenser on new rubber mounts. Then, many hours of pouring over the circuit, photos

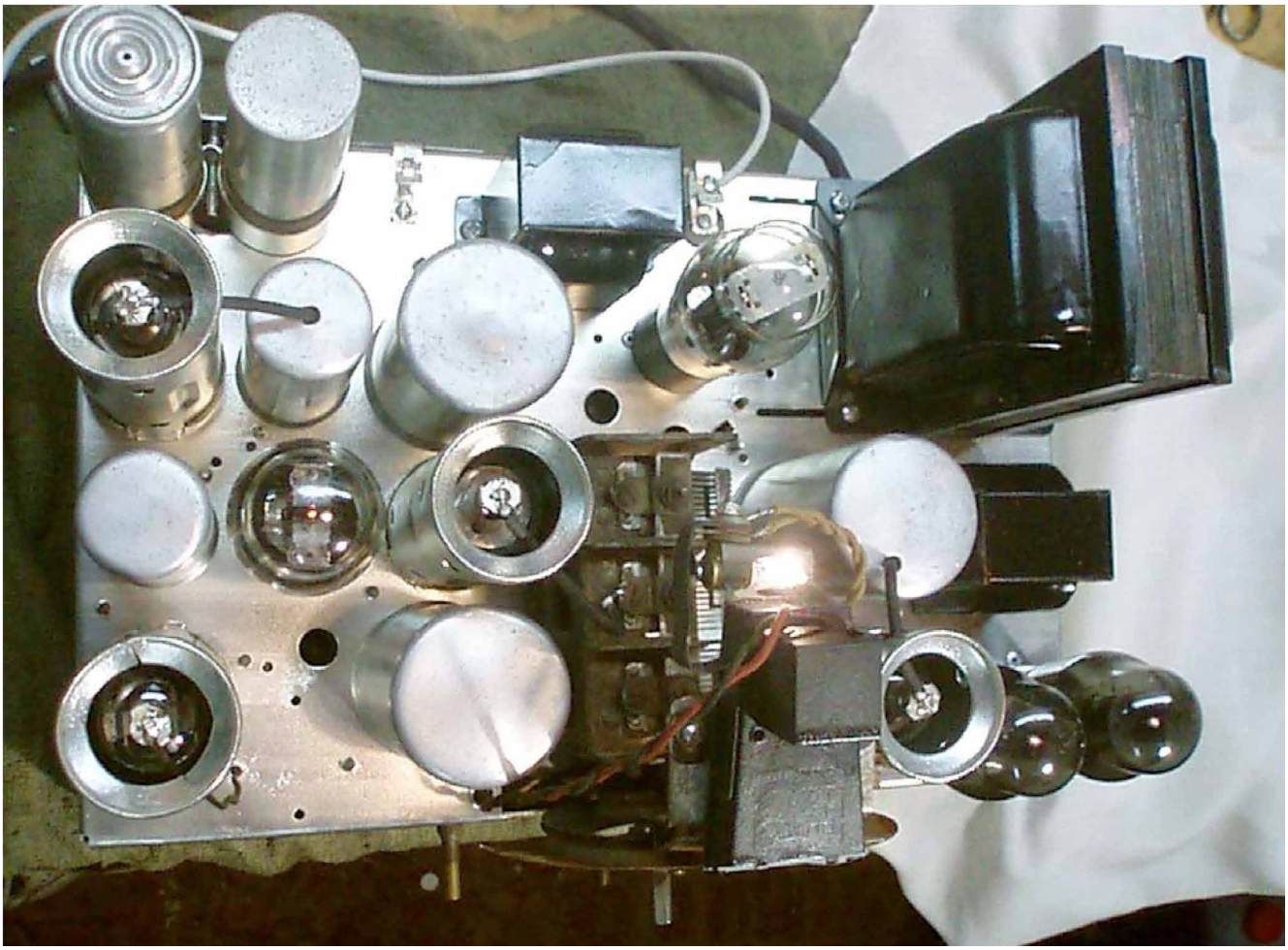


and notes, disappeared before the chassis was again complete. Yes, the waxed paper capacitor connected to the volume control is the only non-block capacitor in the whole set. I was able to rewind the bias wire-wound resistor but not the HT one which has been replaced with a ceramic wire wound resistor although the original is still in place. The speaker was reassembled and this proved to be a time-consuming, precise job. After the fitting of a new power cord, with an earth this time, it was switch-on time.

The set leapt into life, probably for the first time in many years, but as mentioned earlier, the primary of the audio driver transformer went open circuit after a couple of minutes. I was however able to proceed, in the interim, by connecting the output transformer to the 42 driver. I was amazed at how little re-alignment was required to obtain maximum sensitivity. The set performs particularly well and with the push-pull output certainly has some grunt! The response of the shadow meter is extremely good and I found there was no need to include the shunting resistor, as shown in the circuit diagram, to reduce the sensitivity. It moves freely over a good range and it is very sensitive. The positioning of the lamp behind the meter is quite critical to centre the shadow.

The four step tone control is interesting in that it works in both the grid and plate circuits of the 75 first audio tube but it really does not work very satisfactorily at all.

Repair of the dial escutcheon was achieved with the help of some epoxy resin. After this had set it was filed into shape and sprayed black. Nearly eighty years had taken their toll on the celluloid dial which was coated in dirt and almost unreadable. The dirt was removed using Brasso and a surprising amount of elbow grease. Luck was on my side here as the dial markings are on the underside and the dirt was on the top side. A new replica ARTS&P label and the cleaned and polished makers label, which was in particularly good order, were reattached to the chassis to complete this part of the job.



During the February earthquake, the completed chassis was thrown off the bench and it landed upside down on the valve shield in the bottom left of the photo. (the 75). The shield was bent and suffered a small split as can be seen but, despite the valve being inside the shield and the set being very heavy, this was the only damage the set sustained. – remarkable.

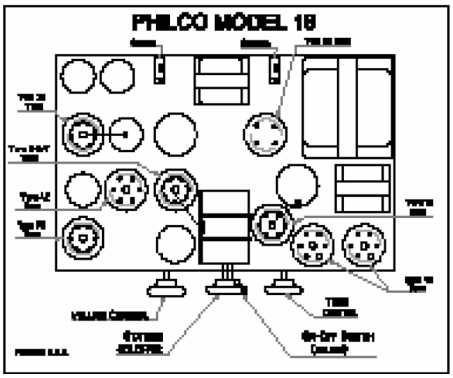
'Now to the cabinet.'

The centre piece of veneer around the dial escutcheon was of good quality and it was in good order, but it was very apparent early on that the only way to repair the larger part of the front was to replace the veneer. Before removing the old veneer a rubbing of the lined pattern was taken so that it could be reproduced in the new veneer. Also the removal of the two pieces of thick, high quality veneer, one to each side, and the moulding around the bottom was needed. It was a painstaking job to remove these pieces as, in contrast to the rest of the gluing on the cabinet, they were stuck fast. However patience prevailed and in time I was rewarded. The rest of the front veneer came off very easily. The curved top of the case fits, and is glued into, a slot routed into the back of the front, but over time, the back two layers of ply had fallen off and there was only one small piece remaining. It was a tricky job to set up the router to remake the missing pieces so that they fitted snugly around the case. Once again patience prevailed and the reward was granted. During this time, at the end of each session the painstaking job of forcing glue into the delaminated ply and cramping each little piece with small G cramps continued. There were numerous places where the glue between the ply laminates had failed and the case had become quite unstable.

However this came right slowly and the cabinet became rigid again. I had a local joinery firm copy the moulding for the bottom and this is where a bit of New Zealand crept in as the new moulding is made of Rimu. Replacement veneer for the front is American cherry and was sourced locally. Gluing the new veneer on was definitely the easier part of this section of the job. Cutting it around the fretwork was slow, tedious work and routing the pattern back, using a 2mm router bit and specially made router guides, was quite scary. One slip and it was all over. However, when completed, the cabinet started to look a lot better. It was time to clean the remaining varnish off the rest of the cabinet. I used a very sharp chisel drawn backwards, as a scraper. This is very effective and, provided it is carefully done, does not harm the wood in any way. I agree that liquid stripper is necessary for some hard to reach places but I avoid it if at all possible. This was followed by a thorough sanding with finer and finer grit paper.

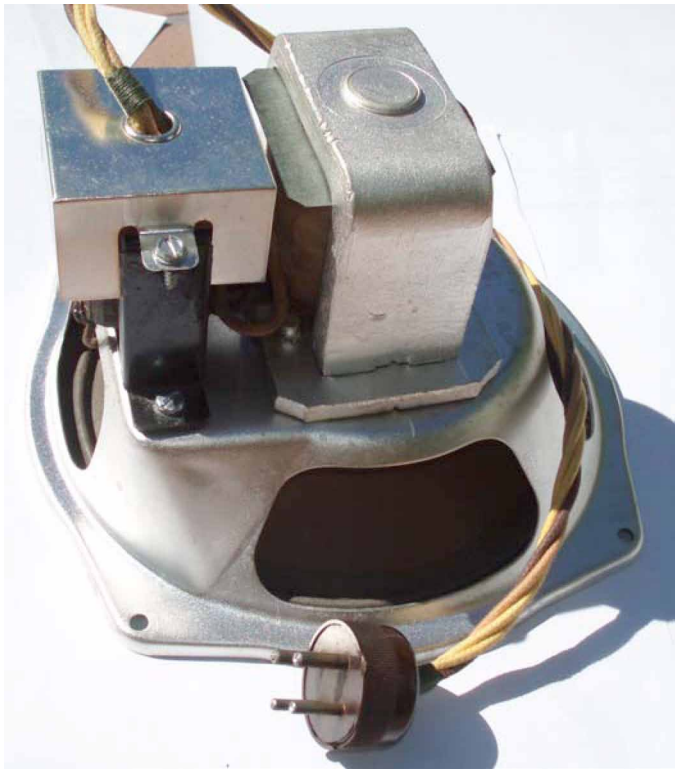
That job complete, I stained the new veneer and moulding with a water based, rub-on stain. The rest of the cabinet still had some colour so I lightly stained it with a diluted stain until everything matched. The timber of the two pieces that had been removed from the front and the central part of the front are of dark, beautifully grained timber which did not need any staining. It was time now to fit the new moulding and refit the two pieces of veneer to the front. The cabinet was now complete and certainly looked a lot better than when I had received it! As I am not very proficient with a spray gun, I finished the whole cabinet using satin polyurethane thinned 50% with turps, put on with a brush. There is a total of eight coats with a sand using 00 wet & dry, dry, between each coat. The shine slowly builds and the finish is smooth and rich. After the second polyurethane coat and with a fine artist's brush, I painted all the necessary edges and lines with black paint. The remaining coats of polyurethane brought the paint to the same finish as the rest of the cabinet. Finally a replacement transfer was floated onto the cabinet.

I had left the hardest and in my view the worst job till last. – fitting the new grille cloth to the cardboard backing. I have always had trouble with this and this set was no exception. I wrote off a piece of cloth in my efforts. I then found that ADOS F2 is, for me anyway, the best product to use. I painted a small section of the cardboard and pressed the cloth into it immediately. This way there is a short time to put some tension onto the cloth. After drying, the next section is glued and so on until complete. Lastly, a reproduced chassis layout diagram was stuck into place.



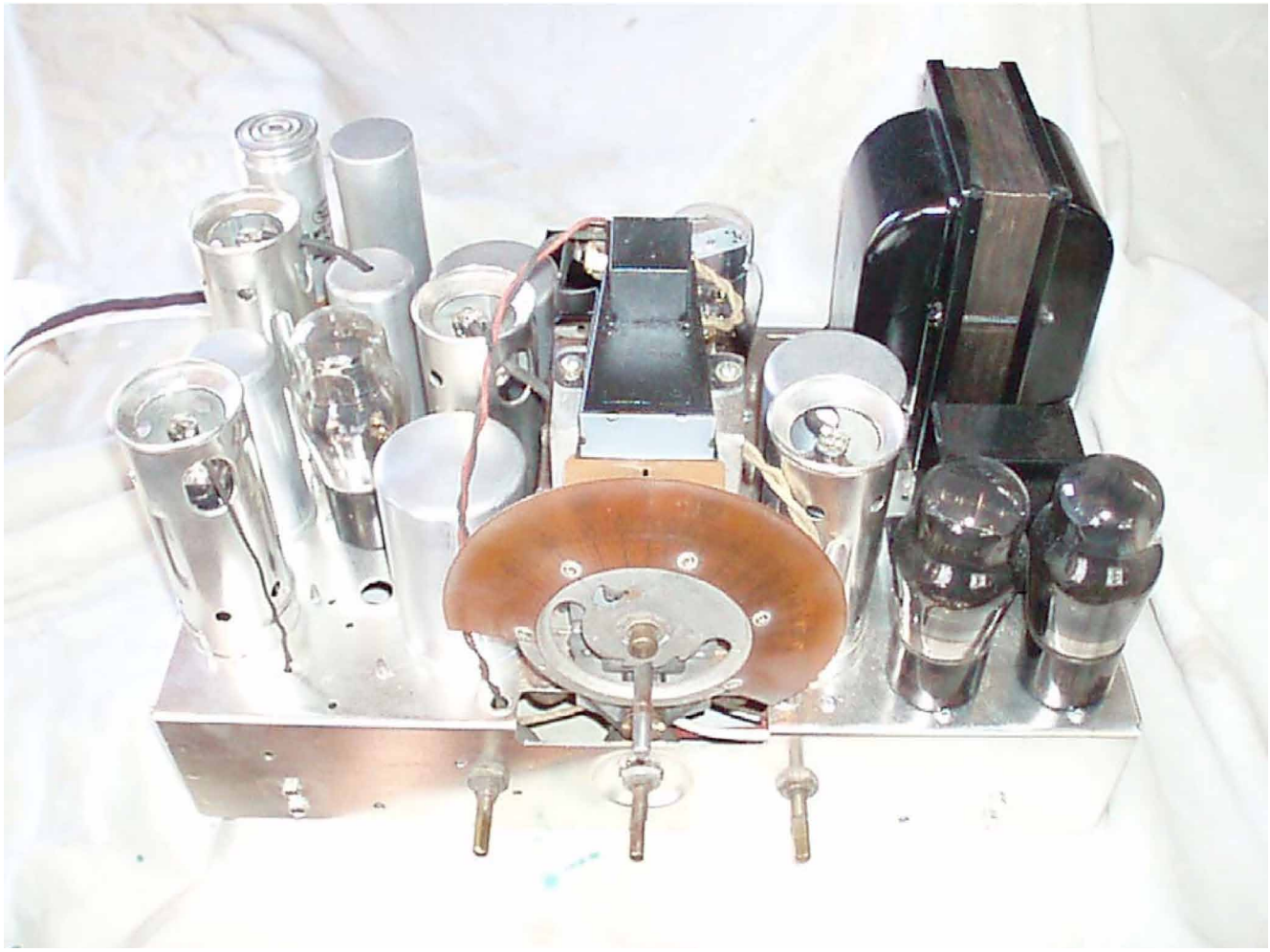
This restoration has taken me six months but I am satisfied that the result is the best restoration I have ever done. It is interesting to compare the time this took me with the time the Philco Radio & Television Corporation would have spent on it given that in their heyday they produced 1.5 million radios in one year!

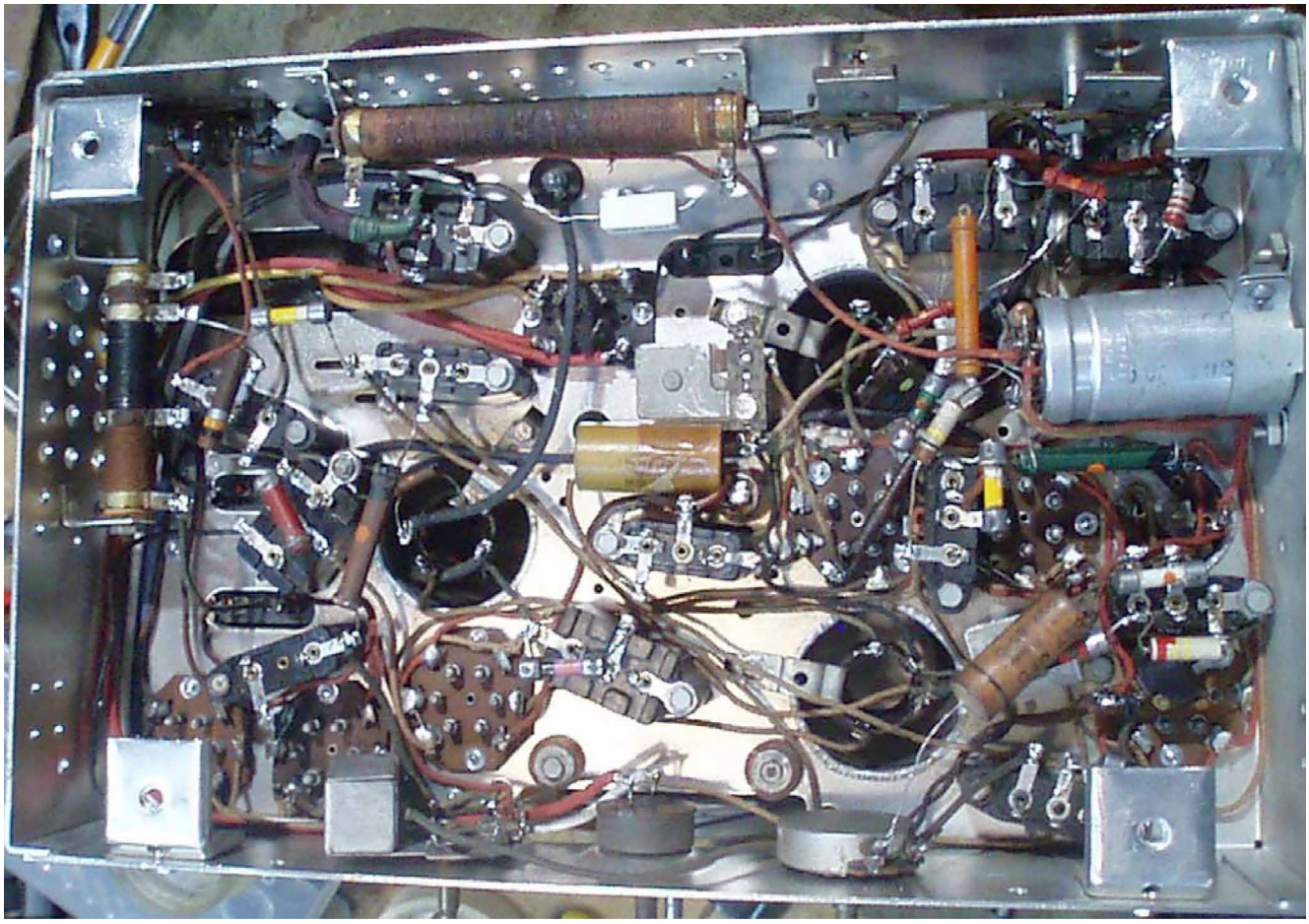
The finished ‘Philco Model 18’



Restored speaker

Completed chassis





Completed chassis underside

Completed rear view

Cabinet repair in progress

Cabinet repair in progress

Cabinet recoloured

Chassis ‘as received’