Vintage Radio

By Associate Professor Graham Parslow

STC's 1946 model 512 5-valve mantel radio

Post WWII, most manufacturers concentrated on producing budget sets in a time of austerity. But as a last hurrah from the 1930s, STC offered the model 512 as a traditional timber cabinet radio with a 5-valve line up. Interestingly, it carried over a feature of pre-war designs – an electrodynamic loudspeaker.

Before the war, STC had been targeting high-end radio buyers, along with Stromberg Carlson and HMV. The mass market was dominated by AWA, Astor and Kriesler and after the war these market leaders concentrated on budget mantel radios in Bakelite cases. Many of the high-end manufacturers similarly adapted to the market and made budget models. STC's budget line was a succession of Bantam radios.

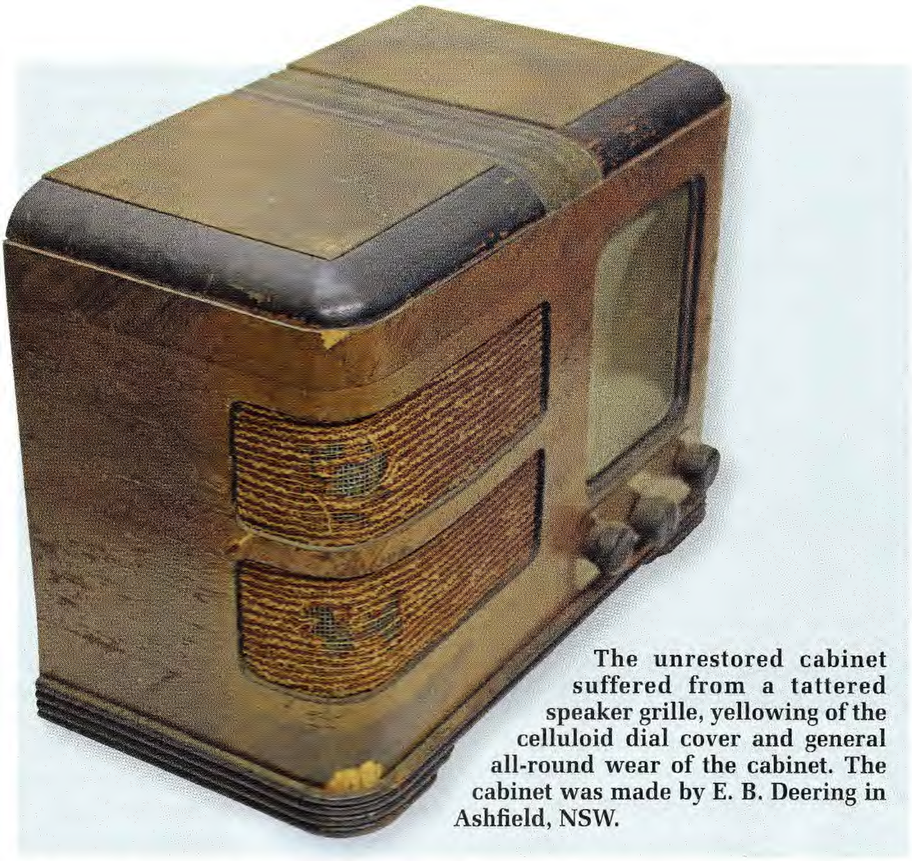
During the war, STC ceased domestic radio production as all new radio valves were reserved for military applications after 1941, even though many civilian valves were not rugged enough to endure the shock and stress of military service. So at the end of the war there were substantial stocks of valves available for domestic radio manufacture.

Even though the model 512 was new for 1946, it was a 1930s design. The high quality wood veneer cabinet from E. B. Deering was available at least as early as 1941, when it was pictured on the STC stand at the Sydney Romance of Radio Exhibition.

STC was a major global developer and supplier of high power transmitters and military electronics, particularly for radar. The British parent company at the time was among the top 100 companies listed on the London stock exchange. STC in Australia would have made many of their own components for domestic radios, including the 6-inch electrodynamic speaker for this model.

In fact, it is likely that the speaker had been on a shelf for the duration of the war and was used instead of a permanent magnet speaker which after the war would have been cheaper and competitive in efficiency. Rola permanent magnet speakers were used in other STC models of 1946 including the model D150 in my collection.

The electrodynamic speaker was further relegated to irrelevance by the development of high value electrolytic capacitors for ripple filtering. The speaker's 2000Ω field coil could therefore be replaced with a separate



The unrestored cabinet suffered from a tattered speaker grille, yellowing of the celluloid dial cover and general all-round wear of the cabinet. The cabinet was made by E. B. Deering in Ashfield, NSW.

choke or a resistor between two filter capacitors.

The chassis on the model 512 has the same high quality appearance of STC sets from the 1930s. Even the data panel on the rear of the chassis, showing the valve placement, is the same style as seen on 1930s STC radios.

By comparison, the economy 1946 STC model D150 has a plain steel chassis with stencilled valve data painted on it. The D150 also had flimsy clip-on goat shields for the valves (for a description of goat shields, see page 91 of the January 2017 issue; www.siliconchip.com.au/Article/10515) rather than the somewhat more substantial cylindrical valve shields seen on the model 512.

One deviation of the model 512 from the 1930s is the vertical dial arrangement that was the trend for the 1940s. In the 1930s, STC used rotary dials, mostly sweeping a pointer through 180 degrees. The front view of the model 512 chassis shows a section cut away in front of the transformer; this allows the speaker to slot into the chassis.

5-valve superheterodyne circuit

We have redrawn the circuit diagram, based on that from the 1946 Australian Official Radio Service manual (see Fig.1). That circuit did not show the details of the electrodynamic speaker. An external antenna is coupled to the first tuned circuit and the tuned signal is fed into the control grid of a 6A8G pentagrid self-oscillating mixer.

The plate of the 6A8G drives the first IF transformer which then drives the grid of the 6U7G pentode and it, in turn, drives the second IF transformer, both tuned to 455kHz.

All of the valves have octal sockets and the first three have top-cap control grids. Terminating the grids at the top allows for shorter wiring connections to minimise the effects of stray capacitance.

The third valve, a 6B8G audio preamplifier, has a shielded lead coming from the volume control fed through a hole in the chassis to contact the top-cap grid inside the shield can.

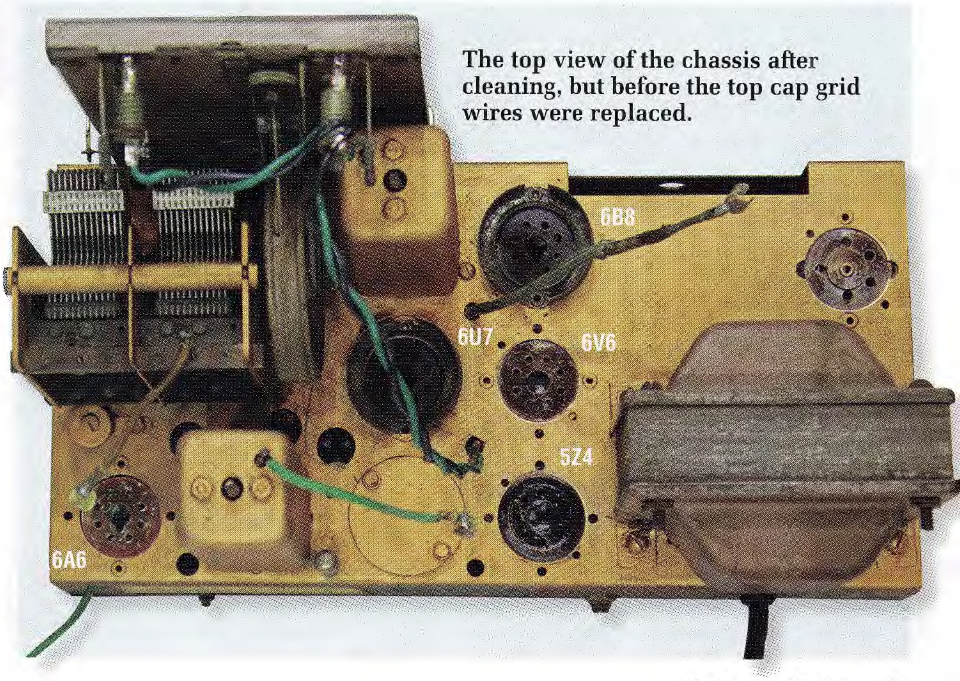
An interesting addition to the front end is a 1200Ω trimpot that joins the 6A8G cathode to earth. As the resistance is increased, the 6A8G's control grid becomes more negative, thereby reducing the RF amplification.

This was a way of protecting against front-end overload from a local transmitter. The trimpot can be adjusted by the screw at the rear of the chassis adjacent to the ARTS&P label.

This function was confirmed by tuning to a weak station and hearing a change in level by using the trimpot. Strong stations showed no audible change because AVC compensated for the change in front-end gain.

There are no design surprises in either the oscillator using the 6A8 or the IF amplification (6U7). The 6B8G is a dual diode pentode, with both diodes wired in parallel to produce a common signal for detected audio and negative AVC voltage which is applied to the grids of the 6A8G and 6U7G.

The pentode in the 6B8G amplifies the demodulated audio and its output is fed to the grid of the 6V6G output pentode via a 10nF capacitor. In this radio, that coupling capacitor to the 6V6G had already been replaced by



The top view of the chassis after cleaning, but before the top cap grid wires were replaced.

The rear view highlights the two substantial metal screens fitted to the 6U7G and 6B8G valves. Note the top-cap grid leads for the first three valves. This was common in pre-war receivers to minimise the effects of stray capacitance.

a previous restorer so there was no leakage to cause positive grid bias on the 6V6G.

The 6V6G class-A output stage is conventionally designed, with a 350Ω cathode resistor and 10µF bypass capacitor between the cathode and earth. The grid is connected to earth by a 500kΩ resistor and measured 0V, as it should.

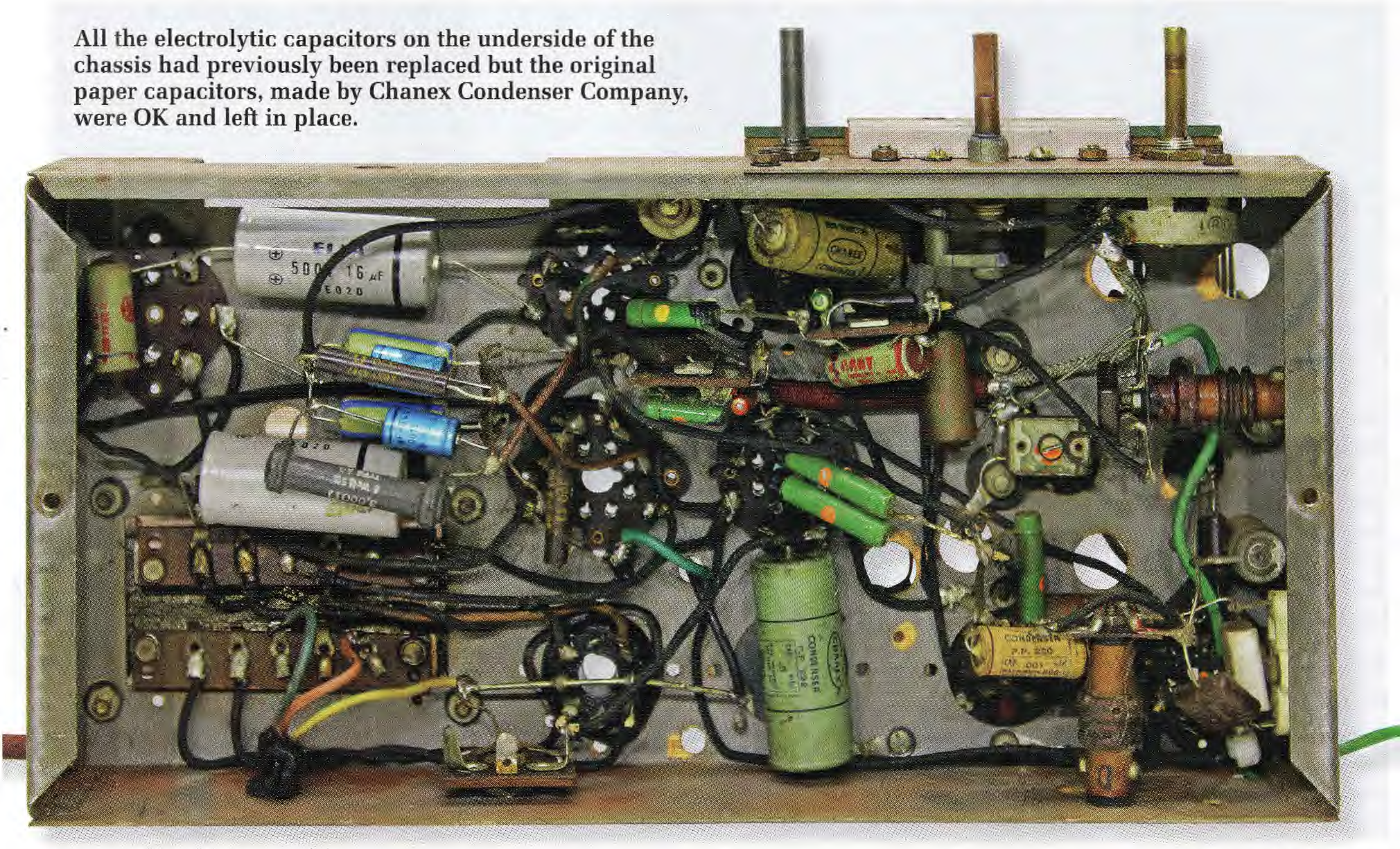
The grid bias was -12.7V, as developed across the cathode resistor. The anode of the 6V6G measured 226V and the screen 240V, relative to earth; all good figures. Because the 6V6G valve operates in class-A mode, the power used is independent of the audio volume. Total power consumption was 44W.

The 3-position tone control switch has two settings offering capacitive top-cut to the signal fed to the output transformer primary.

Maximum top-cut produces an unpleasantly muffled sound, as you might expect with a value of 1µF. That really is excessive, as the corner frequency with a 1µF capacitor effectively across the 5kΩ load would be around 31.8Hz – no wonder it sounds muffled!

A better choice would have been 100nF, with the intermediate tone position suppressing a bit of hiss in appropriate circumstances. The non-cut position is a bit strident, but still my choice for listening.

The HT rectifier would usually be a 5Y3 but my set has a 5Z4G that features a large envelope and is seated next to the transformer. Although mine is in a glass envelope it was also manufactured in a metal envelope. It has high-end specifications, in excess of what is needed for a domestic radio receiver, since it is capable of delivering up to 500V at 350mA.



All the electrolytic capacitors on the underside of the chassis had previously been replaced but the original paper capacitors, made by Chanex Condenser Company, were OK and left in place.

The 5V directly-heated cathode-filament is driven from a separate transformer winding as otherwise, HT would be applied to all the valve heaters. Because the speaker field coil is part of the HT filtering circuit, failing to plug the speaker in deprives the rest of the circuit of HT.

Cabinet Restoration

The radio was acquired through eBay at a time when I was particularly keen to collect STC radios. I paid more for it than I should have. considering the visibly poor condition. It sat on various shelves for a decade, taunting me to make a start on restoration.

The poor appearance resulted from multiple degradations. The tattered speaker grille was an immediate eye-catcher and the celluloid dial cover was strongly yellowed. The shellac finish had become flaky and tinted the timber with a golden hue that was not true to the tones of the veneers. Some veneer had broken away.

The first step was to disassemble the cabinet to a bare case, less speaker grille and dial cover. Using a scraper and abrasives, the shellac was completely removed to avoid any chemical reaction with the polyurethane finish that was to be applied.

The black and brown timber highlights were repainted before spraying with satin-finish Carbothane. The first coat was sanded back with particular care to create a smooth surface for the next three coats.

The detailed grain of the inlaid veneers, revealed under polyurethane, made a fitting display of the craftsmanship that went into this cabinet. The round-the-corner speaker grille is a design feature that does nothing to indicate directionality of the speaker which faces in the forward direction.

Interestingly, the grille profile is supported by a fly screen wire mesh. The choice of a replacement grille cloth was not an easy one and was arrived at after some agonising. As part justification for the choice, orange-red fabric can be seen on other 1940s radios, notably AWA and Kriesler. Even though I had misgivings about the final choice of cloth, I have come to like it.

The original yellowed celluloid dial cover was heat-moulded to bulge outwards. I made a mould to heat-shape some thermoplastic sheet and

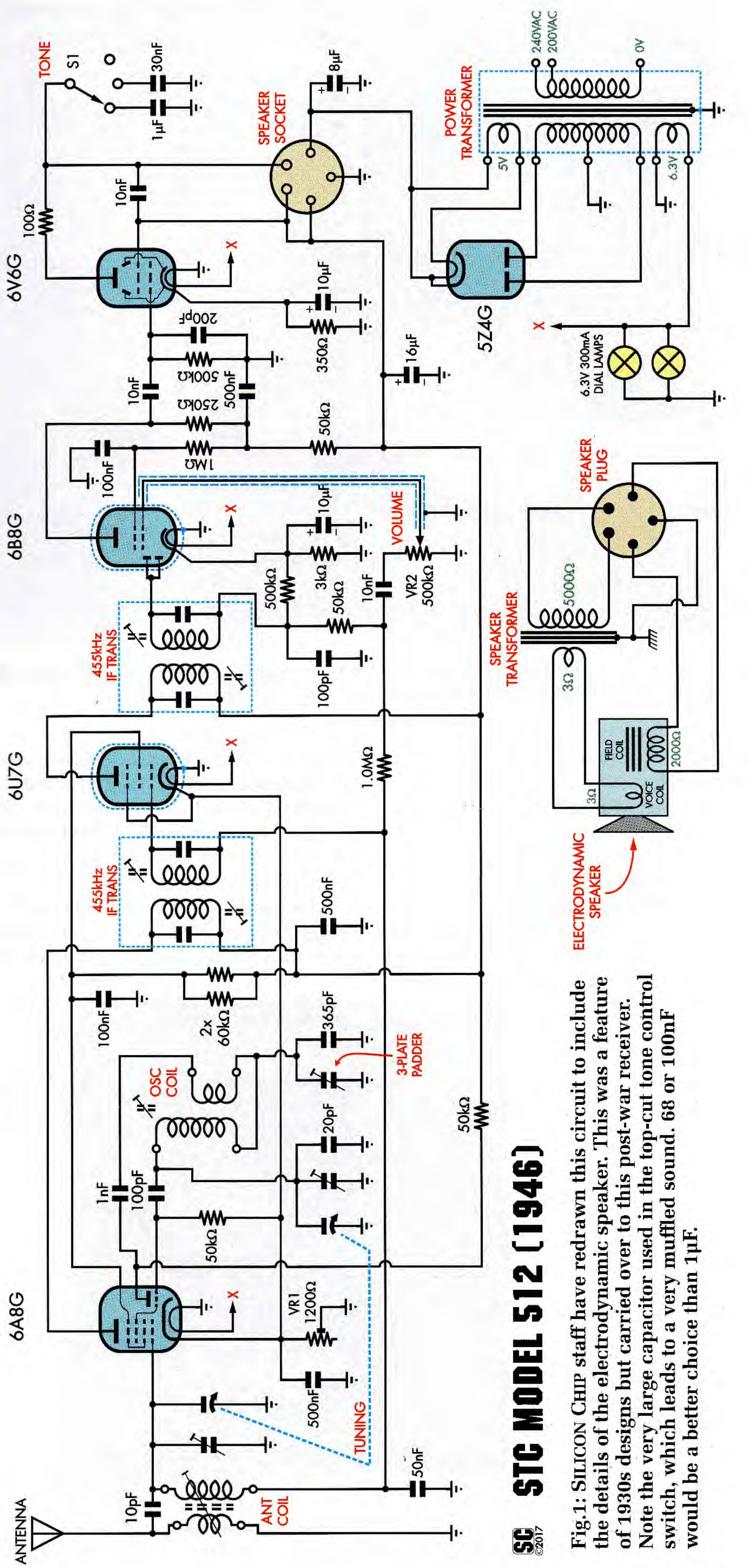
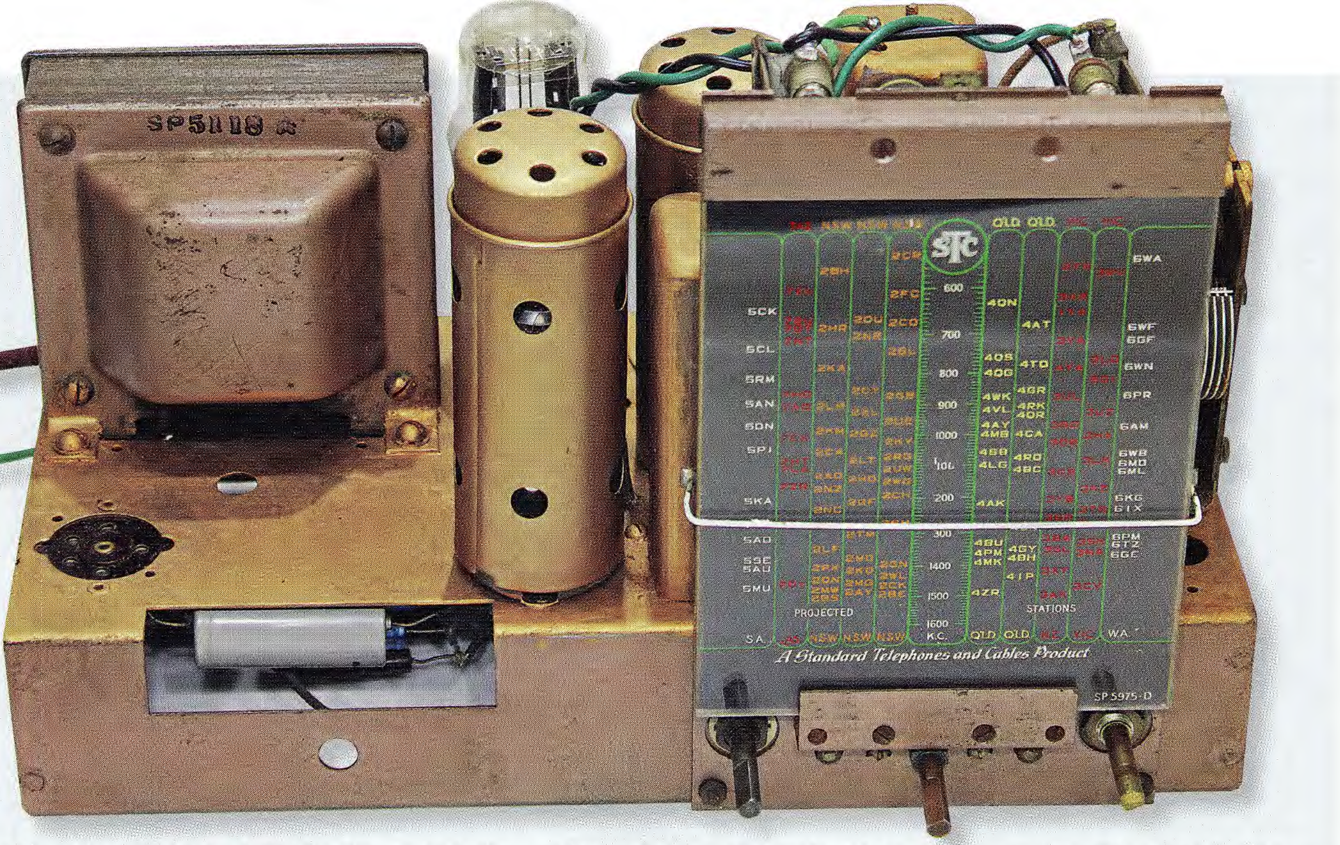


Fig.1: SILICON CHIP staff have redrawn this circuit to include the details of the electrodynamic speaker. This was a feature of 1930s designs but carried over to this post-war receiver. Note the very large capacitor used in the top-cut tone control switch, which leads to a very muffled sound. 68 or 100nF would be a better choice than 1µF.



The elaborate vertical dial for the set includes markings for New Zealand and Australian stations. The vacant 5-pin socket on the left-hand side of the chassis is for the speaker plug.

ended up with a close to acceptable result. However, imperfections were evident and would have compromised the end result.

Many previous STC dial covers were moulded so that a dial pointer could project forward into the space created by the moulding. After checking this one, I established that the pointer was recessed into the case. A plain piece of 1mm thick PETG plastic was duly installed as the dial cover and did not foul the pointer. The knobs were cleaned ultrasonically to complete the external restoration.

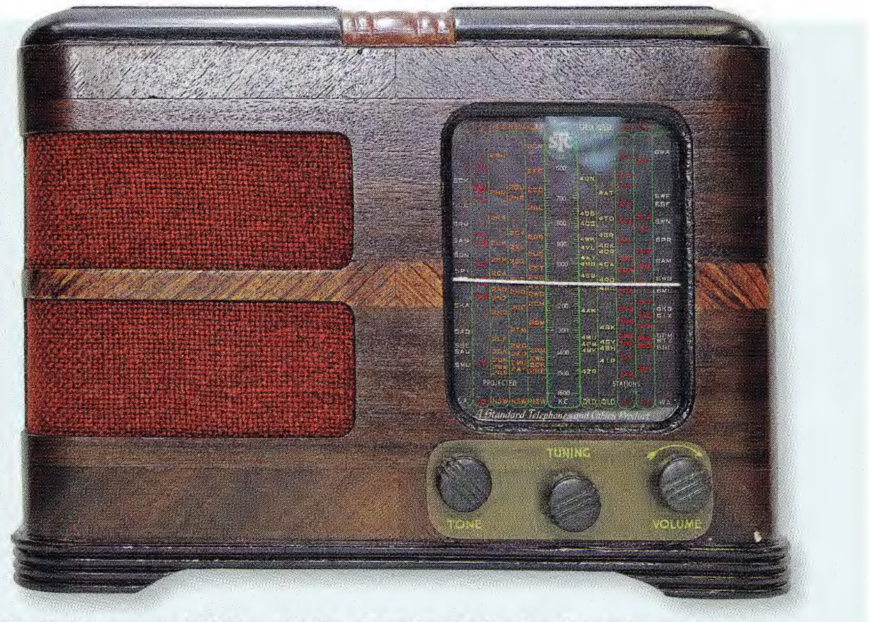
The electrical restoration was easier, in spite of the challenging layer of dust over the chassis. Happily, the overall condition of the unit was excellent and as noted, a previous restorer had already replaced some parts, specifically capacitors.

It is a tough call whether to power up the radio before cleaning it. In this case I crossed fingers and was rewarded with the radio working immediately, while drawing appropriate power (41W, without the dial globes working). Although I was tempted to replace a few more components, everything worked so I left the components as they were.

The dial lights turned out to be two open-circuit 2.5V globes. The marginally-serviceable wiring to the dial lamps was replaced and the correct 6.3V lamps installed. Those lamps provide edge lighting to the dial glass, creating a colourful dial display in a dark room.

The 240VAC mains cable was a modern plastic sheathed cable; functional but not in keeping with the time of manufacture. It was replaced with a new cotton-covered cable. The top-cap wire to the 6U7G valve was replaced, as was the tatty aerial wire.

That was it. After a decade of waiting, the ugly duckling was transformed into an elegant display piece, illustrating a notable transition period in Australian radios. **SC**



The fully restored STC model 512 5-valve radio in all its glory. Sporting a fresh coat of paint and lacquer, new grille cloth and a newly made dial cover.