Vintage Radio

By Associate Professor Graham Parslow

STC's Type 500A 5-Valve Mantel Radio

STC's 1938 Type 500A is a well-made 5-valve mantel radio which was housed in a handsome timber cabinet. The unit featured here was obtained in quite good condition and required relatively little work to restore it to full operation.

This STC 1938 500B tombstone model still has it original speaker grille and knobs. Exactly the same grill and knobs would have been installed on the model 500A pictured above but these parts have been changed at some stage during the set's life.

THE 1938 STC Type 500A mantel radio is among the author's favourite radios. The attraction started with a visit to the palatial Como House (now a National Trust building) in Melbourne. One member of the wealthy family that previously lived in Como House was an avid radio listener and an STC Type 500A radio is displayed (in working condition) in her bedroom. It made a lasting impression on me at the time, well before radio collecting became a passion.

Some years later, the Type 500A radio featured here was offered on eBay and I duly purchased it (in 2006) for $300. Since then, it has occupied a prominent place in my home and has always been appreciated for its outstanding craftsmanship. STC's promotional material at the time stated that the "two-tone cabinet" was made from "specially selected highly-figured walnut veneers, hand rubbed" and with a "full piano finish".

I'm certainly not the only person to appreciate its qualities because my Type 500A radio came with an interesting story. It turned out that it had spent a long life of active service on a farm in the Illawarra region of NSW. When the farmer died, the radio was passed on to his son who kept it as a treasured memento before reluctantly deciding to sell it because he was moving to the US. We exchanged a number of pleasant emails during the transaction and when the radio arrived, I felt that I had inherited an obligation to get it going again and to look after it.

Prior modifications

In deference to its history, the radio hasn't been fully restored though. To keep the radio functional and "updated", the previous owner had had the knobs, speaker and speaker grille replaced at some stage, probably during the 1960s. The speaker is mounted on a baffle-board which is angled at 30° to the front face at one end of the cabinet. Its relatively easy to remove this to gain access to the grille material.

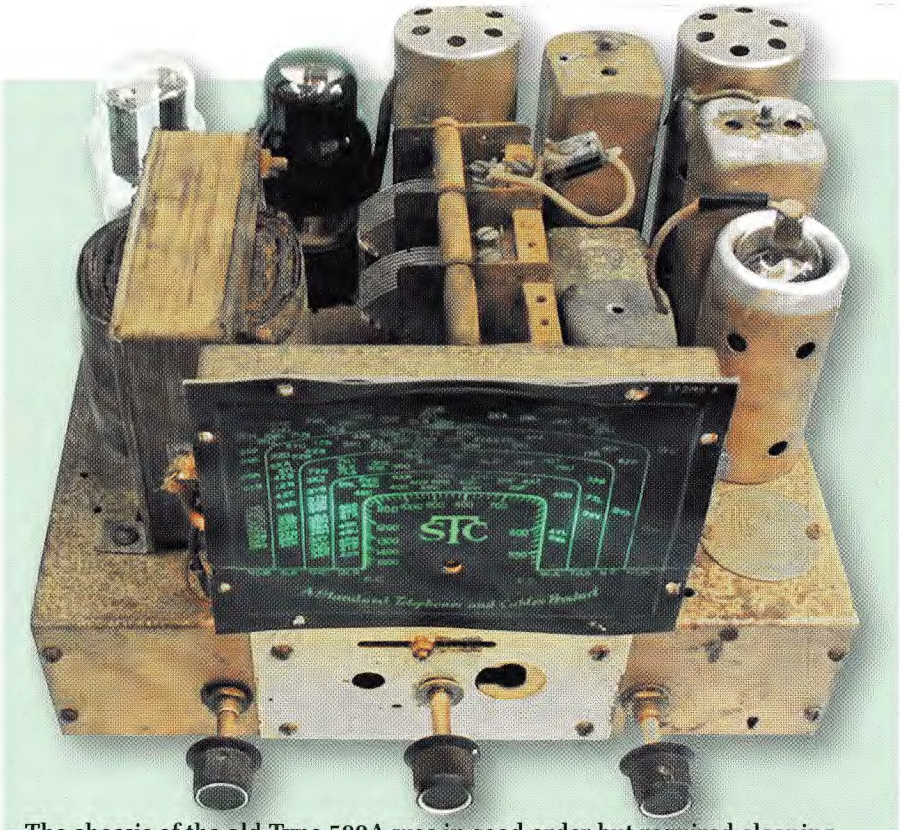
The speaker itself was originally an electrodynamic type and was plugged into a 5-pin socket on the rear of the

chassis. Two wires ran to the remotely-mounted output transformer, two were for the electromagnet and the fifth wire was an earth lead.

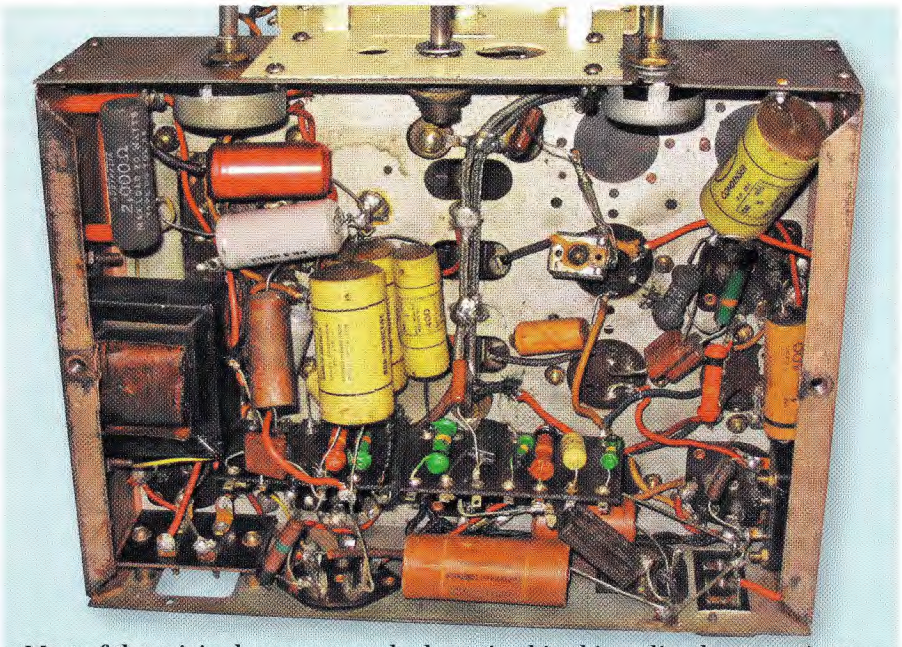
The speaker grille fabric had probably been replaced when the permanent-magnet loudspeaker was installed. This 'new' speaker was a Rola 6-inch (150mm) type H of 1950s vintage. It had been installed professionally, presumably by a local serviceman, and the work included adding a 2kΩ 20W resistor to replace the electromagnet in the HT filter circuit. The HT filter electrolytics (C10 & C11, both 8μF) were also replaced at the time.

The grille fabric and knobs originally used on the 500A were also used on the 1938 STC tombstone model 500B. This set is shown in one of the accompanying photos and is another of the author's prized radios. It's displayed next to the 500A and clearly demonstrates what the 500A's original grille fabric and knobs look like.

I've left my 500A just the way it came to me though, as I consider the replacements to be a genuine part of the radio's history.



The chassis of the old Type 500A was in good order but required cleaning. The back-lit dial uses two 6.3V globes that shine through a green transparent sheet and a second opaque sheet with transparent station call-signs.



Most of the original components had survived in this radio, the exceptions being the loudspeaker, the output transformer, the celluloid dial cover, two 8μF HT filtering capacitors and two other coupling capacitors.

STC aimed high

STC stands for Standard Telephones and Cables and the company began life in London as International Western Electric in 1883. It became STC in 1925 when it was taken over by ITT of the USA. Two important high-points for the company involved supplying the radio systems for the *Queen Mary* and *Queen Elizabeth* ocean liners (1936-39) and patenting pulse code modulation (PCM) in 1938.

STC's Australian operations date from 1923 when Western Electric set up a manufacturing subsidiary in Sydney. Local manufacturing expanded significantly in 1936 following the construction of a new factory at 252-274 Botany Road, Alexandria, Sydney. This new factory employed some 700 people and was involved in building domestic radio receivers (such as the Type 500A), commercial transmitters and military equipment.

The sales motto for STC was "for tone it stands alone". All pre-war radios were high-specification models and this included both the cabinet work and the electronic circuitry. As a result, these radios were aimed at the higher end of the market and were relatively expensive. This changed after the war when the "Bantam" range of domestic radios was introduced to compete on price.

Circuit details

Fig.1 shows the circuit details of the STC Model 500A. The 'A' suffix describes the case type. On the other hand, the chassis is labelled 500-I and the 'I' defines the circuit used and its features.

For this particular circuit, the 1938 STC sales manual lists the features as including automatic volume control, tone control, a clearly marked tuning dial, a chromium dial escutcheon, an electromagnetic moving-coil loud-

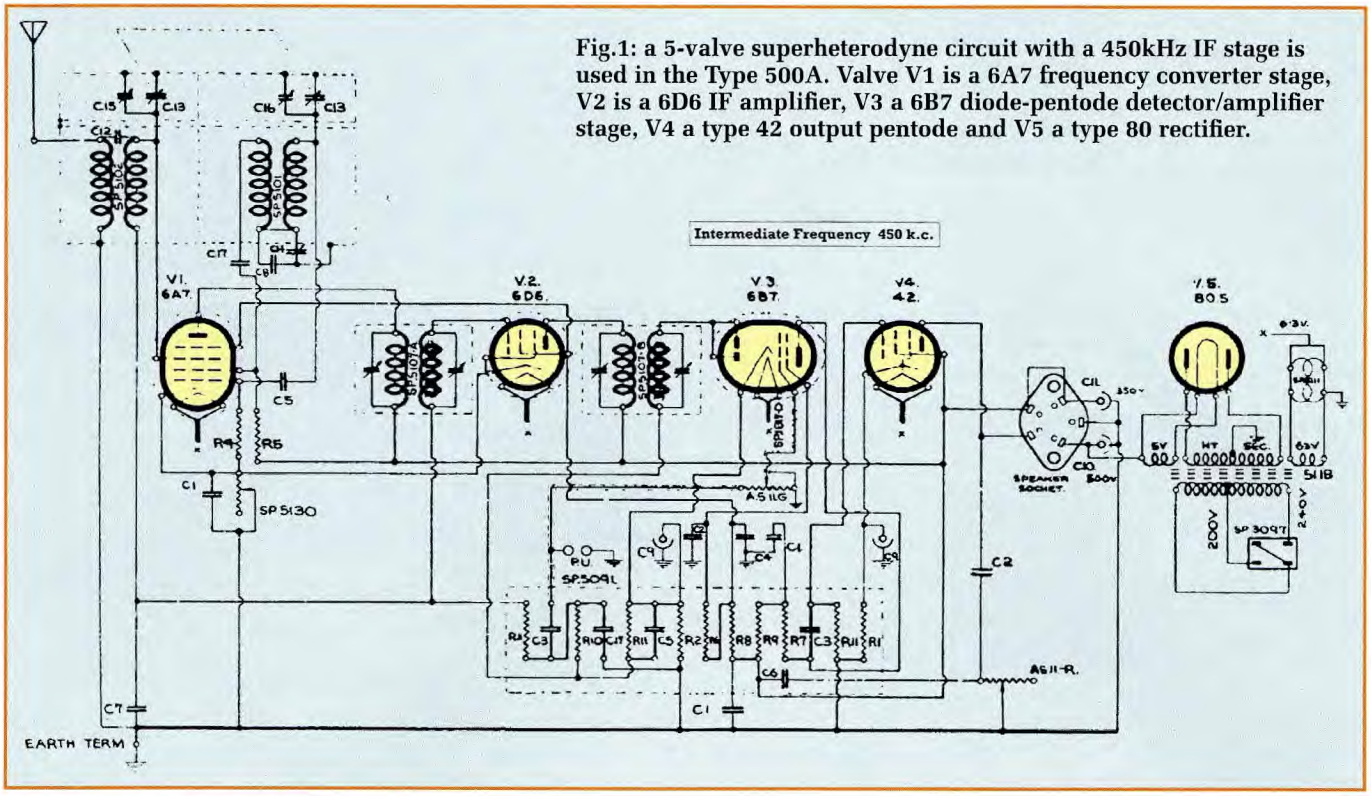


Fig.1: a 5-valve superheterodyne circuit with a 450kHz IF stage is used in the Type 500A. Valve V1 is a 6A7 frequency converter stage, V2 is a 6D6 IF amplifier, V3 a 6B7 diode-pentode detector/amplifier stage, V4 a type 42 output pentode and V5 a type 80 rectifier.

speaker and a "threshold sensitivity" control.

The circuit itself is a 5-valve superheterodyne type using a 450kHz IF stage. It includes a 6A7 frequency converter (V1), a 6D6 IF amplifier stage (V2), a 6B7 diode-pentode detector/amplifier stage (V3) and a type 42 pentode (V4) for the audio output. The 450kHz IF stage employs two metal dust core transformers and STC state that resistance coupling is used between the detector/amplifier (V3) and output stage (V4).

The last claim is a bit odd though, because C3 provides conventional capacitive coupling to the type 42 output pentode.

Potentiometer AS11-R (50kΩ) acts as a top-cut tone control in conjunction with C2. The volume control pot (500kΩ) is labelled AS11-G and this alters the gain of the 6B7. The top of the volume pot also accepts signals from a gramophone pick-up, with the signal fed in via terminals on the rear of the chassis (see photo).

The threshold sensitivity is adjusted by a trimpot marked as SP5130 on the circuit diagram and located at the lefthand rear of the chassis. This trimpot alters the RF gain of the 6A7 converter valve.

The final valve in the line-up is a type 80 rectifier. This provides full-wave rectification of the high-voltage secondary output of a conventional mains transformer to provide the HT line. This HT line is filtered by capacitors C10 & C11 (both 8μF) and the HT coil in the electrodynamic loudspeaker. As previously mentioned, in this particular set, the latter had been replaced by a 2kΩ 20W resistor.

The original twin-flex mains cord ran to a plug to the right of the speaker socket and this plug was used to select between a line voltage of 200VAC or 240VAC (see Fig.1). This warning label on the rear panel advises the user to check that the plug position correctly corresponds with the supply voltage .

Restoration

Despite the set's age, the cabinet was in good condition. It was polished with O-Cedar wood polish but was otherwise left unchanged. However, the celluloid dial window was nearly opaque due to oxidation.

The original celluloid was blow-moulded to clear the rather-stylish dial pointer which stands out from the back of the metal escutcheon. This means that a flat replacement window mounted behind the escutcheon would have fouled the pointer, so an alternative method had to be found.

Unfortunately, when I first acquired this radio I didn't have the skill to duplicate a blow-moulded window profile (although this is a technique that has subsequently been learnt). As a result, for this radio, a clear-plastic section was carefully cut from acetate sheet to fit the profile of the outer rim of the escutcheon. It was then carefully glued in using a few small dabs of super glue.

The result was agreeably satisfactory and allows the green back-lit dial to continue to impress more that 70 years after it was manufactured. The

The STC Type 500A radio has pick-up terminals to accept the output from a record player. The pick-ups used in 1938 were either large magnetic types or piezo-electric crystals as shown in this advertisement from Levenson's Radio.

dial back-lighting is achieved using incandescent dial globes which shine through a layer of green backing positioned behind an opaque dial-plate with transparent call-signs.

Mains cord replacement

The original 2-core mains lead installed in the 1960s is now illegal in this type of equipment. In addition, this cord was terminated in a loose socket that made poor contact and this socket had to be orientated to match the mains voltage. This meant that the 200VAC tap on the power transformer could be incorrectly selected.

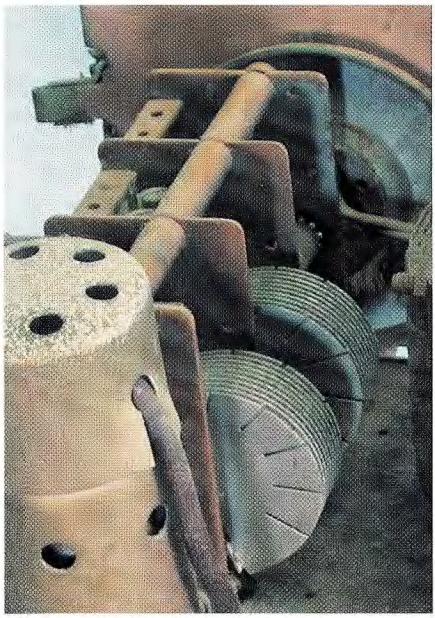
As a result, the 2-core mains lead was replaced with a modern 3-core lead which was directly connected to the 240VAC tap on the power transformer. This cord will be substituted with a cloth-covered cord in the near future, so that it is more in keeping with the set's age.

It is interesting to note that 2-core mains leads were common in 1938 and most radios, including this one, had no mains switch. This was because if a switch was installed, it was obligatory to switch the Active lead. However, many users spliced the power cord into a light bayonet socket using a 2-pin B-22 plug, so there was a random chance as to which lead would be the Active.

A DPDT switch would have overcome this problem but that would have added to the cost and users generally didn't demand this feature. Wall sockets were only sparsely installed during the 1930s but each room had a light, so double-adapting from the light fixture was fairly common. Users who wanted a switch had to install their own.

Dead on arrival

Although it appeared to be in reasonable (but dusty) condition, the radio was 'dead on arrival' (DOA) with no audio output. This was due to an open-circuit primary on the output transformer and this was quickly es-



The same punched chassis was used by STC for a range of radios and this explains the rather unusual use of a 3-gang tuning capacitor frame with one section missing. A 3-gang tuner would have been necessary in models with an additional tuned RF stage.

This view shows the Type 500A after restoration. The new 3-core mains cord bypasses the voltage selection plug (to the right of the loudspeaker socket) and is wired directly to the transformer. It also allowed the chassis to be safely earthed.

tablished because there was no plate voltage on the type 42 output pentode. In addition, the cathode heater of this valve was glowing red but the valve itself remained cool.

The usual cause of a blown output transformer is excessive current through the output pentode (and thus the output transformer). This can be caused by changed resistor values in the grid bias circuit or failure of the audio coupling capacitor (C3 in this circuit), leading to a more positive grid than is healthy and increased power dissipation. It's also common to encounter both faulty resistors and a faulty capacitor together.

The pick-up terminals are on the rear of the chassis, directly above the antenna terminal. There's no provision to switch out the RF section when using the record player; instead, the user has to tune to a quiet spot on the dial, to avoid interference.

A replacement transformer was installed and the radio then performed perfectly. There is a quick way to check power dissipation in the output pentode and that is to simply remove it. With the 42 pentode in circuit, the power consumption is 51W and this drops to 38.5W after it's removed. A dissipation of 12.5W for the components associated with this stage is acceptable, so the stage appeared to be running normally. Importantly, the replacement output transformer wasn't running warm – they can get quite hot when excess current flows.

Nevertheless, true peace of mind required direct checking and the results were all good. First, the wirewound 400Ω cathode resistor was checked and its value found to be spot on. This resistor sets the grid bias voltage on the output pentode (the grid itself is tied to earth via R11, which holds the grid negative relative to the positive cathode). The cathode measured +11.7V with +223V on the anode plate.

Coupling capacitor C3 (0.01μF) was also checked. This was a Ducon replacement of 1960s manufacture and it measured OK. The fact that it was a replacement meant either that the original had failed or the repairman who had worked on the set had substituted it as a precaution.

The final check involved measuring the DC voltage across the output transformer's primary. This measured 15V DC while the DC resistance measured 600Ω, giving a calculated power dissipation of just 0.38W.

Pick-up terminals

The 500A's back panel features two screw terminals to accept the output from an external turntable pick-up (see the advertisement from Levenson's Radio). These two terminals connect to the volume control (AS11-G) in the first audio stage but note that there's no switch to switch the RF front-end out of circuit. Instead, the radio was tuned to a quiet part of the dial when the record player was being used.

In operation, the pick-up may have produced as much as 1V, so sensitivity wasn't a problem. It's worth noting that many valve radios included provision for a pick-up during the 1950s and even into the 1960s before portable transistor radios took over.

Finally, despite its age, this the radio still looks good and it still sounds good. It may not be completely original but it's still well worthwhile having in a collection. **SC**