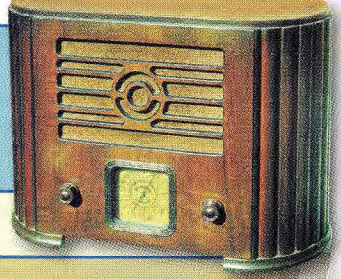
VINTAGE RADIO

By Associate Professor Graham Parslow



AWA 1963 model B13 stereogram

If you watch the popular "Endeavour" detective series on ABC TV, you will know that the young D.S. Morse is a classical music enthusiast who listens to LP records on a portable record player similar to the AWA model featured here. The series is set in the 1960s when valves still ruled and stereo sound was the latest "big thing".

The 1960s were the best of times in many ways. If we take Charles Dickens' introduction to A Tale of Two Cities then we can also reflect on the 1960s as the worst of times. Russia and the USA were engaged in a cold war that looked like it could annihilate the planet in nuclear war. Many people built bomb shelters.

On the other hand, the youth of that time were the most liberated generation that the planet had seen. The post war baby boom had produced prosperity and teenagers who revelled in rock and roll, songs of protest, listening to the top 40 and buying 45 RPM records. And LP record albums were coming out in stereo.

With rising interest in stereo sound, it is not surprising that all major radio manufacturers in Australian were making stereograms both in portable and furniture format that were more affordable than the radiograms that parents previously aspired to have in their lounge room.

Portability was a new feature that departed from the tablegrams manufactured in the 40s and 50s. Teenagers could take their music with them to party with friends.

AWA, who manufactured the portable stereogram featured in this article, was the largest electronics manufacturer in Australia in 1963. Following behind them was Astor, Kriesler and HMV, all of whom offered similar portables.

Examples from Astor, Kriesler and HMV in the author's collection are shown in this article. They all have timber cabinets covered in fabric or leatherette, with a carry handle for transport like a suitcase.

In 1963 it still made sense to purchase a valve unit, relative to the new transistor technology. The valve units arguably sounded better and produced higher volume.

Idler wheel

The AWA unit featured here performs well as a radio but it has a problem that is common to all record players of this vintage which have idler-driven turntables. The idler wheel is placed between the stepped spindle of the turntable motor and the inside rim of the turntable. After 50 years or more, the idler wheel will be either perished or seriously cracked.

In some cases after many years of disuse, the idler wheel may be so

The AWA B13 has a hand-span tuning dial with stations for all Australian states. Note the combined tone control and power switch.

badly perished that it is a glutinous mass stuck to inside rim of the turntable. Or maybe the idler wheel has been left engaged for many years and now has a serious flat spot. If you do manage to get it to run, it will have intolerable wow.

In all these cases you need to obtain a replacement idler wheel before you can restore the record player function. That is just the first hurdle. You will find there are a number of online companies that can either replace or make new idler wheels but they are based in the USA and the cost will be high.

If you are handy with a lathe and can source rubber discs of the right consistency, such as cistern rubber parts from hardware supplier Bunnings, you make may able to make a new idler wheel.

Of course, you will also need to source a new replacement cartridge. Record players of this era used turnover crystal or ceramic (piezoelectric) cartridges with two styli, one for playing 78 RPM records and one for playing 45 RPM and 33 RPM vinyl records.

It is most unlikely that any 60-year old crystal cartridge will still work and even if it did, the styli are likely to be seriously worn or broken off. Fortunately, a range of these cartridges are available for most record changers used at the time, such as BSR and Collaro.

At the time of writing this story, I had not been able to do anything about the record changer and its idler wheel and cartridge. Instead, I concentrated my efforts on restoring the cabinet and chassis.

Valve radio technology was mature in the early 1960s and this AWA set follows a well established format and valve complement. Somewhat surprising is the omission of a ferrite aerial.

Instead, the front end has a conventional aerial coil needing an external loop antenna. Because of the area available below the turntable, a loop antenna has been stapled to the plywood base.

Circuit design

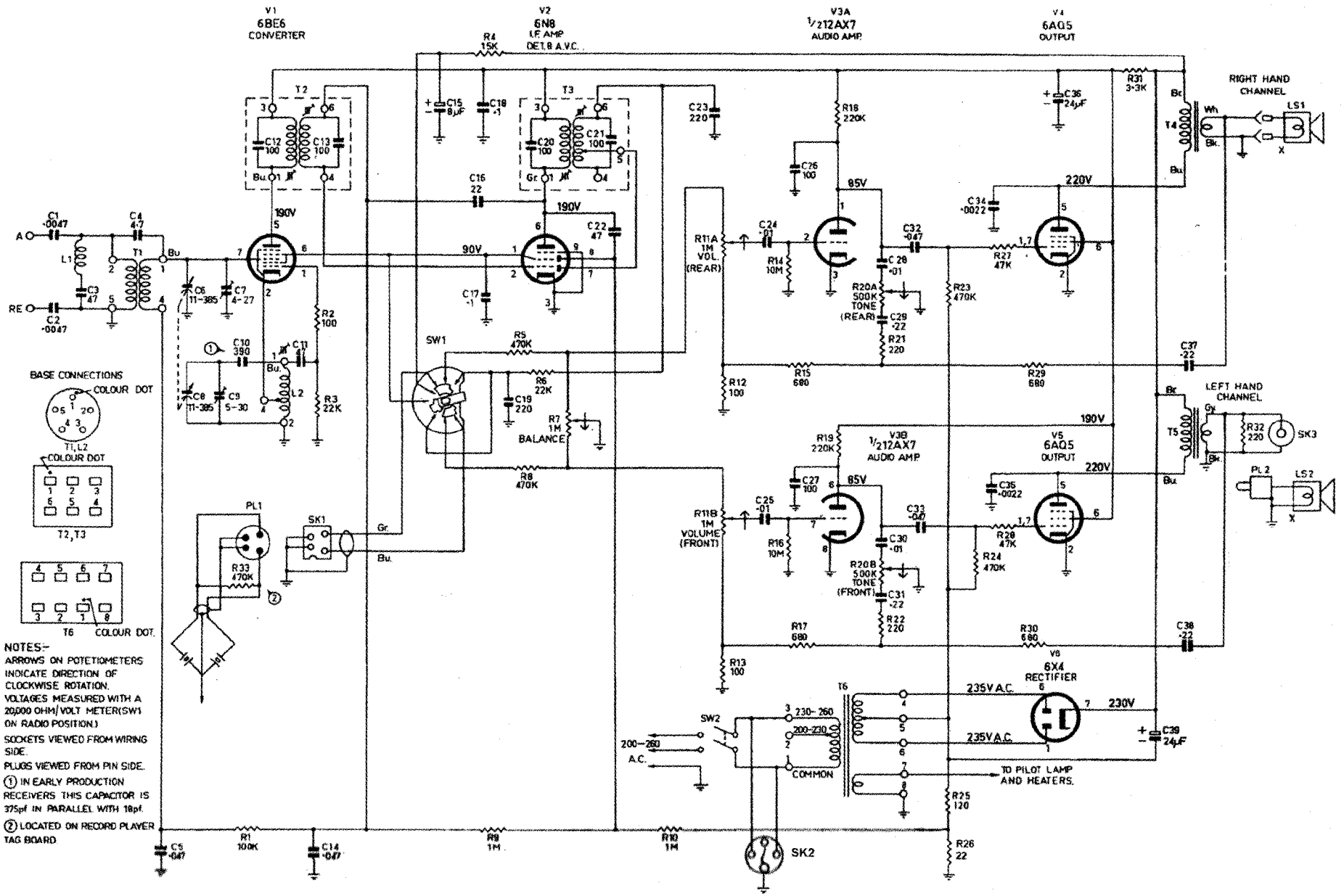
This is really an AM tuner with an integrated stereo amplifier. The circuit is quite simple with a line-up of just six valves: a 6BE6 pentagrid converter (mixer oscillator), a 6N8 double-diode pentode, a 12AX7 twin triode, two 6AQ5 pentodes and a 6X4 full wave rectifier.

The signal from the loop antenna is fed into the aerial coil (T1) which supplies the grid of the 6BE6 and coil L2 is configured as a Hartley oscillator, with the oscillator signal fed into pin 2 of the same valve. Both the aerial and oscillator coils are tuned by the 2-section tuning gang.

The 455kHz difference signal from the 6BE6 converter appears at the plate and is tuned by the first IF transformer T2. Its secondary is fed to the grid (pin 2) of the 6N8 whereupon it is amplified and appears at the plate (pin 6) of the 6N8 to be tuned by the second IF transformer T3.

The two diodes in the 6N8 generate the AGC signal and perform demodulation. The 455kHz signal from the plate (pin 6) is fed via capacitor C22 to the diode at pin 8 and the resulting negative voltage is fed to the control

Two of these three portable radiograms of the period were stereo, both with a second channel speaker in the lid which had to be detached for listening to records. The three models shown above are a 1964 Astor G10L, 1955 Kriesler model 11-76 and 1966 HMV Bahama O3-8K.



The tuner circuit is quite conventional, with the two diodes in the 6N8 valve used for demodulation and generating the AGC control voltage. Note the Baxandall tone control which provides treble boost and cut. Bass boost was not available in most portables because of the risk of acoustic feedback to the turntable.

grid of the 6BE6 via resistors R9 and R1 while the 6N8 gets its AGC via R9 and the secondary of transformer T2. Strong signals generate a negative AGC voltage and lower the gain of the 6BE6 and 6N8.

At the same time, the modulated 455kHz signal from the secondary winding of T3 is fed to pin 7 of the 6N8 and the resulting demodulated signal appears at the secondary of T3 across filter capacitor C23. Further filtering is provided by T6 and C19.

The radio/phono pickup selector switch SW1 feeds the demodulated (mono) signal from the tuner (or the stereo signals from the ceramic cartridge) to the 2-channel audio amplifier. In the latter mode, the 90V supply the screens to the 6BE6 and 6N8 is disconnected to prevent radio station break-through when listening to records.

The separate signals from the selector switch to the amplifier channels are fed via 470kΩ resistors (R5 & R8) to the balance control potentiometer R7 and then to the separate volume controls.

Stereo amplifier

The 2-channel audio amplifier consists of a 12AX7 high gain twin triode feeding into two 6AQ5 pentode output valves. This well-tried combination was ultimately replaced in later radios by the 6GW8 triode pentode valve.

When playing records, the speaker in the lid became the right-hand channel while the speaker in the front of the cabinet became the left-hand channel.

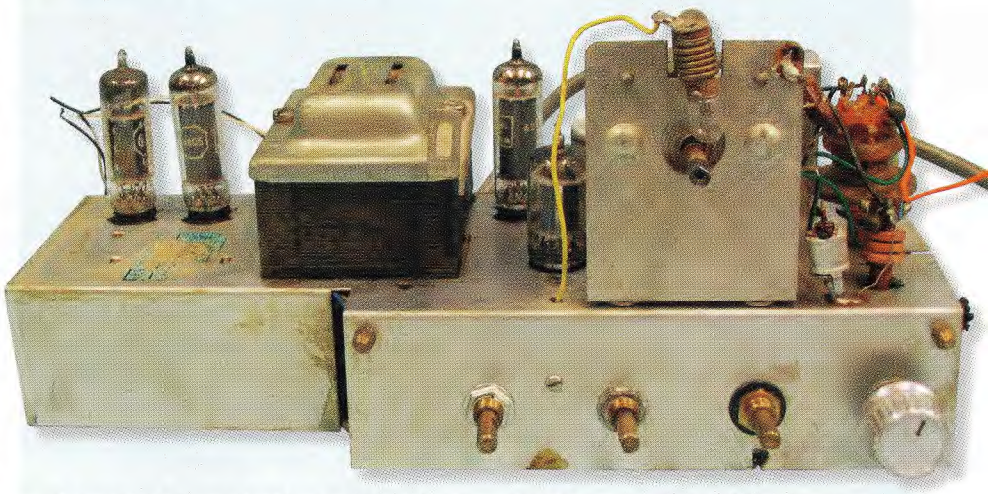
In each channel, negative feedback from the secondary winding of the output transformer was applied via C37 (C38), R29 (R30) and R15 (R17) to the bottom leg of the 1MΩ volume control (RM11A/B). The feedback signal is also applied to the tone control network involving 500kΩ dual-gang potentiometer R20A (R20B), via R21 (R22).

The resulting tone control gives variable treble boost or cut and this must be one of the first instances of a Baxandall tone control stage in valve consumer equipment. Prior to this, tone controls in valve amplifiers tended to be passive networks.

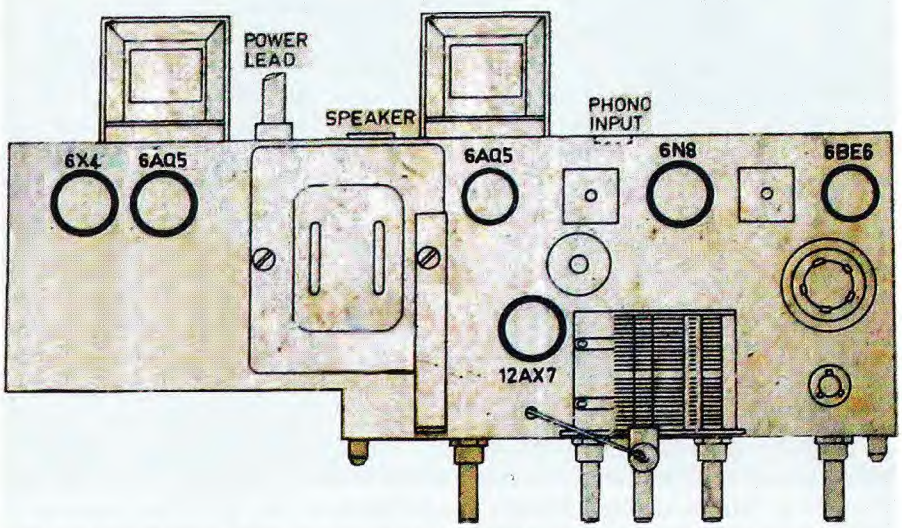
Note that the DPST mains switch is integral to the stereo tone control potentiometer, not the volume control.

Interestingly, the primary winding

The chassis is crammed into the front of the case and the two audio out transformers hang off the rear. The orange wire is the aerial loop.



This view shows the front of the chassis which has a cutout section on the left to accommodate the front-mounted speaker.



The chassis layout is on a paper label on the base of the cabinet. Note the pilot lamp which provides illumination behind the circular dial.

This metal plate carries the isolating capacitors for the external aerial and the RCA socket for the lid-mounted loudspeaker.

of the power transformer has a tap to cater for mains voltages of 200-230VAC or 230-260VAC. That voltage range is appropriate today since domestic solar panels commonly now boost the mains voltage in some areas to well over 250VAC.

The chassis of the unit has been crammed into the front of the case as can be seen on the previous page. The orange wire used for the loop antenna can be seen connected to the aerial coil in the photograph showing the front of the chassis (right hand side in the photograph).

The end of the loop antenna terminates at the back of the cabinet in a trio of connections for aerial, earth and the left-hand speaker.

The photograph above of the back panel plate shows C1 and C2, both low voltage ceramic 4.7nF disc capacitors, which couple signals to the external aerial and earth. Adjacent to the aerial and earth is the RCA socket for the left-hand speaker, which is mounted in the removable lid.

The RCA socket was loose and making poor earth contact so it was anchored with solder. The internal socket sheath that makes contact with the central RCA pin had expanded and was making unreliable contact.

Fortunately, it was possible to use a small precision screwdriver to close up the socket sheath and restore reliable connection. The rear panel also has R32 (220Ω) that acts as a dummy load if the extension speaker is not plugged in.

Restoration

At the time this unit was purchased through eBay, the author was time-poor. One aspect of the transaction that did not take much time was the collection of the unit.

Against the odds the seller worked in the building opposite the author's. Sometimes the stories that go with acquiring a vintage radio make the radio far more interesting.

There was no great story to be told when I collected this one. At home the unit performed feebly but at least showed that it could work. The high tension was measured at 62V so even achieving feeble operation was remarkable. It stayed on a shelf for ten years, always niggling at me ever so slightly.

Then the Historical Radio Society of Australia (HRSA) published a series of eight circuit books, including the AWA model B13 in book number four. The books are of valve radio circuits, all edited by Philip Leahy (see www.hrsa.asn.au/books/index.htm). They are only for purchase by HRSA members, but annual membership is a modest $40 and includes four editions of the HRSA journal Radio Waves.

Collectively the HRSA circuits extend well beyond the scope and time covered by the Australian Official Radio Service Manuals, covering from 1935 to 1955.

With a circuit in hand, and no longer so time-challenged, the time came to restore this unit. Removing the chassis is straightforward but tedious due to the large number of screws involved. The skinny chassis with a slightly flared front section and output transformers on the rear is unstable in any position except upright.

Working conveniently underneath the chassis necessitated some sort of stable support, so fabricating a jig was the first task. A tripod arrangement, as shown above, worked well.

The high tension was 62V, just as measured a decade before and the power consumption was low at 23W. The first thought was that a paper capacitor decoupling high tension to valve plates or screens had become leaky and was dragging the voltage down.

None of the relevant capacitors were getting warm but that can be misleading when only 62V (or less) is involved. The decoupling capacitors were replaced with the result being absolutely no difference.

The first HT filter electrolytic was getting slightly warm, but hindsight suggested that this was because of proximity to resistors that were warm. Replacement of the suspicious electrolytic did nothing.

Looking intently below the chassis can obscure problems that reside above the chassis. Taking a peek above chassis showed that the 6X4 rectifier had been "cooked" with a brown stain on the inside of the envelope; a characteristic of valves that have been overloaded and dissipated intense heat.

A replacement 6X4 brought about a dramatic improvement. The high tension rose to 180V DC (it should be 220-230V) and power consumption rose from 23W to 62W.

The audio output level was still a bit low and the sound was distorted. Measuring the grid bias to the 6AQ5 output valves was the final clue to the core problem that had disabled this set.

The bias was a negligible -0.3V, driving the 6AQ5 valves into high conduction, explaining why the original 6X4 had been destroyed.

Bias resistor R25 had fallen from 120Ω to 70Ω and was replaced. This could not account for all of the degradation of the bias voltage so it was a matter of replacing the usual suspects – the coupling capacitors between the 12AX7 and the 6AQ5s.

In most sets I would have done this routinely but this one has a metal plate installed over the socket of the 12AX7 as a shield against noise signals entering the preamplifier.

Removing the plate allowed access to the tag strip holding the two coupling capacitors. One of the two capacitors was buried and could not be conveniently removed, so a pig-tail was snipped to take it out of circuit.

With both C32 & C33 replaced, the set came to life. Power consumption decreased from 62W to 47W and the 6AQ5 bias measured a reassuring -8.7V, perfect for producing undistorted sound. HT values were spot on to the values given in the AWA circuit. After that, it worked well.

The sound quality is surprisingly rich and satisfying but it is also a bit strange at first because sound from the two channels comes from the front and top of the unit when the lid is down.

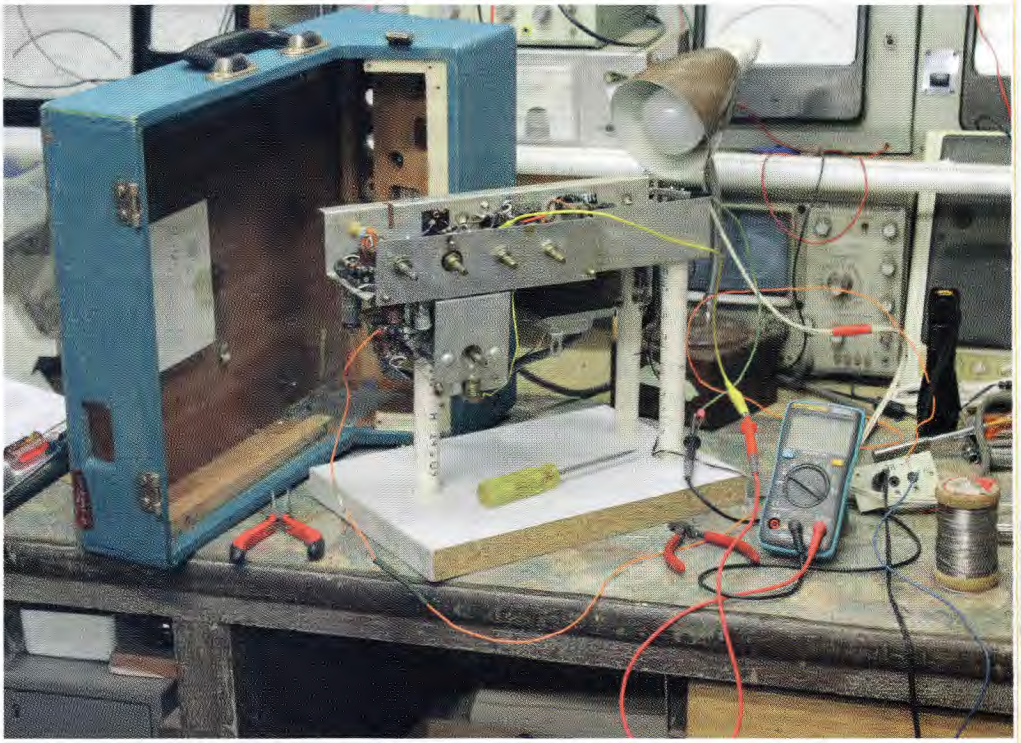
But in practice, that's not how you would listen to this unit because the rear speaker needs to be tilted up to

access and use the turntable. If you played a record with the lid lowered, this would result in howl due to the proximity of the speaker to the turntable.

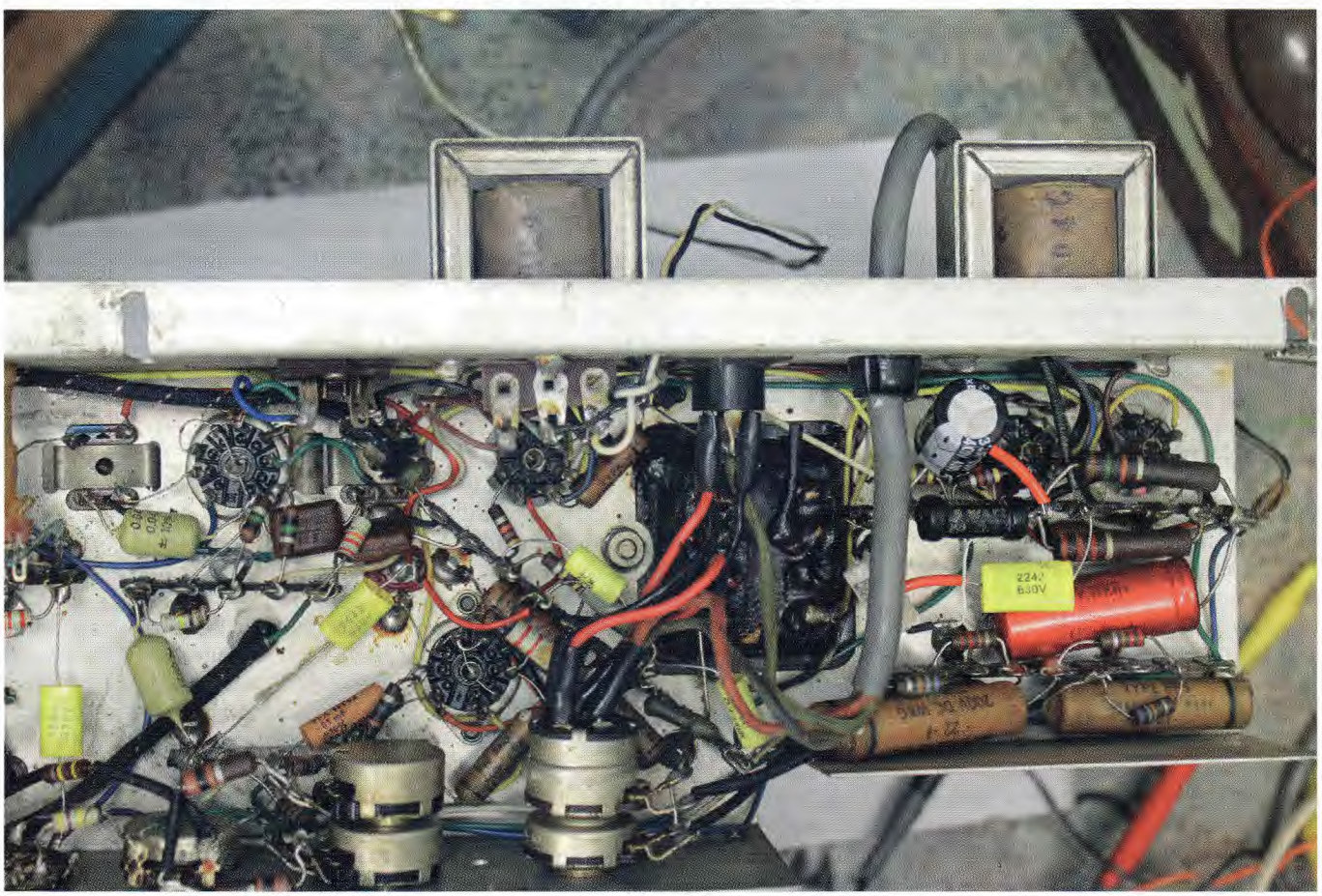
These portable record players proved to be a transitory technology. In 1963, the year this record player was made, Philips introduced the compact cassette tape for dictation machines with no idea that this would become the portable music technology of the immediate future (see the June 2018 article by Ian Batty; siliconchip.com.au/Article/11136).

On the other hand, the large console-style radiogram was superseded by the stereogram, having two loudspeakers in the one cabinet, but these were ultimately superseded by home entertainment centres combining AM/FM stereo tuners plus CD, tape cassette and record players.

And now, all of those have been largely consigned to the rubbish heap of technology by tablets and smartphones. SC



Working on the upturned chassis is tricky without a tripod arrangement to prevent the valves being damaged.



This photo of the chassis after restorations shows that most of the components are reasonably accessible from undearneath the chassis. The repair consisted of replacing the two coupling capacitors (C32/33) and the bias resistor (R25), with the 6X4 rectifier valve replaced on the top of the chassis. Note the DPST mains switch on the rear of the dual ganged tone control potentiometer.