Vintage Radio

By Associate Professor Graham Parslow

Restoring a 1946 HMV Model 456A mantel radio

Above: the fully-restored HMV Model 456A. The cabinet in particular required a lot of work.

Built into an attractive up-market timber cabinet, the HMV 456A is a mid-price large mantel set from 1946. The circuit uses just four valves and covers the AM broadcast band only.

Francis Barraud's painting of the Jack Russell terrier Nipper, titled "His Master's Voice". The image was acquired by the newly-formed Gramophone Company in 1899 and the design was used on its record labels from 1909. Photo: HMV/EMI Archives.

SOME SETS ARE a real challenge to restore and this 1940s HMV 456A mantel set was no exception. The set in my possession was a gift but it brought with it "obligations" that a bargain purchase would not. The radio was passed onto me by Peter, a fellow member of the Mustang Car Owners' Club, who knew that I collected radios.

Basically, Peter has a mate who was going to throw the radio away but Peter saved it, thinking that it was part of our radio heritage and as such, should go to a caring collector. It was transferred between our car boots on a dark night but in the cold light of day, it looked to be more a liability than an asset – not that I wasn't appreciative to have had it given to me.

Unfortunately, this set had had a hard life. The dial glass was missing and timber cabinet was water damaged. The wood veneer was also cracked and had de-laminated in several places, while the righthand end panel of the cabinet was missing.

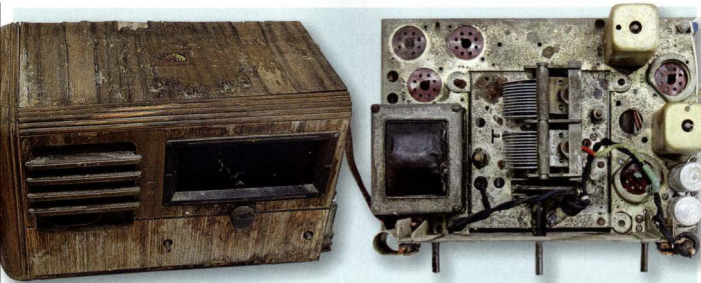
If I had paid a few dollars for it, then it would have gone straight onto my spare parts shelf to be cannibalised. However, because it had been given to me and because it's potentially such a nice set, I felt that I had some moral obligation to fully restore it.

Identifying the set

Confirming the identity of this set was easy because the top of the case and the speaker were both branded HMV and the chassis proclaimed the radio to be a model 456. If the dial glass had been present, it would have been even easier.

Searching through the "Australian Official Radio Service Manuals" locked in the year of manufacture as 1946. This was the year that domestic radio production resumed after ceasing in 1941 for the remainder of WW2.

During the war, HMV was occupied with developing and manufacturing radar. However, despite the many advances made during this time, the components and circuits used for ra-



These photos of the cabinet and the chassis shows the very poor condition of the set prior to restoration. The cabinet had been badly water damaged, the righthand end panel was missing and two of the knobs were also missing.

dios manufactured immediately after the war were little changed from the early 1940s designs. Part of the reason for this was that old stock had been stored and it was prudent to use it.

In the HMV model 456, the valve line-up is quite conventional, as is the electrodynamic speaker with its 1500Ω coil that serves as both an electromagnet and a filter choke for the high-tension rail. In fact, the model 456 circuit is almost identical to the 1939 HMV model 449.

The relatively simple 4-valve configuration made the set more attractive for me to restore because my collection already included the more expensive 5-valve 2-band HMV model 886. The 886 is contemporary with the model 456 and used the same style of timber cabinet which is also a pre-war design. Because my model 886 was in pristine condition, I could see what the model 456 should look like once it had been restored.

The famous HMV logo

His Master's Voice is the title of a painting by Francis Barraud which featured the dog Nipper listening to a cylinder phonograph. The trademark image was later acquired from the artist in 1899 by the newly-formed Gramophone Company (London) and subsequently used for gramophones and records.

In 1931, The Gramophone Company and The Columbia Company merged as Electric and Musical Industries (EMI) and began manufacturing radios. The company made HMV radios in Australia from 1936 at 2-6 Parramatta Road, Homebush, NSW. The 1936 advertisements for HMV proclaimed that the radios were for "discriminating buyers who demand the best".

Circuit details

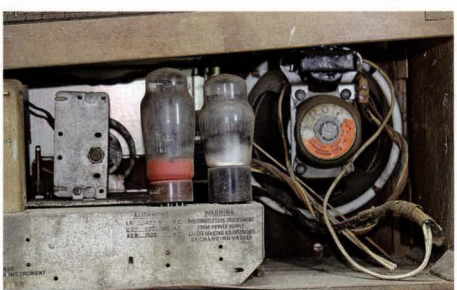
Fig.1 shows the circuit details of the HMV Model 456. It's a conventional 4-valve superheterodyne set with a 6A8G mixer-oscillator, a 6G8G IF amplifier/detector/first-audio stage, an EL33A (or EL3NG) audio output stage and a 5Y3G rectifier.

The set has a 457.5kHz IF stage, a conventional power transformer and an electrodynamic loudspeaker. It also has AGC and this is derived from the second diode in the 6G8G and applied to the first and second stages from the junction of R10 & R11.

Restoration

As with all such restorations, the first step was to remove and clean the chassis. For metal work in fair condition, I use turpentine and a brush to clean away the grime but this one required sterner treatment.

First, the valves were removed and the power transformer covered in plastic to make it waterproof. That done, degreaser was liberally sprayed over the top surfaces which were then brushed. The chassis was then hosed with water to remove the degreaser and



Also taken prior to restoration, this inside view shows the poor condition of the 2-core power lead (it had been joined at some stage in the set's past). The chassis and the valves were also dirty and the speaker cone had been punctured.

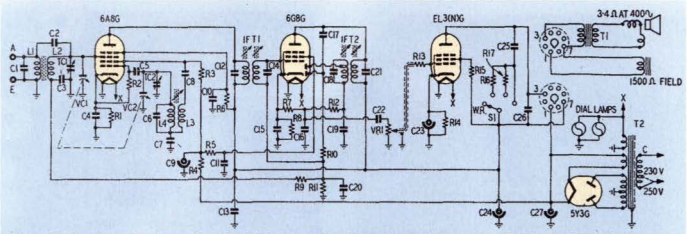


Fig.1: the circuit uses just four valves in a fairly conventional superhet arrangement, with AGC applied to the first two stages. The valve line-up includes a 6A8G mixer/oscillator, a 6G8G IF amplifier/detector/first audio stage, an EL33A/EL3NG audio output stage and a 5Y3G rectifier.

then blasted with compressed air to evaporate all visible remaining water.

I have learnt the hard way not to power a set up immediately after this sort of treatment, so the set was left for several days to completely dry. The electrolytics showed no signs of leakage so I didn't bother replacing them.

With the valves still out of circuit, I next connected my bench HT supply to the cathode pin of the 5Y3G rectifier. By the time I ramped up to 100V, the set was drawing 15mA, a clear sign that the electrolytics needed to reform. As a result, I backed off to give 10mA and then slowly increased the voltage in small steps to ensure that the current never exceeded 10mA.

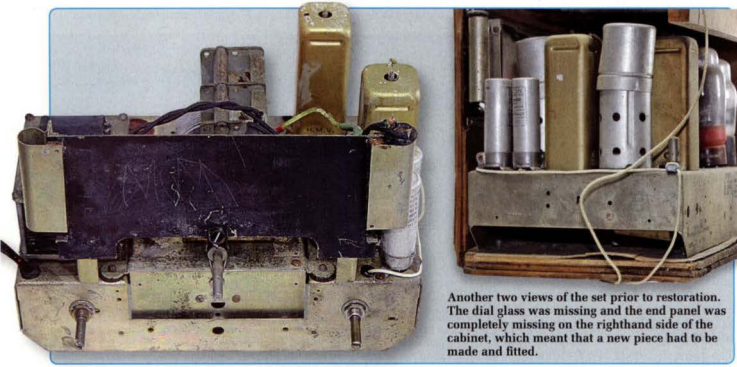
After about three hours, the 450V electrolytics were happy to accept 330V at 2mA. The working radio subsequently settled at a HT of 340V, so I was not too far off by stopping at 330V.

My next step was to replace the dodgy 2-core power lead with a modern 3-core lead, so that the chassis could be earthed.

Before reinstalling the valves, I did a high-voltage leakage test on the power transformer to ensure it had survived the chassis-washing process. It proved to be OK, so I then checked the two dial lights. These both had darkened glass envelopes, a classic symptom produced by the tungsten filaments slowly evaporating with long service. Both dial lamps proved to be open circuit, a logical consequence of the filaments evaporating. As a result, the old globes were discarded and two new 6.3V 300mA (2W) globes installed.

Next came the anxious moment of first switch-on. I was expecting to see two brightly-lit dial lamps and about 5-6W showing on my power meter but that didn't happen. Instead, both lamps were off and the power meter was only showing 1W. At least this indicated that the power transformer had no shorted turns.

The problem with the dial lamps was easily diagnosed. The connecting lugs in the bases were insulated by an



Another two views of the set prior to restoration. The dial glass was missing and the end panel was completely missing on the righthand side of the cabinet, which meant that a new piece had to be made and fitted.

oxide layer that prevented good contact with the globe terminals. Cleaning them fixed that particular problem

At this stage, everything was looking good. The power transformer was obviously OK and the electrolytics were accepting the applied HT without any signs of stress or undue leakage. As a result, the four octal valves and the speaker were plugged in and the set optimistically switched on.

The power consumption rose to a reasonable 44W but my optimism was misplaced because the only noise that came from the set was due to arcing inside the EL33A pentode valve. This was attended by a fine visual display of purple plasma in the envelope.

A classic symptom of a gassy tube is oxidation of the silvery magnesium "getter" that's deposited inside the envelope to absorb residual gas. However, this EL33A was externally painted in red near its base, so there was no visible clue.

It's interesting to note that some gassy tubes can still be functional (see **www.thetubestore.com/Blue-Glow**). I specifically recall a PA amplifier at my local townhall in the 1950s that remained working while the output valve glowed purple.

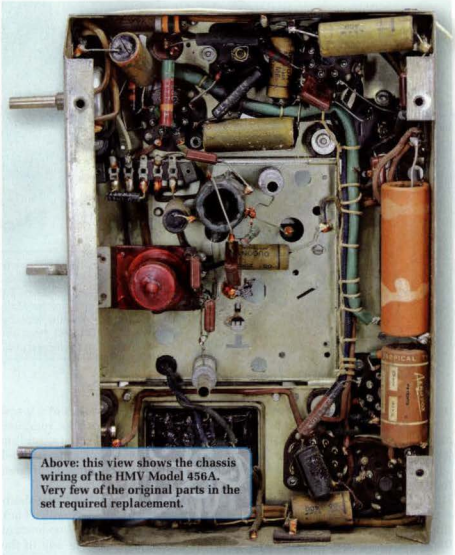
In this case, the old HMV's EL33A was headed for the bin of bad valves. With the EL33A removed, a signal tracer was connected to the slider of the volume pot and the radio switched on again. Result – nothing, absolutely nothing! There was no hiss or any hint of even the faintest reception. The power consumption was 28W, an aerial was in place and no components were overheating or showing any other signs of failure.

Troubleshooting the problem

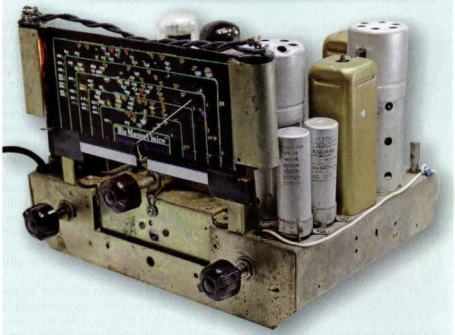
Feeling somewhat disillusioned by this, I decided that the front-end fault just wasn't worth my time and so I left it, not intending to come back to it. However, after several weeks, it got the better of me and I decided to see if I could solve it.

Because the circuit is relatively simple, every component was tested and everything checked out fine. Admittedly, some of the resistors had gone high by up to 20% but this should not have resulted in a complete loss of function.

With no obvious faults present, I powered the set up again but as expected, it still didn't work. It was then left



Above: this view shows the chassis wiring of the HMV Model 456A. Very few of the original parts in the set required replacement.



A new dial-scale was made by photographing the dial-scale of another HMV set, then printing it out (after processing) and attaching it to the backplate.

The partially-restored chassis is shown at left, complete with its electromagnetic loudspeaker. The view at right shows the fully-restored chassis inside the cabinet, with the replacement audio output valve (a 6F6) fitted and a replacement speaker transformer.

on while I prodded each component in turn with an insulated rod to see if an audible crackle might reveal a dry joint or some other intermittent fault.

This drew a blank so I then decided to try wriggling the valves. As soon as I nudged the 6A8 mixer-oscillator, the set produced some hiss and a faint station could be heard through the signal tracer. I then adjusted the tuning gang over its full travel and the radio tuned in stations over almost the complete broadcast band. Judiciously bending one plate in the tuning gang restored its clearance and the set then covered the full MW range.

Unfortunately, the "cure" was short-lived because the radio soon fell back into complete silence and no amount of wriggling the 6AE8 or any of the other valves would restore normal operation.

Hours of frustration then followed with the set occasionally springing to life but mostly failing to function. As a result, I began progressively replacing likely suspect components, including the 6A8, in an attempt to identify what seemed to be an intermittent. Even the electrolytic filter capacitors were replaced, despite the fact that they had been successfully reformed and appeared to be functioning normally.

In the end, the problem was solved by methodically measuring the voltages on the pins of the 6A8 mixer-oscillator. These measurements revealed that 113V was present on pin 4 when the set was functioning but only 10V when it wasn't.

Pin 4 is the screen adjacent to the 6A8's anode and the two components attached to it (C10 and R6) had been replaced without fixing the problem. In addition, the valve socket and the 6A8's pins had been cleaned and the valve inserted and removed a number of times to clean the contacts. But it hadn't been enough – pin 4 of the socket required extra attention to ensure a reliable contact.

And that was it – the radio then functioned reliably. I didn't have an EL33A output pentode in my valve drawer, so a 6F6 with comparable specifications was substituted. Unfortunately, the radio only worked for a few minutes with the replacement pentode in place before again going completely silent.

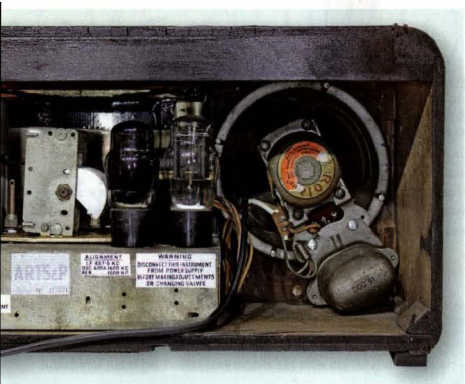
A few quick voltage checks revealed that there was no HT on the pentode's plate, indicating an open-circuit speaker transformer. This was subsequently confirmed by a resistance measurement and a replacement transformer restored operation.

Making a new end-panel and other repairs to the cabinet were a time-consuming part of the restoration.

Restoring the cabinet

The old HMV 456 had lost both its dial glass and the pointer. A new pointer was made from white solid-core hook-up wire, so that problem was easy to solve.

The original dial was on the back of the glass, so that it sat in front of the pointer. Not having a replacement dial-glass, I decided that a printed dial-scale attached to the backplate would look reasonably authentic. This dial-scale was created by first photographing my model 886's dial and then modifying the image using



Arcing inside the EL33A pentode valve was accompanied by a fine visual display of purple plasma in the envelope, indicating that it had gone "gassy". The valve was replaced with a 6F6 which is a close equivalent.

photographic editing software (I use a freeware program called "The GIMP").

The editing involved extending the base-lines of the dial image and modifications to the contrast and brightness to turn a clear dial-scale into one with a black background. A sheet of clear glass was later fitted to the set in place of the original dial-glass.

The timber case was perhaps the most demanding part of the restoration because of its poor starting condition. The biggest job was making and fitting a new end piece. The remains of the original finish on the cabinet were then removed using paint stripper, after which it was sanded back and the veneer restored. It was then given the paint and polyurethane treatment so that it looked almost new.

A large hole in the original speaker grille cloth meant that this too had to be replaced. Whatever had penetrated this cloth had also punched a hole in the speaker cone which sits immediately behind it. This damage was repaired by cutting a patch from the cone of a non-functioning speaker and attaching it using PVA glue.

As shown in the lead photo, this all worked out quite well and the completed set looks quite authentic. The end product in now a worthy part of our radio heritage. **SC**