By RODNEY CHAMPNESS, VK3UG

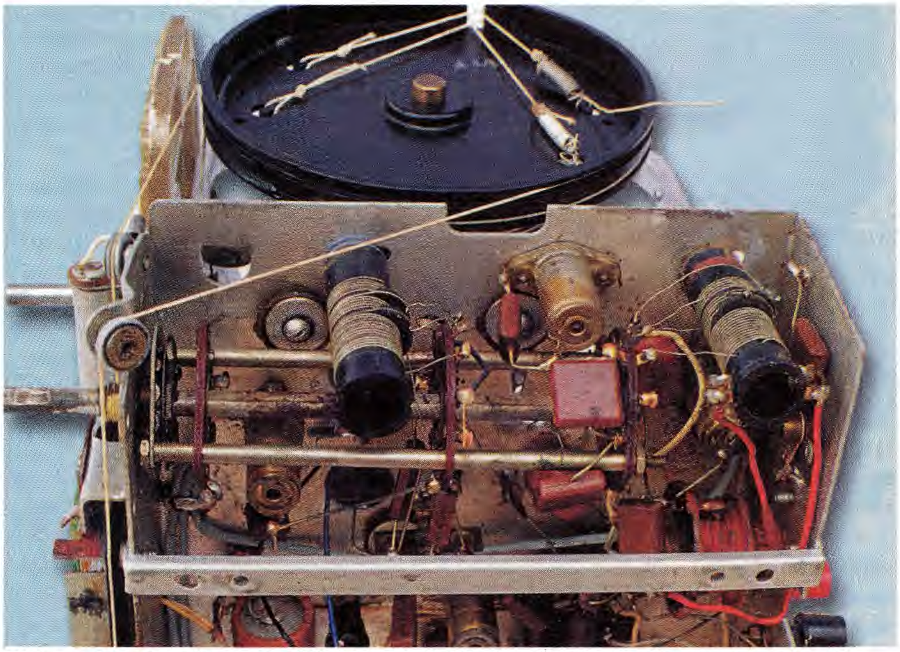
The HMV 42-71 migrant special

Dual-wave radios were popular in Australia in the years following World War 2 but many of them were poor performers on the shortwave bands. However, there were quite a few exceptions, including the HMV 42-71.

When World War 2 came to an end, many thousands of people in Europe migrated to Australia. And naturally, many of them were quite homesick for news from their home country.

During that era, many dual-wave radios were bought by Australians and by a large number of "New Australians", as they were called at that time. However, the majority of these dual-wave radios just couldn't cut the mustard when serious shortwave listening was contemplated and listeners were usually very disappointed.

So where did those radios fall down in their performance? There were several factors at work here. First, their tuning was ultra-critical, particularly up around the 17MHz end of the band, where simply touching the tuning control was usually enough to cause the receiver to tune off the station. The fact that shortwave stations are spaced at 5kHz intervals, compared to 10kHz for broadcast stations, didn't help matters either.



This under-chassis view of the HMV 42-71 clearly shows the shortwave coils (wound with tinned copper wire), together with the band-change switch.

The sets were insensitive too, with a sensitivity figure of about 30μV for a 5-valve AC receiver being common. Dual-wave 4-valve AC sets were even less sensitive. In fact, it was almost a complete waste of time fitting shortwave to these sets!

So why were shortwave bands fitted to these sets when their performance was questionable? I don't know for sure but I suspect that it was a selling point to have shortwave so that you could listen to the BBC in London or other stations in Europe, or the shortwave service for inland Australia.

It sounded exciting at the time but the excitement soon waned when the deficiencies of the receiver became painfully obvious. It really was an expensive gimmick.

However, radio manufacturers eventually realised that a considerable number of listeners really did want to listen to shortwave. They also wanted to be able to tune each station easily and they wanted receivers with greater sensitivity.

There were several ways that the problems could be addressed and we'll take a look at some of the methods employed.

Performance tweaks

AWA's 7-band, 6-valve receivers (see May 2001 and March & April 2002 issues) achieved an easy tuning rate on shortwave by having six shortwave bands to cover from 1.6-22.3MHz, with a maximum of 6MHz tuned in any one band. Tuning did have to be precise with these sets but it was still far superior to the tuning on sets that tuned 6-18MHz in one sweep.

The sensitivity of these AWA sets was very good too thanks to the inclusion of a tuned radio frequency (RF) stage. This improved the reception markedly compared to sets without an RF stage.

Most people weren't particularly interested in listening to frequencies outside the international broadcasting bands. Bands which had shipping, bushfire brigades, radio amateurs, weather forecasts, etc were of no real interest to these people.

A number of manufacturers decided that they would provide bandspread tuning on a selected number of the international shortwave bands. In fact, some sets were designed to tune just one band per switch position.

In practice, there are 12 international bands, ranging from the 120-metre band covering 2.3-2.5MHz to the 11-metre band covering 25.6-26.1MHz. However, the frequency range tuned in each band has varied over time with international agreements, so the frequencies quoted above may not now be 100% correct.

The most common bands tuned were the 49, 41, 31, 25, 19 and 16-metre bands, although not all of these were included in post-war multi-band receivers.

Some receivers tuned two international bands per switch position and the HMV 42-71 described here (and its rebadged stable-mate the Kelvinator 42-K) did just this. Its tuning ranges on shortwave are 5.9-7.5MHz (which includes the 49 and 41-metre bands), 9.4-12.1MHz (which includes the 31 and 25 metre bands), and 14.2-18.4MHz (which includes the 19 and 16-metre bands). Its dial drive is not as smooth as on the AWA "7-banders" but it tunes slightly smaller band segments so tuning is not a hassle.

RF stage

Most of the receivers built to provide good reception of international broadcasting stations included an RF stage to boost sensitivity. However, it appears that HMV were looking to cut costs and so they settled on a receiver with a 6AN7 converter and no RF stage.

The 6AN7 is a quiet converter compared to the noisy 6BE6, so front-end noise was not a problem. In addition, the audio amplifier has more gain than normal and this was achieved by using a 6N8 pentode instead of the more commonly used triode as the first amplifier.

As a result, HMV was able to produce a receiver that could do a credible job at a reasonable price. Let's take a closer look at this unit.

The HMV featured three shortwave bands (plus the usual broadcast band) and was housed in a large bakelite case. The case was cleaned using automotive cut and polish and now looks almost new again.

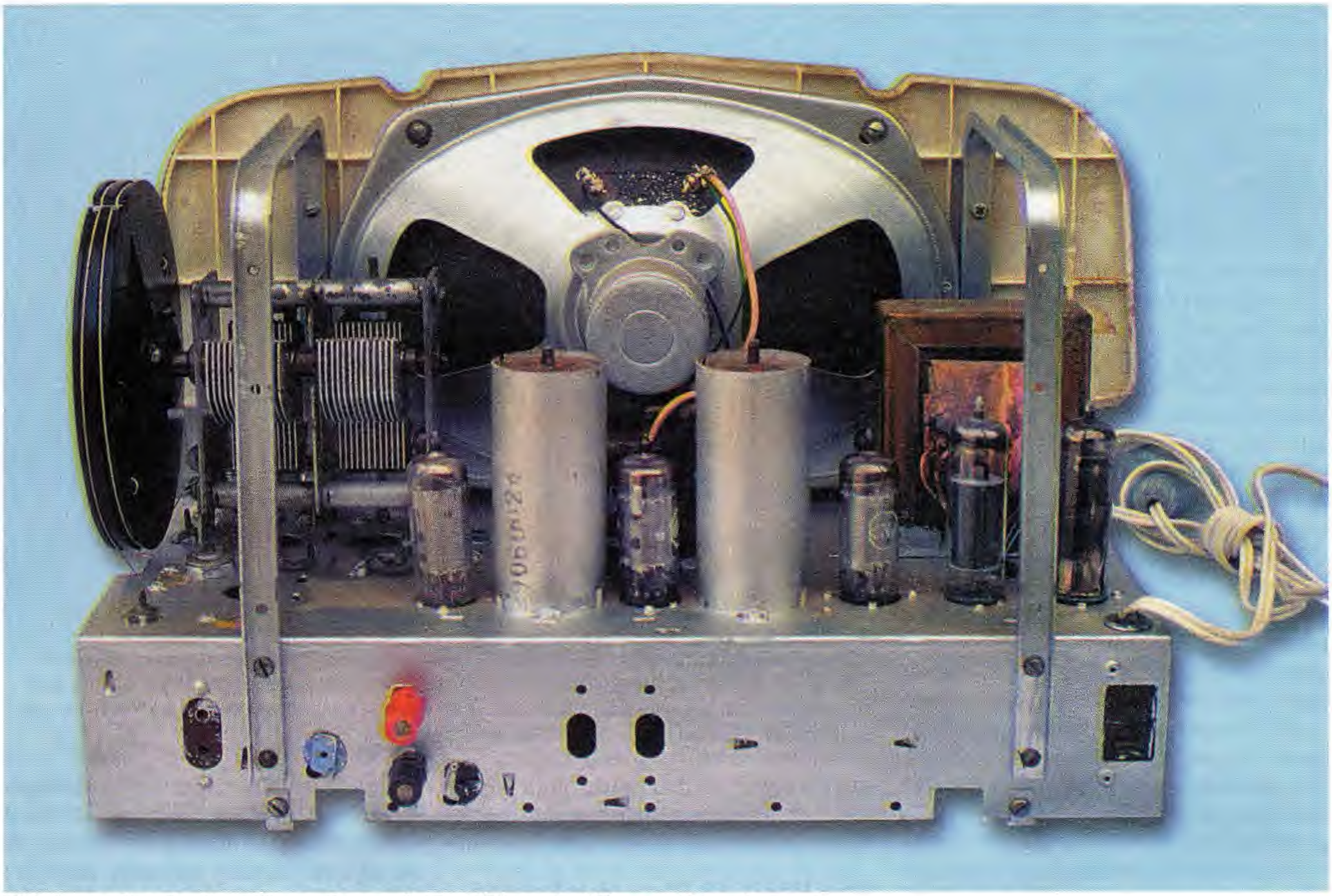
The HMV 42-71 mantel radio

The HMV 42-71 came onto the market in 1954 to serve the needs of Australia's ever increasing migrant population. It sported the broadcast band and three bandspread shortwave bands, plus an input for a record player.

Basically, it was aimed at the lower end of the market for those people seriously interested in listening to international broadcasts. However, that does not mean that it is a poor performing receiver – quite the opposite, in fact.

Fig.1 shows the circuit details of the receiver. The input circuit is similar to many other HMV multi-band sets, with the shortwave antenna/aerial coil primary in series with the broadcast band coil primary. There is an IF trap (L1, C1) between antenna and earth.

The shortwave coils are tapped to suit the band being tuned. Note that in order to achieve bandspread tuning, several capacitors (C5, C6, C7 and TC2) are switched in series and parallel with each tuned circuit. The oscillator tuned circuits also use similar parallel and series combinations of capacitors to achieve band-spreading. The 6AN7 "frequency changer" converts the incoming signal down to 455kHz – ie, to the intermediate frequency (IF).



This rear chassis view shows the uncluttered layout of the receiver. Access to the valves and to other parts on the top of the chassis is quite easy. Note the large U-shaped brackets at either end of the chassis – these make servicing easy, since they support the chassis whem it is turned upside down.

Next in line is a 6N8 and this acts as a neutralised intermediate frequency (IF) stage at 455kHz. Delayed automatic gain control (AGC) is developed from the signal at the plate of the IF valve and is applied to both the IF and converter stages. After detection, the signal then goes through a switched tone control to the grid of a 6N8 audio valve.

When set to the "Bass and Top Cut" position, the tone control modifies the audio so that speech passes through normally, while music signals will be devoid of highs and lows. Other positions give normal wide-range audio and audio with varying degrees of tone top cut. This helped listeners get the best out of the receiver in difficult listening environments.

As mentioned before, the 6N8 audio stage has higher amplification than the usual triode audio stage. Its output is fed to a 6M5 power amplifier stage. Feedback is achieved via the voice coil to C33, the 6N8 screen bypass capacitor.

The audio output transformer (T2) is larger than usual and the speaker is a substantial 6 x 9-inch unit, so the audio quality is much better than from the average mantel receiver. However, this set would need a rather large mantelpiece as it is far from small. That said, the lack of miniaturisation has helped to give the set an air of quality and performance.

The power supply is conventional and uses a 6V4 rectifier which has higher ratings than the commonly used 6X4. Back bias is used to delay the AGC and to provide a fixed initial bias on the converter and IF valves. The 6M5 also receives back bias, while the 6N8 audio stage has its cathode biased via R16.

Note that because the cathode of the 6N8 has no bypass capacitor, there is negative feedback which improves the audio quality and stability of the audio stages.

Restoring the cabinet

My HMV 42-71 radio receiver was offered to me in a very bedraggled state several years ago. At the time, it looked interesting, was fairly large and had several bandspread shortwave bands. And it certainly looked like it could do with a good home. It was covered in dust, the cabinet was dull, the knobs were missing and the inside was covered in a thick layer of white dust from the feed in the cowshed in which it had been sitting for many years!

What a place to have such a set – it must have been used to serenade the cows while they were being milked! Mice hadn't done much damage but someone (presumably a rat) had soldered metal extensions (in the form of bronze welding rod) to the control shafts to make it possible to operate the set without its knobs. So it wasn't in very good condition when I acquired it.

Naturally, I had to remove the bronze welding rod "controls" before I could extract the set from its case. It was also obvious that the original back had been broken as a quite different back had been fitted, although the screw holes all lined up OK. It was obviously another HMV cabinet back but not the one specifically designed for this receiver.

The back was easily removed by undoing four screws, after which the set was placed face-down on a blanket so that the four screws holding the chassis to the case could be removed. However, when I tried to extract the chassis, something seemed to be holding it in place. A closer inspection revealed that there were two screws and clamps that held the edge of the speaker baffle in place. These were loosened, the clamps moved to one side and then the chassis slid out of the cabinet quite easily.

That done, I gave the cabinet a good bath in the laundry tub, using dishwashing detergent and a small scrubbing brush. It was soon clean. I then gave it a good workout using automotive cut and polish and it came up looking almost like new (for more on restoring bakelite cabinets, see my article on this subject in the July 2001 issue of SILICON CHIP).

Unfortunately, I didn't know exactly what the original knobs looked like so I used some that I had which appeared to suit the set.

The speaker grille was a light coloured plastic perforated panel attached to the speaker and chassis. It looked disgusting, being covered with grime from its time in the cowshed. I cleaned it in the same way as the cabinet but because there are so many nooks and crannies in its construction, I couldn't get it thoroughly clean.

In the end, I decided to remove it from the set and give it a couple of coats of gold-coloured enamel spray paint. This went on well and it looked a million dollars compared to its original state.

Before doing this, however, I removed the HMV emblem and polished it with the auto cut and polish and it now looks first class. Finally, with the cabinet and speaker grille looking so good, it was time to attack the chassis and the electronic circuitry.

Restoring the chassis

First, the valves were removed and the chassis was cleaned with a brush. Alternatively, if you have an air compressor, it can be blown clean. However, if using an air compressor, be careful not to damage the tuning gang vanes or get "muck" stuck between the vanes.

Having got the loose muck off, it

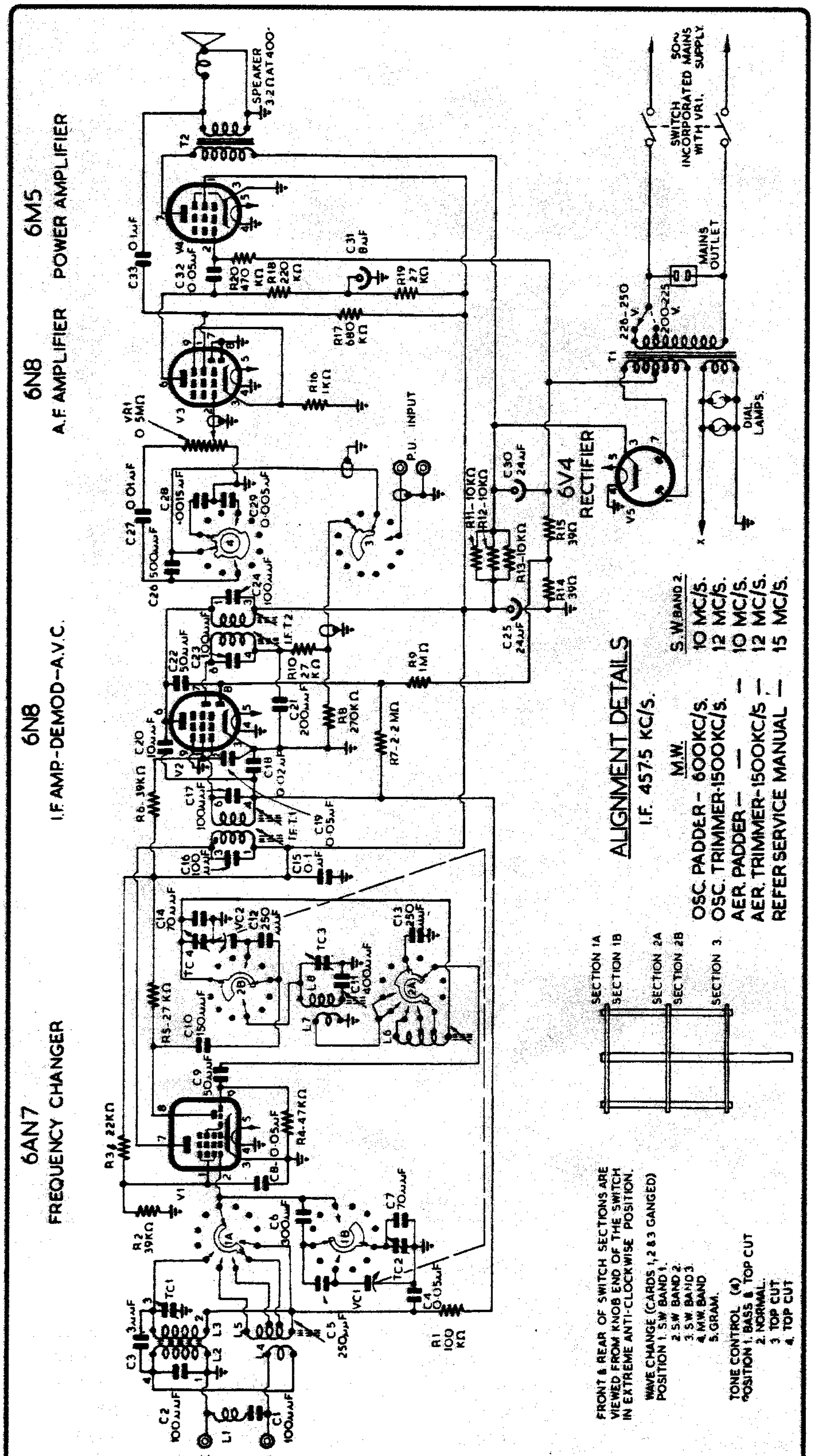
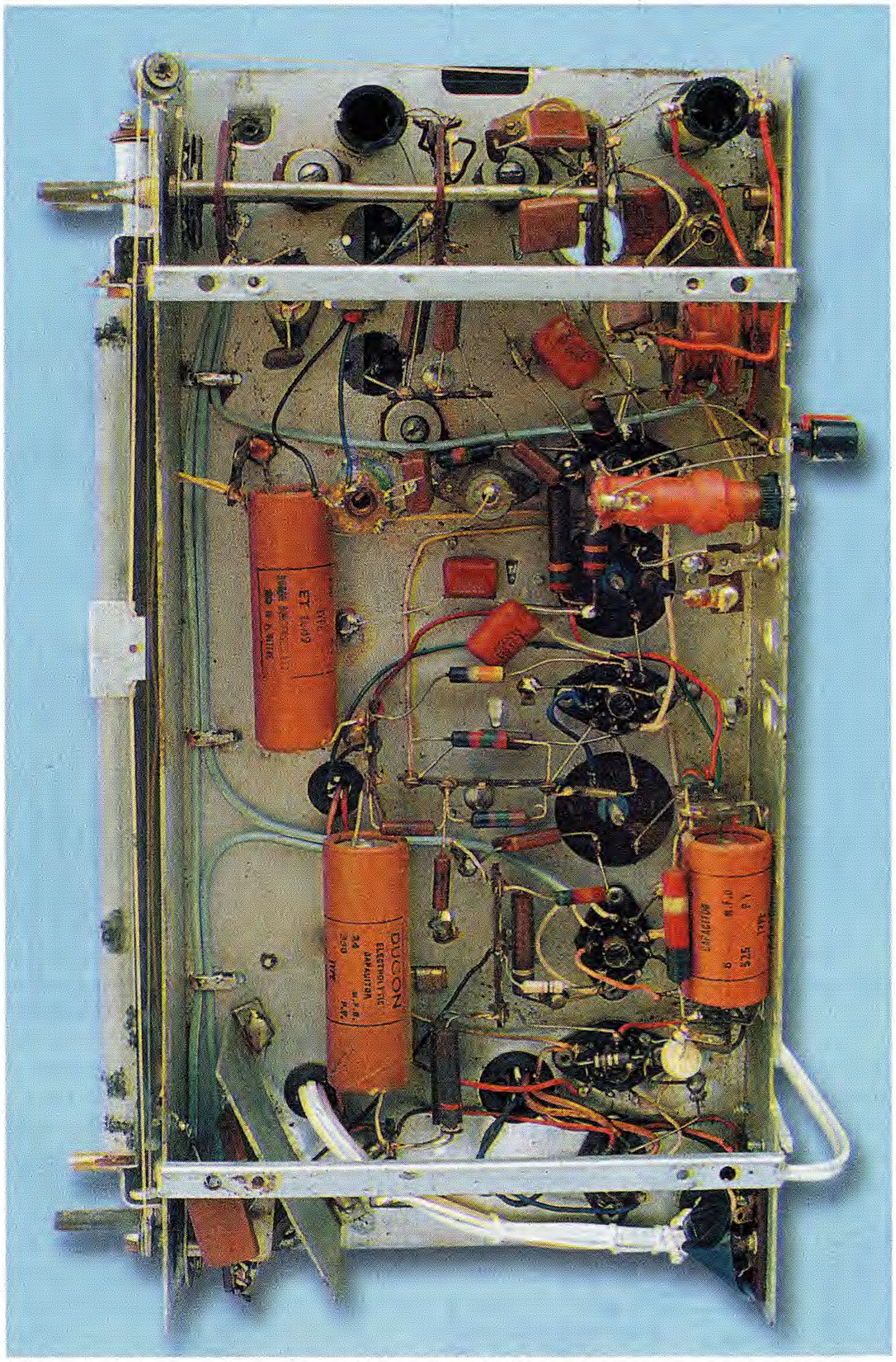


Fig.1: the HMV 42-71 is a fairly conventional 5-valve dual-wave receiver. There's no RF stage but the 6N8 audio stage has higher amplification than the usual triode audio stage.

was time to scrub the chassis as best I could. I used the end of a file to scrape the thickest debris off the chassis, then used a kerosene-soaked kitchen scouring pad to work on the rest of the muck. It was a long job and even when



The under-chassis wiring is uncluttered and all parts are easy to access, even around the band-change switch at top.

the chassis was clean it was not in a pristine condition. There were patches of discoloration where rodent urine had eaten through the plating.

I was in a quandary about whether I should leave the chassis as it was – clean but not pristine in looks – or paint it. This was one of my early restorations and I thought I'd have a go at painting the chassis with aluminium roofing paint similar in colour to the original chassis colour.

Painting a chassis is OK if you really know how to paint well. My attempt is passable but with more experience and care I'm sure that the chassis would look better than it does. As time goes by, we all learn to achieve a higher standard of restoration.

Restoring the circuitry

During the 1950s era, HMV had the helpful habit of enclosing the chassis top in a frame, which meant that the chassis could be turned upside down for service without any likelihood of damage to the valves or other components.

Before I try out any new (to me) radio, I always overhaul the electronic circuitry and test it out of its cabinet. That way, I rarely get unpleasant and expensive surprises. The capacitors, transformers and resistors can all be tested with the set turned off and if shown to be faulty, can be replaced or repaired before any damage is done to other sections of the receiver.

Note that the paper capacitors must be tested with a high-voltage tester. If you don't have a high-voltage tester, the audio coupling capacitor (C27) between the 6N8 and the 6M5 valves should be replaced as a matter or course, along with all the AGC bypass capacitors (C4, C18).

Reforming the electros

My next step is to remove all valves except for the rectifier and check that there are no shorts between the HT line and the chassis. I then turn the set on and wait for about 30 seconds while the voltage from the rectifier rises to its peak. I then turn the set off again and monitor this voltage – it should slowly decrease. If it drops very quickly, it is probable that the main electrolytic filter capacitors need reforming.

My method of reforming electrolytic capacitors may be considered a bit brutal by some but with care, it is quite safe. The method is quite simple – after about a minute, when the voltage has vanished, switch the set on again, wait for the voltage to rise to a peak again and then switch off again. Do this several times and if the electrolytics are reforming correctly, you will find that the peak voltage increases and that the voltage disappears more slowly at switch off.

Note that while this method does overload the rectifier for a short period, it doesn't have the full set load to cater for.

If the plates of the rectifier glow red, you have a serious short between the HT line and the chassis and the set should be turned off immediately. You may have a component breaking down under load and the most likely culprit will be an electrolytic capacitor.

If there is no improvement, switch off, unplug the set from the mains socket and check the electrolytic and paper bypass capacitors for warmth (warning: make sure that the electro-

Photo Gallery: AWA Radiola 52G Dual-Wave Receiver

Housed in an attractive Bakelite "Tombstone" style cabinet, the Radiola 52G was manufactured by AWA in 1939. The set covers both medium and shortwave bands, with separate sections of the large glass dial being illuminated according to the band selected.

The valve line-up was as follows: 6A8-G frequency changer; 6U7-G IF amplifier; 6G8-G 1st audio/detector/AGC amplifier; 6F6-G audio output; and 5Y3-G rectifier. (Photo: Historical Radio Society of Australia, Inc).

lytic capacitors have been discharged before doing this). In this case, warmth equals faulty, so replace any capacitors that do get warm. Remember that some sets have a bleeder resistor across the power supply, so the voltage may still disappear reasonably quickly.

With all the valves out of the set (except the rectifier), the HT voltages on various stages can be checked within a minute. They should all read the same as long as there isn't a tapped bleeder resistor network across the power supply. In some receiver models, the screens of the RF and IF valves are fed through such a network.

I did all the above and replaced seven paper capacitors with much later polyester types. I also replaced the cathode resistor for the 6N8 audio stage. All other components including the electrolytic capacitors tested OK. The shielded wiring had perished, so it was all replaced to prevent shorts on the audio line in the future.

It was now time to try the set out with all the valves reinstalled. Initially, the performance was rather poor for such a high-performance set and the 6N8 IF amplifier was found to be slacking on the job and so it was replaced. In addition, the wave-change switch had suffered from the presence of the rodents and some bands weren't working. Its contacts were sprayed with contact-cleaning fluid and then operated many times to clean the sliding contacts.

Aligning the HMV 42-71

It was now time to align the set. However, as with all multiband receivers, this isn't quite as easy to do as on a broadcast-band only set.

First, the gang is fully closed and the dial pointer is aligned with the far edge of the clear glass (good one Mr HMV – a lot of other manufacturers don't tell you where the dial pointer should be with the gang closed). Aligning of the IF amplifier stages and the broadcast band is quite straightforward and my articles on alignment in December 2002 and January and February 2003 will assist you with this part of the job. The location of the various alignment points and the dial-drive layout were shown in an accompanying diagram supplied with the main circuit.

The shortwave alignment is a little different as the three shortwave bands all use a common coil for the antenna circuit, plus a common coil for the oscillator circuit. These coils are tapped in order to give the required tuning range for each band.

In practice, you can either connect your antenna/aerial to the receiver or do as HMV advise and use a 400Ω (390Ω will do) resistor in series with the aerial terminal to the signal generator. The signal generator must be tone modulated to carry out the alignment procedure.

First, set the wave-change switch to SW2 and the signal generator to 10MHz. Now tune the receiver to the 10MHz mark on the dial or to a point

This front view shows the assembled receiver after it has been removed from its cabinet. The loudspeaker grille was resprayed with gold-coloured enamel paint to restore its appearance.

where the receiver just responds to the signal close to the 10MHz mark. That done, adjust the shortwave oscillator tuning slug until the 10MHz signal is heard on 10MHz, then adjust the shortwave aerial coil slug for peak performance.

Next, adjust the signal generator to 12MHz and adjust the shortwave oscillator and aerial trimmer capacitors so that the dial pointer corresponds to 12MHz for peak performance. Repeat these adjustments on both 10MHz and 12MHz until correct calibration is achieved at both frequencies.

Now switch to SW1 and tune the signal generator and receiver to 15MHz. The receiver may not tune to the signal generator exactly on the 15MHz point but there is nothing you can do about this. The shortwave antenna circuit is now adjusted for peak performance and this is done by altering the position of the wire connected to the first tap, which is nearest the coil base.

To adjust this, file a small slot in the end of a non-metallic knitting needle and use the needle to adjust the position of the wire for best performance. It's an unusual method of alignment but it works. The wire can be seen near the aerial coil (near the rear of the chassis), as shown in one of the photographs.

Note that there are no adjustments for shortwave band three (SW3), as the manufacturers relied on the manufactured accuracy of the coils and the close-tolerance of the fixed band-spread capacitors.

By the way, if you don't have a signal generator, it's possible to look around for the WWVH time and frequency stations on 10MHz and 15MHz. These stations put out a pulsed tone signal every minute.

And that completes the alignment, although the performance won't be quite optimum and some of the frequency calibrations will be slightly inaccurate. In general, the dial-scale is remarkably accurate, with a maximum error of 120kHz at 18MHz and no more than 50kHz on the other two shortwave bands. By contrast, many dual-wave receivers are 500kHz or so out of calibration on the shortwave bands.

To overcome these relatively slight inaccuracies on shortwave, many people put pencil marks on the dial to mark their favourite stations. However, because of the touchy nature of the tuning on low-cost dual-wave receivers, the user often still could not be 100% sure they were tuned to the sought-after station – even with the pencil marks. This is not a problem with the 42-71, however.

Summary

Although HMV designed this radio for the lower-priced end of the market for serious shortwave listening, it works quite well. The set is quiet when not connected to an antenna and both man-made and natural noise become apparent immediately an antenna is connected. It is sensitive, although it could do with a little more IF amplifier gain (I'm fussy).

The dial calibrations are remarkably accurate, the alignment is quite straightforward and the audio quality is good due to the use of generously-sized components and good design. What's more, it is easy to service and is an attractive set to look at.

The only criticism I have is that although the control functions and positions are shown on the dial-scale, the band change and tone controls have no indications as to what position they are in. That said, the HMV 42-71 is noticeably superior to the average dual-wave 5-valve receiver. I'm more than happy to have it in my collection. **SC**