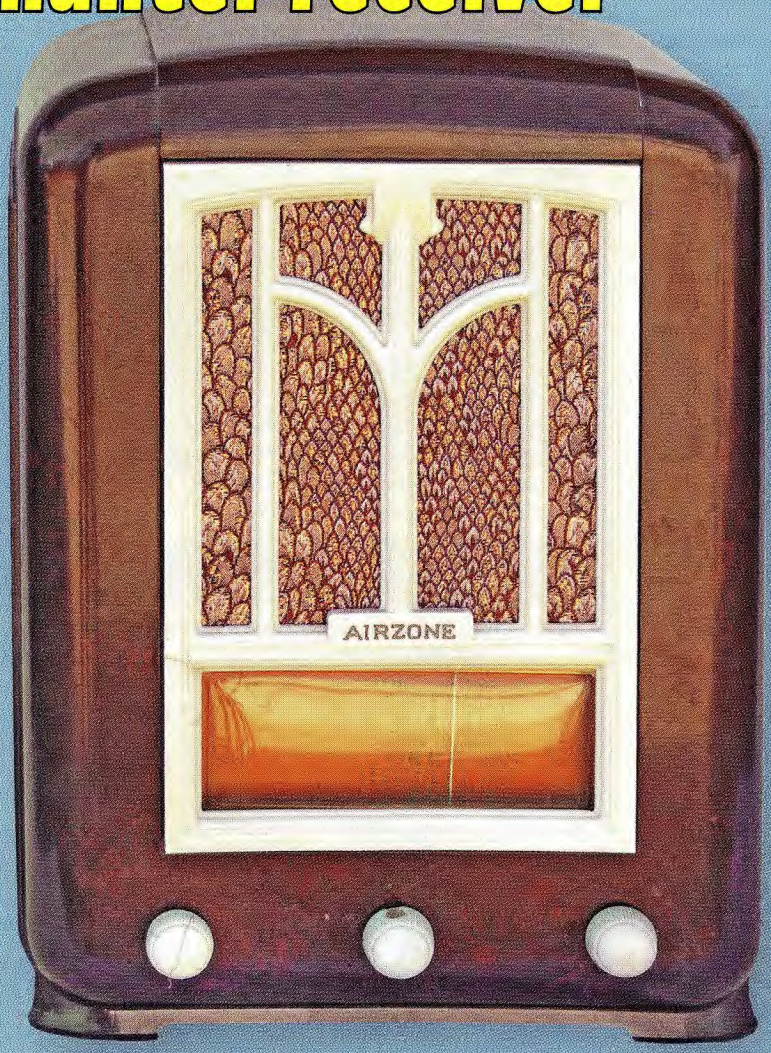
Vintage Radio

By RODNEY CHAMPNESS, VK3UG

The Airzone 520/550 5-valve mantel receiver



Manufactured in the mid-1930s, the Airzone 520/550 is an early 5-valve superhet that was capable of good performance. It was housed in a distinctive bakelite cabinet and is usually easy to restore to working order.

BY THE MID-1930s, many manufacturers were building well-designed superheterodyne receivers. This was made possible by the development of new components. In particular, valves specifically designed for the task of frequency conversion had become common and these considerably improved the circuitry around the converter/mixer stages.

Airzone, like many other manufacturers, was quick to embrace this step forward in valve design, as they made it easy to design receivers with greatly improved performance. Airzone was established in Sydney in 1931 and quickly established itself as a manufacturer of good-quality domestic receivers.

The company's 520/550 5-valve superhet receiver was released in the mid 1930s and built on that well-earned reputation. It is a well-made set with distinctive styling and is easy to service and align.

The Airzone 520/550

Airzone's method of identifying their sets was different from that used by other manufacturers. Basically, they gave the chassis one number and the cabinet that housed it another number and combined the two together. This enabled them to quickly identify both the chassis and the cabinet.

In the case of the Airzone 520/550, the number indicated a model 520 chassis fitted into a model 550 cabinet. By contrast, other manufacturers gave sets with slight cabinet variations different model numbers, even though

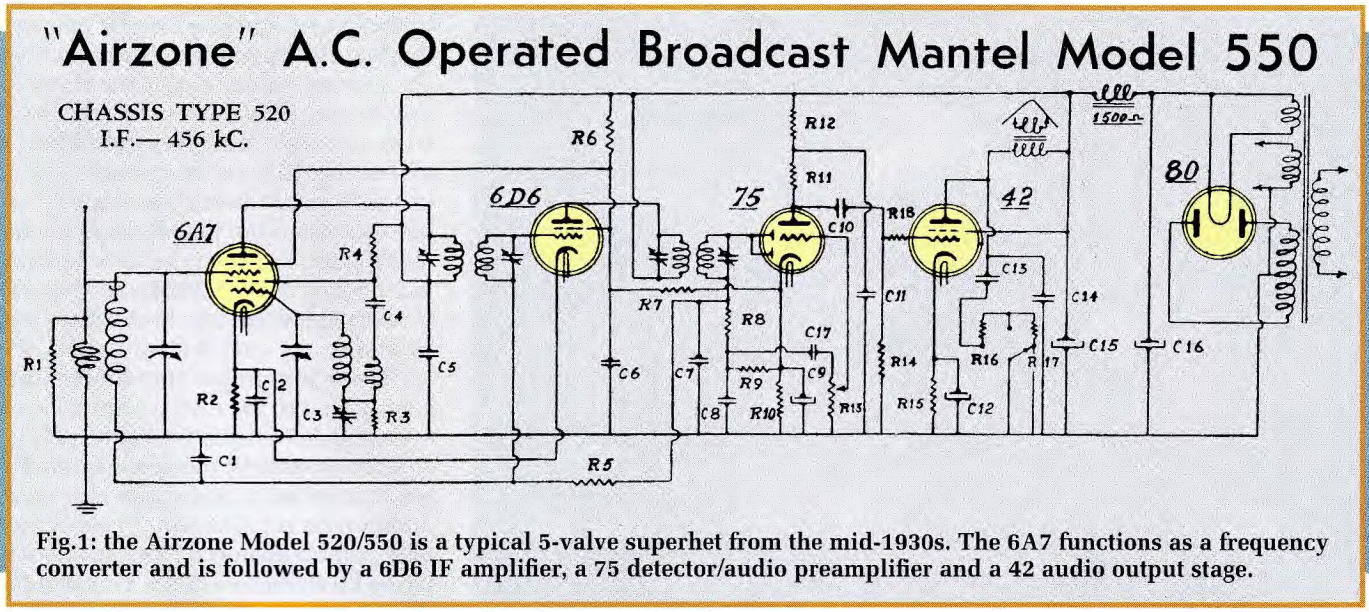


Fig.1: the Airzone Model 520/550 is a typical 5-valve superhet from the mid-1930s. The 6A7 functions as a frequency converter and is followed by a 6D6 IF amplifier, a 75 detector/audio preamplifier and a 42 audio output stage.

they used the same chassis. This meant that a string of sets with different model numbers could, in fact, be electrically identical.

As shown in the photos, an attractive, tall, brown bakelite cabinet was used to house the Airzone 520/550. This featured an ivory-coloured escutcheon around the dial and speaker cloth. However, the speaker cloth in this particular receiver looks as though it has been replaced so I cannot be sure what the original looked like.

The controls along the lower edge of the cabinet are white bakelite and from left to right they are for volume, tuning and tone. As was typical of the mid to late 1930s, the power was switched on and off at the wall socket.

For a mantel receiver, the 520/550 is quite tall and would also have needed quite a wide mantelpiece to safely support it. In fact, it could have just as easily been called a "table" set rather than a "mantel" set.

The layout inside the set is straightforward, with the chassis sitting on the bottom of the cabinet. However, as shown in the photos, the speaker, speaker transformer and filter capacitors are all fitted to an elevated bracket assembly that's attached to the chassis, with the parts sitting just behind the loudspeaker. As a result, the set cannot be rested upside down for service and instead must be laid on its side.

A look at the circuit

The circuit of the 520 chassis is typical of better designs from the pre-octal valve and pre iron-dust core era. It is purely a broadcast-band receiver, which simplifies any work needed underneath the chassis. Fig.1 shows the circuit details.

The antenna input circuit is typical of the era, with some top coupling between the antenna and the tuned winding. However, resonating the primary winding to a frequency below the broadcast band was not a feature of this set, nor was it used in sets from other manufacturers at that time. Resistor R1 is there to even the response across the broadcast band.

The first valve in the line-up is a 6A7. This is the frequency converter and it converts the incoming broadcast signal to several frequencies, one of which is the 456kHz intermediate frequency (IF). This is fed to an IF amplifier stage based on a 6D6.

The oscillator tuning circuit in the converter stage is a little different to most others, as there is no high tension (HT) voltage on the feedback winding. Note that this circuit uses variable padder C3 to adjust the low-frequency end of the tuning instead of the iron-dust or ferrite cores used in later sets.

The IF transformers are air-cored and the IF stage is aligned to 456kHz using the trimmers across the transformer windings. The IF signal is amplified by the 6D6 and passed through a second IF transformer to the detector and AGC diodes in a 75 valve.

Simple AGC is used so that even with just noise being received, a small, negative amount of AGC control voltage is developed across resistors R8 & R9. In particular, the top of R8 is always negative with respect to the bottom of R9 which connects to the cathode of the 75.

Note that the DC return for the detector and AGC diodes goes to the cathode of the 75. When there is no input signal, this means that the AGC line will be positive due to the voltage drop across R10, which is around 1.3V.

Normally, this would be an indication of either a design fault or a component failure. However, that's not the case here because both the 6A7 and 6D6 have cathode bias, with the valve cathodes resting at around +3V with reference to the chassis. This results in a bias of -1.7V between the signal grids and the cathodes of these two stages.

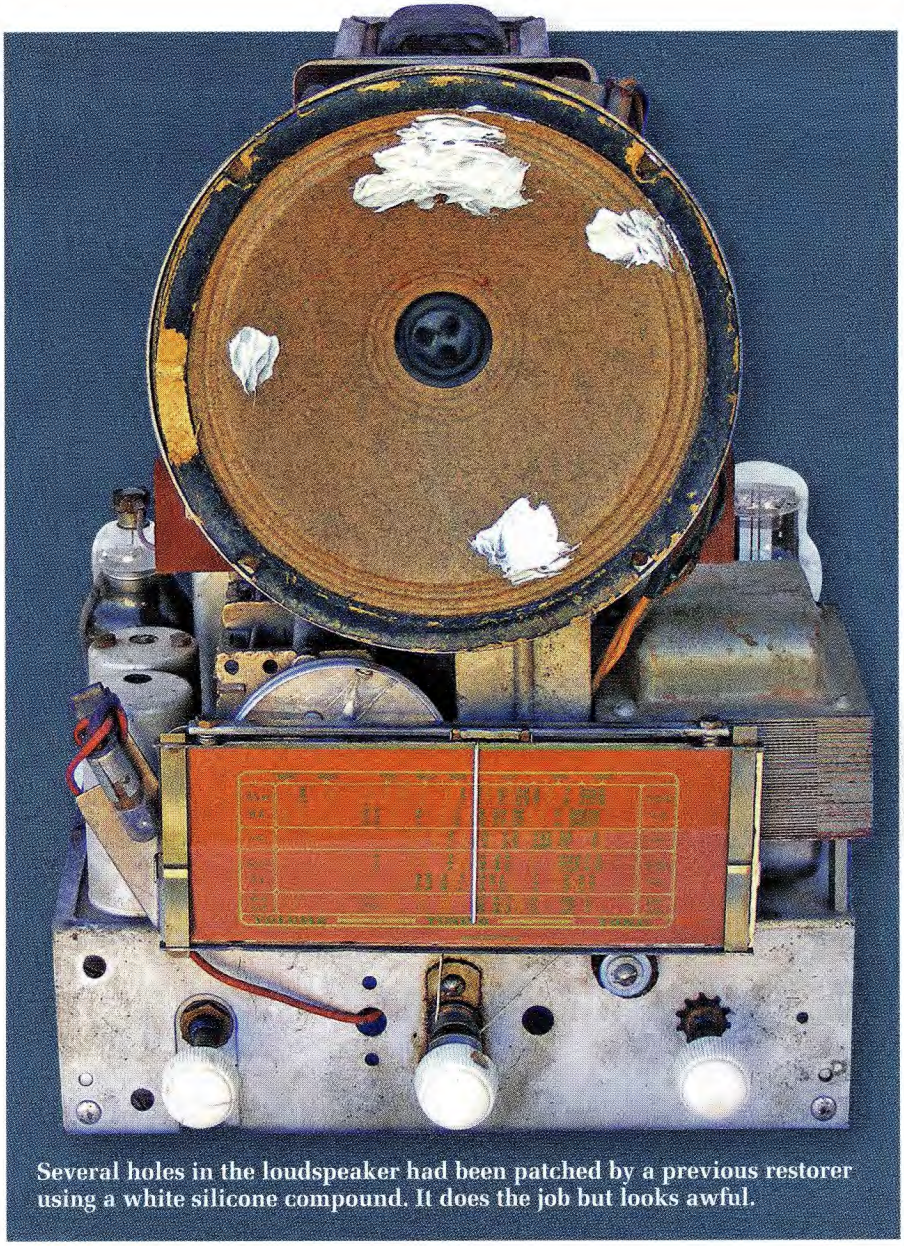
When a strong signal is received, the positive voltage on the AGC line quickly goes negative to the tune of several volts, so the operation of the AGC system is quite normal.

Detected audio

The detected audio signal from the 75 has any 456kHz signal filtered out by a network consisting of C7, R8 & C8. The filtered audio signal is then applied to the triode section of the 75 valve for amplification.

Any 100Hz hum on the HT line to the 75 is filtered out using R12 & C11. The amplified audio is then applied to a 42 output stage where it is further amplified and fed to the loudspeaker via a transformer. In addition, a switched tone control system is wired between the 42's plate and chassis.

The power supply is standard for the



Several holes in the loudspeaker had been patched by a previous restorer using a white silicone compound. It does the job but looks awful.

era, with an 80 acting as a full-wave rectifier. This in turn feeds an 8µF filter capacitor (C16) and the field coil of the dynamic loudspeaker. The HT output from the field coil is then further filtered by another 8µF capacitor (C15). This filtered output forms the HT line for the remainder of the receiver.

Restoration

The chassis is easy to remove – just remove the three control knobs, undo four screws which pass through the bottom of the cabinet and release the two clamps that secure the speaker against the front of the cabinet. The latter, by the way, ensure that the speaker is held hard against the front of the cabinet so that it has a reasonable baffle to ensures good sound quality.

Having removed these parts, it's then just a matter of sliding the chassis out of the cabinet. In this case, the cabinet was still in good order, with a good shine present on the bakelite. As a result, it required no work other than a quick clean-up with some soapy water.

This set had actually been restored at some time in the past, before it was loaned to me. As a result, I did not expect it to require much work.

A glance under the chassis reveals that some of the wiring goes to small round tagstrips. In general, the parts are well-spaced and so short-circuits are unlikely. However, it is necessary to move some components aside to get at others near the bottom of the chassis.

The paper and electrolytic capacitors had all been replaced by the previous restorer, as had a number of resistors. In addition, the loudspeaker had been repaired using several "blobs" of a white silicone compound to fill in the holes. It doesn't look too good but it does do the job. An equivalent black compound would have looked much better but a replacement speaker is really the way to go if one can ever be found.

As a safety precaution, a fuse had been added to the mains input. However, this is of doubtful value as it is a 3A unit and is therefore unlikely to blow before real damage has been done to the set. This set draws about 55W (approximately 0.25A), so a better rating for the fuse is 0.5A. This would then protect the set in the case of a severe fault.

Cleaning up

The set had been in storage for quite some time, so the first job was to give the chassis a good dust out. That done, the valves were removed and the chassis cleaned using a kerosene-soaked kitchen scourer. This produced a good result although it would be necessary to completely dismantle the set to return it to pristine condition, a job that's not to be undertaken lightly.

Two of the valves needed re-gluing to their bases. This was done using Tarzan's Grip, after which the valve pins were cleaned using Inox spray. The valves were then refitted in their sockets.

Next, all the moving parts associated with the dial mechanism and tuning gang were lubricated with light machine oil. The bearings on the tuning gang are hard to get at so I used a small hypodermic syringe partially filled with oil to do the job.

Electronic work

Having cleaned the set up, it was time to restore the chassis to working order. First, the top cap lead to the 6A7 had perished, so this was replaced with a short length of hook-up wire. I then looked at the two 8µF electrolytic capacitors on the HT line and found that both were encased in black, heat-shrink tubing.

The previous restorer had obviously replaced these but had used radial lead capacitors instead of the original axial lead units. As a result, he had converted the replacement units to axial

types by soldering a length of wire onto the negative terminal and extending it down the side of each capacitor. He had then fitted them with heatshrink to hold the leads in place.

This worked but it was impossible to read the capacitor values and ratings. I peeled back the heatshrink and found that they were both 10µF 450V units. These are quite adequate for the job, so they were left in place and the heatshrink refitted (I always like to check the voltage ratings of filter capacitors).

The power cord had also been replaced by the previous restorer but the installation was rather crude and not up to current safety standards. The earth had been soldered to the chassis and the cord had been tied in a knot to secure it which is now illegal. These problems were corrected by fitting a cable clamp and securely bolting the earth lead to the chassis via a crimp lug.

Switching on

Before plugging a restored set into the power socket, it's always wise to make a few basic checks. In this case, a quick check with a multimeter revealed no shorts between the HT line and the chassis or from mains to chassis.

The mains wiring was also carefully checked. That done, the set was powered up and the HT line monitored as the set warmed up. During this time, it's also a good idea to observe the valves for any signs of distress, such as violet glows or sparks.

Following switch-on, the HT voltage across C16 rose to 400V and then quickly settled back to 350V as the valves warmed up. The voltage across C15 settled down to around 250V, so the HT voltages were all quite normal.

Next, I connected an antenna and found that stations could be tuned in. However, the dial pointer could not be tuned all the way to the low-frequency end of the dial and the tuning capacitor was not completely closing at this end.

There is very little space between the slide-rule dial scale, the dial drum and the tuning gang so it was difficult to see exactly what the problem was. After some experimenting, I found that I could manually assist the system so that the gang fully closed but that didn't really solve the problem.

The top of the chassis is tightly packed with various parts. The valves are easy to access but the tuning gang and dial assembly can only be accessed by removing the speaker bracket assembly.

With the gang closed, the pointer was repositioned so that it sat right at the low-frequency end of the dial scale. It now correctly moves between each end of the dial scale but the tuning gang still doesn't quite close at the low-frequency end unless manually assisted. This problem was left for the owner to solve, as he is a fitter and turner by trade.

I also found that the set would intermittently stop operating at around 600kHz. This is almost certainly due to the stator and rotor plates of the tuning gang shorting together at this particular spot.

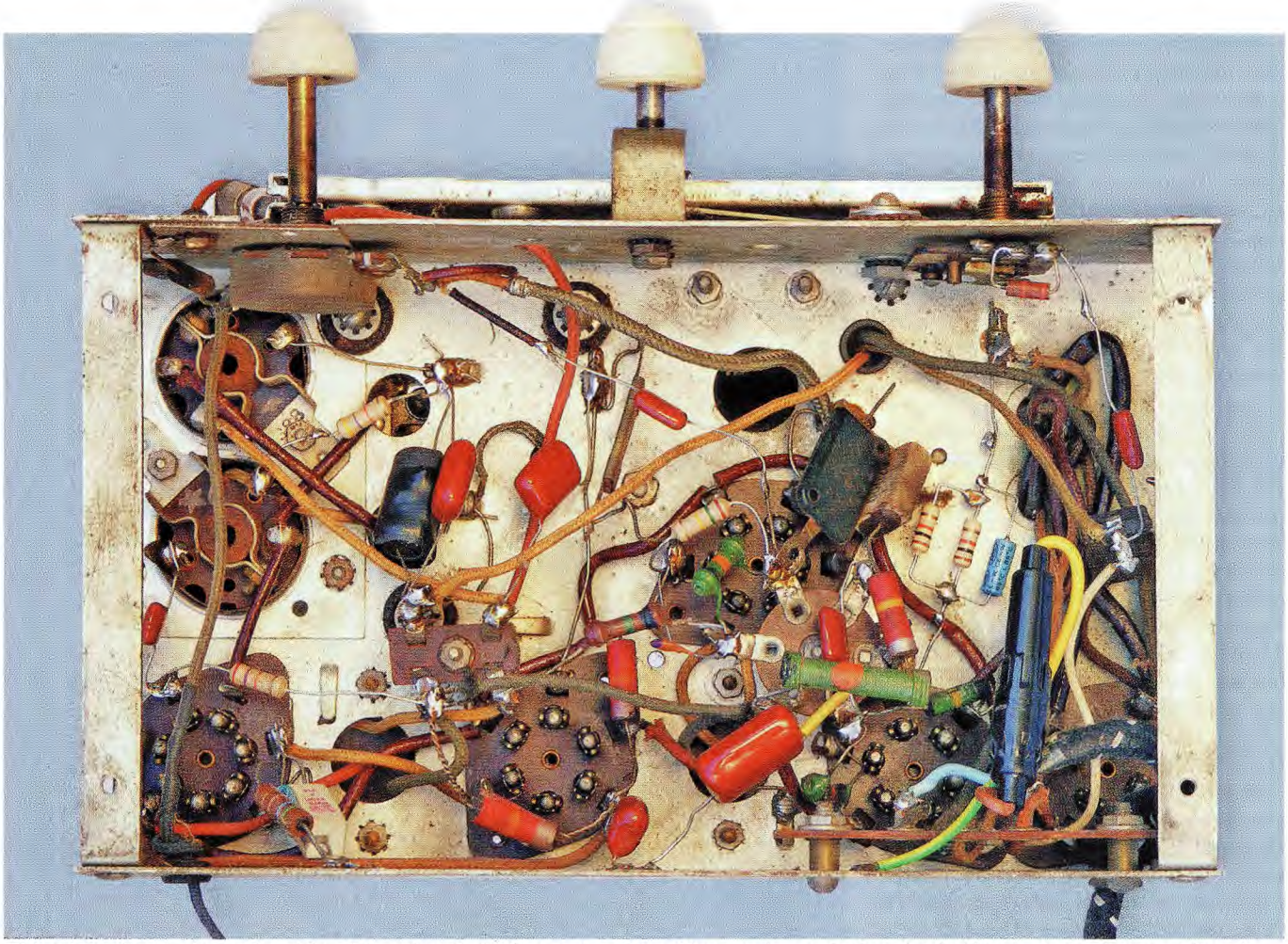
Unfortunately, the gang is extremely difficult to get at, being underneath the speaker assembly and behind the valves. Even with a headset and a torch, I made no headway with this problem, despite bending the plates slightly in an effort to clear the fault.

Once again, I'll leave the owner to remove the speaker assembly and fix this particular problem.

Alignment

I had expected the alignment to be spot-on but in practice, it was slightly out. To correct this, I first connected a signal generator via a low-value capacitor to the antenna lead and tuned the receiver to the low-frequency end of the dial. I then tuned the generator across the expected intermediate frequency (IF) and it was nominally at 456kHz.

Next, I disconnected the antenna from the set and set the generator to



This view shows the underside of the chassis before restoration. The paper capacitors had all previously been replaced, along with the mains cord. The latter required further work, including the installation of a proper cord clamp to secure it and securely bolting the earth wire to chassis via a crimp eyelet.

a low level so that little AGC action would occur in the receiver. I then tuned the IF transformers by ear and was able to noticeably improve the performance. **You have to be careful doing this though, as two of the trimmers are connected to the HT line!**

The front-end tuned circuits were next on the list. First, I tuned the set to the low-frequency end of the dial and manually assisted the dial-drive system so that the gang completely closed. The antenna was then reconnected and the output of the signal generator attached to the insulated antenna wire via a crocodile clip.

Next, I tuned the generator over the 500-600kHz range and found that the set was not tuning down to 530kHz. To correct this, I set the generator on the low frequency side of the lowest frequency the set would tune, then adjusted the oscillator padder for maximum response. This step was then repeated, after which the set would then tune down to 530kHz.

That done, I tuned to the other end of the dial and found that the set would only go to about 1500kHz. So, using much the same technique as used at the low-frequency end, I "walked" the oscillator higher in frequency by adjusting its trimmer so it would tune to 1629kHz (a local Italian station).

In fact, the dial scale indicates that the set should tune to somewhere between 1600kHz and 1650kHz but I don't have any information on the manufacturer's exact specification.

Next, I went back to the low-frequency end of the dial and readjusted the padder before repeating the procedure at the high-frequency end. The dial has a frequency scale as well as station indications, which makes tuning and alignment just that much easier to accomplish.

Finally, aligning the antenna circuit is easy – just tune the receiver to a weak station at around 1400kHz and adjust the antenna trimmer for best performance.

At the end of these adjustments, the set turned in a very good performance. In fact, it is amongst the best of the era.

Summary

The Airzone 520/550 is a well-made set with good performance and good looks. It is somewhat less complicated than many similar sets of the era but Airzone certainly got the best out of the circuit.

My only areas of criticism are the difficulties in accessing the tuning gang and the lack of clearance between the dial drum, gang and slide-rule dial (hence the trouble I had with the system jamming at the low-frequency end of the dial). Even so, these problems can be sorted out if someone is prepared to spend a few hours on the set.

In summary, this is a radio from one of the lesser-known manufacturers and is well worth having in your collection. SC