Vintage Radio

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The 1933 Airzone 503 5-Valve Mantel Set

By the early 1930s, some manufacturers were producing quite good superhet radio receivers for the domestic market. The Airzone 503 was designed for the low-cost end of the market but still came in an attractive wooden cabinet and offered good performance.

RADIO RECEIVERS were still very much at a developmental stage in the early 1930s, the very first sets having been built just 30 years earlier, around 1900. During that time, they had developed from modest "breadboard" pieces of equipment through to the "coffin-style" cabinets of the 1920s and then to steel chassis sets from the late 1920s onwards.

A steel chassis made life so much easier when it came to design and manufacture. It meant that each receiver made would consistently perform according to specification, provided of course that the correct components were used and the wiring had been correctly carried out.

Of course, some designs were "dogs" due to poor design and construction but many manufacturers did have

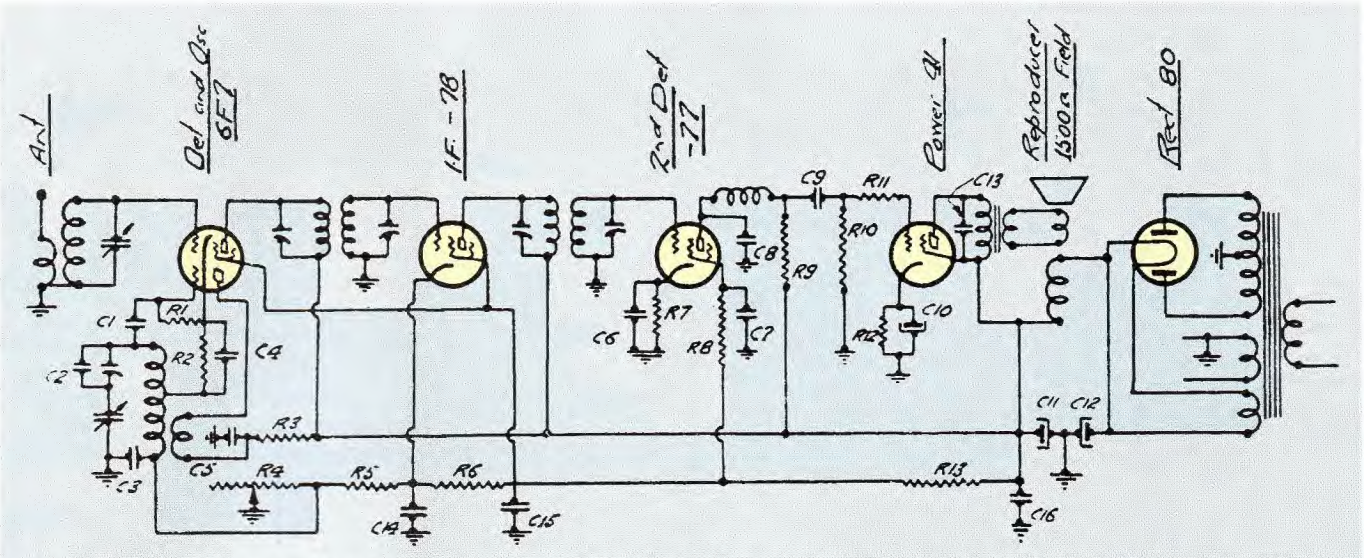


Fig.1: the circuit is an early supherhet design, with the first valve (6F7) acting as a mixer/local oscillator stage. The second stage (78) functions as an IF amplifier, while the 77 functions as an anode bend detector. A type 41 valve is used as the audio output stage, while an 80 is used for the rectifier.

good engineers who designed excellent equipment. Some of that early equipment is still around today and can still turn in a good performance. One such receiver is the Airzone 503, described here.

The Airzone 503

This particular Airzone 503 belongs to a friend and it had been restored several years ago. As a result, there wasn't much I had to do to get it running at peak performance.

As shown in the photos, the set is housed in an attractive medium-sized wooden cabinet. It has a matte finish applied to the timber, which makes it really look the part. However, being built around 1933/4, it only has a rudimentary tuning dial, a feature it shares in common with many other sets of that era.

Basically, the dial consists of a smallish knob with a moulded pointer on it to show what part of the band the set is tuned to. This knob is connected directly to the twin tuning gang and so the tuning is quite direct. However, this isn't really a problem as the IF (intermediate frequency) bandwidth is quite wide.

The volume control is basically a rheostat. It rotates through 330° and uses a knob that's identical to that used for the tuning. However, the controls are reversed to what we normally expect, with the tuning control on the left and the volume at right.

The above-chassis components are well laid out and everything is quite accessible. One unusual feature is the use of a curved metal sheet to form a shield between two of the stages in the receiver. I've never seen anything like that before.

A look at the circuit

Initially, I had problems finding a circuit diagram of this receiver. That was until I got onto the Internet and found a reference to the Airzone 503 that steered me to a publication that I had. A quick check in that publication then turned up the circuit diagram for the old Airzone.

It is just so much easier to service or restore a piece of equipment if the circuit is available. A circuit is also essential for understanding how a set works and for troubleshooting, especially when modifications are necessary.

Fig.1 gives the circuit details of the Airzone 503. As shown, the antenna coil is an air-cored solenoid and has

The old Airzone receiver is housed in an attractive wooden case which has been well restored.

The top of the chassis is well laid out, with all parts easy to access for service. Note the unusual S-shaped metal shield between the IF amplifier (78) and detector (77) stages. A separate shield is also fitted to the mixer/oscillator stage.

no top coupling from primary to secondary. This technique assisted in maintaining reasonably constant performance across the broadcast band.

Sets at that time were designed to work with long-wire antennas, perhaps up to 30 metres long and mounted up to 12 metres high. These large antennas provided such good signals that the deficiencies inherent in early antenna coils were of no great concern. It was only when customers wanted to use their radios on a 6-metre length of wire run around the picture rail inside the home that manufacturers had to design coils to suit these much shorter antenna lengths.

The signal from the first tuned circuit is applied to the signal grid of the pentode section of a 6F7. The triode section acts as the local oscillator and the oscillator signal is cathode-coupled into the pentode so that it acts as a mixer.

By the way, the 6F7 was designed for the frequency conversion task but it was also suitable for use in the types of circuits that used common triode/pentode miniatures (6U8, etc) towards the end of the valve era. The 6F7 was never made in Australia but given its versatility, it probably should have been used more widely.

The signal on the plate of the 6F7 is fed to the first IF (intermediate frequency) transformer which is nominally tuned to 455kHz. Its output is in turn applied to the grid of the remote cut-off IF amplifier which is based on a 78 valve (a 6K7 is an octal equivalent). The output from the 78 is then coupled via a second IF transformer to a 77, which is a sharp cut-off pentode.

Anode bend detector

The 77 is configured as an anode bend detector. The anode bend detector was common in the early to mid 1930s, as few valves were made that combined an RF pentode with detector and AGC diodes in the same envelope. For the time, they provided effective detection of the RF signal and reasonable amplification.

In operation, the 77 is biased near cut-off, so that only the positive going sections of the RF signal are amplified. The valve operates very much like a single-ended class B stage and as such there is distortion in the output. This is one of the main deficiencies of this type of detector.

The other deficiency is that the signal level needs to be kept within a relatively small range (the "sweet spot") so that the distortion is minimised. In this receiver, Airzone appear to have got it right, as the signal level applied to the detector results in good audio levels at the set's output. In fact, the circuit used here is similar to that used in many other receivers with anode bend detectors.

The detected RF signal appears on the plate of the 77 and is filtered to recover the audio signal which is then applied to the grid of a 41 output valve. The filter circuit is formed by capacitor C8 and the following RF choke in the plate circuit of the 77. In addition, resistor R11 acts in conjunction with the grid to cathode capacitance of the 41 to provide additional filtering.

The resulting audio signal is amplified by the 41 and applied to a 5-inch (125mm) electrodynamic loudspeaker.

Note that it's important to keep RF signals out of the audio output stage. If this is not done, they will be amplified and radiated back into the IF amplifier, causing RF instability.

Power supply

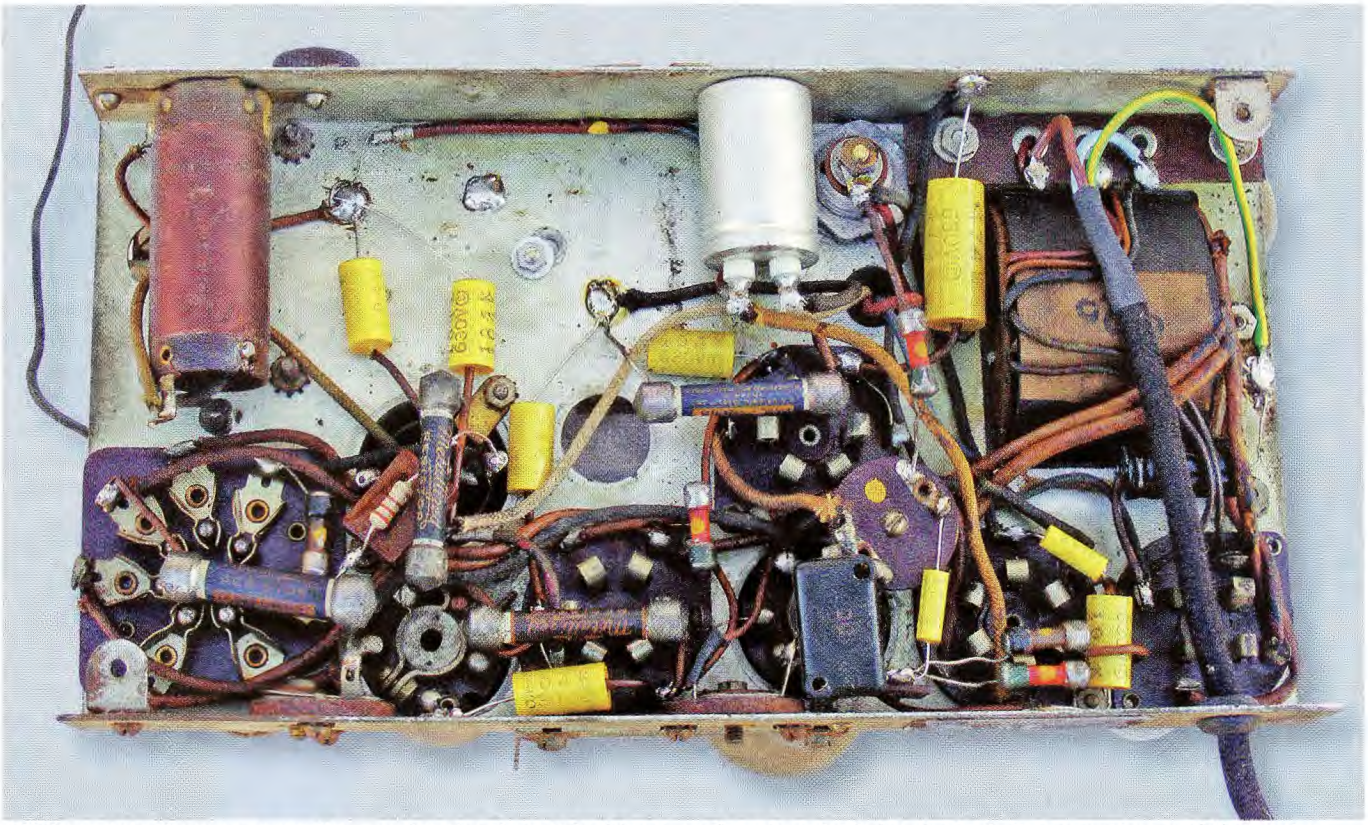
The power supply is quite conventional and uses a mains transformer to drive an 80 rectifier stage. The 80's HT output is then filtered using two 8μF electrolytic capacitors and the field coil of the electrodynamic loudspeaker.

Note that although the circuit doesn't show it, the primary of the mains transformer has two tappings – one for a 200-230V input (colour coded black & yellow) and the other for 230-250V (colour coded black & red). As with virtually all receivers of the era, there is no mains on-off switch which means that the unit has to be switched on and off at the power point.

No AGC

This set, like many from the early 1930s, does not have automatic gain control (AGC) to compensate for signal strength variations between stations by automatically adjusting the volume. This means that, depending on signal strength, the volume can vary from one station to the next and so has to be manually adjusted each time a station is tuned.

The volume control itself takes the form of a 4kΩ rheostat (R4), which forms the earthy end of a voltage divid-



All the original paper capacitors under the chassis had been replaced, as had the electrolytic capacitors and the mains power cord. The mains cord had not been securely anchored, however.

er from the HT line. When the moving arm is set to the R5 end (see Fig.1), the RF amplification is at maximum (and so is the distortion on strong stations). Conversely, when the control is set to the far left, the two front-end valves are cut off and there is no audio output.

Note that both the 6F7 and the 78 require quite a high negative voltage to cut them off (about -40V). When their cathodes are at about 40V positive with respect to the chassis, their signal grids are at chassis potential, ie, the grids are at -40V with respect to the cathodes.

Restoration

As indicated earlier, I had nothing to do with the restoration of this set. The owner obtained it in a fully restored condition and it had been very well done, which regrettably often isn't the case. In fact, sets are often advertised as being fully restored only for the new owner to later discover that the restoration is often not much more than a figment of the seller's imagination.

In this case, the cabinet was in excellent condition but not being an expert on cabinet restoration, I cannot definitely say what the finish is. It has a matte appearance and I suspect that some form of oil has been used to obtain what is a very impressive result.

Out of curiosity, I decided to remove the chassis from the cabinet. This involves removing the two knobs and the two chassis retaining screws underneath. However, as I started to slide the chassis out, I noticed that the volume control was not coming with it.

Closer examination revealed that the control was firmly attached to the cabinet by a nut and its terminals connected to the circuit by two flying leads. Undoing the nut freed it, after which the entire assembly (including the loudspeaker) could be removed.

Once the chassis was out, I took a look inside the cabinet and found a metal gauze and what looks like an asbestos pad lining the underside of the top. One edge of this pad had split open but nothing appeared to have come loose. Despite that, I suggested to the owner that it would be wise to seal this pad as asbestos is a carcinogen.

Asbestos sheets were used in quite a few receivers during the 1930s and 1940s to keep heat away from cabinet tops. Heat often spoiled the cabinet finish in early sets, particularly above the output valves and rectifiers.

All the tuning adjustments had been sealed with a dab of yellow paint. The S-shaped shield used on the top of the chassis is unusual but effective in shielding the various sections from each other.

A glance underneath the chassis revealed that the paper capacitors had all been replaced, along with the electrolytic capacitors and the mains power lead. The power lead installation did not meet present-day standards, however. As a result, I spent a few minutes fitting a cordgrip grommet to ensure that it was anchored correctly.

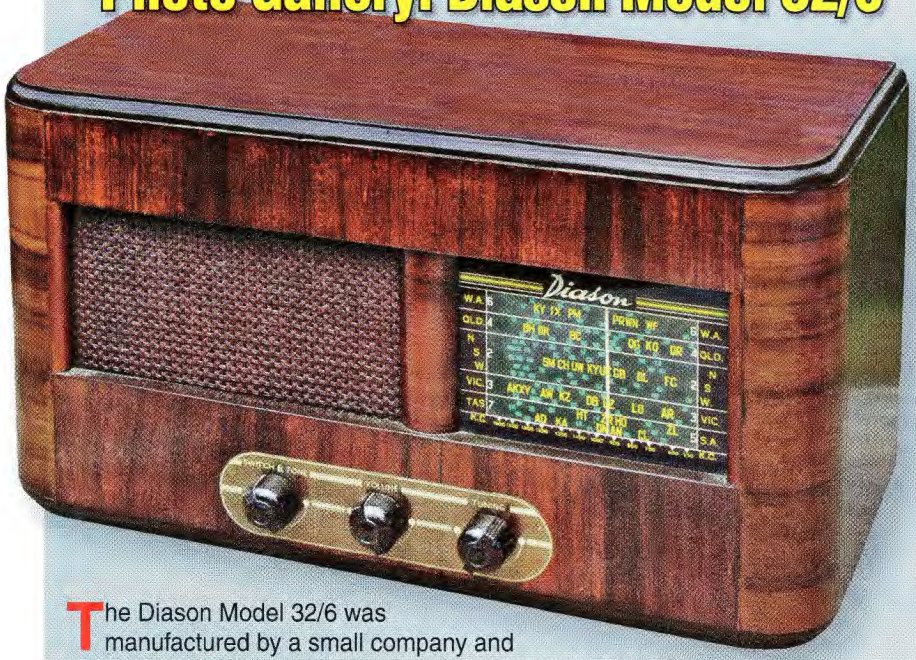
I didn't have the circuit diagram at that stage and so I wasn't quite sure what valves I would find in the various sockets. As a result, I looked at each of these in turn and they were all familiar types except for the output valve which was an NU41. However, I could find no reference to it in my valve manuals.

Eventually though, I found a small sticker which indicated that the valve was a type 41, which I did know. So an NU41 is in reality a 41.

Trying it out

Everything looked to be in good order, so I connected the set to an antenna and applied power. The result

Photo Gallery: Diason Model 32/6



The Diason Model 32/6 was manufactured by a small company and used the following valve line-up: 3 x 6SK7, X61M, 6SQ7 and 25L6. If these valves seem unusual, it's because the sets came in three models which were designed for operation on DC supplies of 32, 50 or 110V respectively. The six valves (or seven in the push-pull audio output model) were all RF and audio types, as a rectifier was not needed. Photo by Kevin Poulter for the Historical Radio Society of Australia (HRSA). Phone (03) 9539 1117. **www.hrsa.net.au**

was a complete anti-climax because I got absolutely nothing from it.

This was not looking good, as tracking down and fixing the problem without a circuit diagram could take some time. Nevertheless, I began by checking the voltages on the various valve elements and all but the cathode voltage of the 6F7 were close to what I would have expected. That was a worry, as 6F7s can be difficult to obtain.

Next, I checked that all the valves were correctly seated in their respective sockets and this revealed that the 6F7 was loose. As a result, I removed the valve and closed up the socket connections using a pair of pliers from the underside of the chassis. I then gave the connections a squirt of Inox contact cleaner and re-inserted the valve.

This time, when power was applied, the set began working. Shortly after that, I found the circuit diagram and other general information on the set. This showed that the voltage measurements now all closely matched the specifications.

How it performs

I was pleasantly surprised as to how well this 1930s radio performs. It received all my local stations at good volume and despite having a direct-drive dial system, was easy to tune (aided, no doubt, by the wide IF passband). And despite the likelihood of noticeable distortion being produced by the anode bend detector, the audio output was quite pleasant to listen to.

I checked the tuning range and found that the set covered the frequency range from 550-1700kHz. However, by slightly adjusting the trimmer in the oscillator circuit, this was changed to 530-1630kHz which covers all the stations in my area.

I also checked the IF centre frequency and found that it was up around 480kHz instead of the specified 455kHz. However, despite being 25kHz more than the designated IF, this did not cause any problems.

Some restorers erroneously believe that if the IF is supposed to be 455kHz (or some other frequency), then the IF amplifier must be aligned to that centre frequency or problems will arise with the set's performance. This might be true for some specialised receivers but for the average domestic receiver, a variation of ±5% from the specified frequency is unlikely to cause problems.

In summary, Airzone may not have been one of the large manufacturers but they did produce some very good receivers. The Airzone 503 is a very impressive receiver, especially considering its age. It has been well-restored, works well and is a set well worth having in a collection. SC