VINTAGE RADIO

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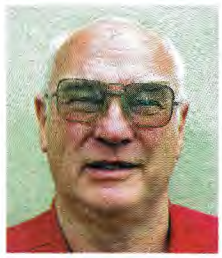


The Airzone 500 series receivers

Airzone's 500 series radio receivers were typical of the 1930s era. This month, we take a look at the 505/515 models which were 5-valve superhets employing 455kHz IF stages but with no automatic volume control.

During the early 1930s, Airzone (1931) Ltd produced a series of progressive receiver designs. The particular chassis featured here is a 500 (which has been modified to 500P standard), while the cabinet is a 555. And just to add to the confusion, the circuit diagram is for receiver models 505 and 515.

However, in those days, manufacturers often built a chassis which was fitted to different cabinets (table, mantel or console). The chassis had one number and the cabinet another, while yet another number was often given to the completed assembly.

The Airzone 500 came in a stylish cabinet and has just two controls: volume and tuning. The control settings are visible through "peep hole" escutcheons.

1930s design philosophies

The early to mid-1930s was a time when superhet receiver design was really taking off. Before that, until about the end of the 1920s, consumers had to be content with tuned radio frequency (TRF) receivers which had reached the zenith of their design. But as good as many of these sets were, a new direction in design was needed to make radio receivers both economical to buy and easy to use.

Initially, superhets were even more cumbersome than TRF receivers, until tetrode and pentode valves became common. What's more, purpose-designed converter valves such as the 2A7 and later clones had not appeared commercially on the scene at the beginning of the 30s. To get around this problem, ingenious circuit designers developed the autodyne converter. This provided a local oscillator and achieved radio frequency (RF) amplification and conversion to the intermediate frequency (IF) all in the one pentode valve.

The IF amplifier design was well established early in the 30s and the generic design remained with us well into the solid state era. However, the design of the detector stage was in a state of flux at the time and the diode detector had yet to establish itself in the role it would come to dominate within a few years. Instead, during this period, many different types of detectors were used in radio receivers.

By contrast, audio amplifiers had also reached a reasonable degree of sophistication. Indeed, no further major design advances subsequently took place in domestic receivers while the valve remained king.

The Airzone 500/505/515

Fig.1 shows the circuit of the Airzone 505/515. The antenna/aerial circuit is quite standard for the era, with a 10kΩ potentiometer (R3) connected across the primary of the aerial coil. The potentiometer not only at-

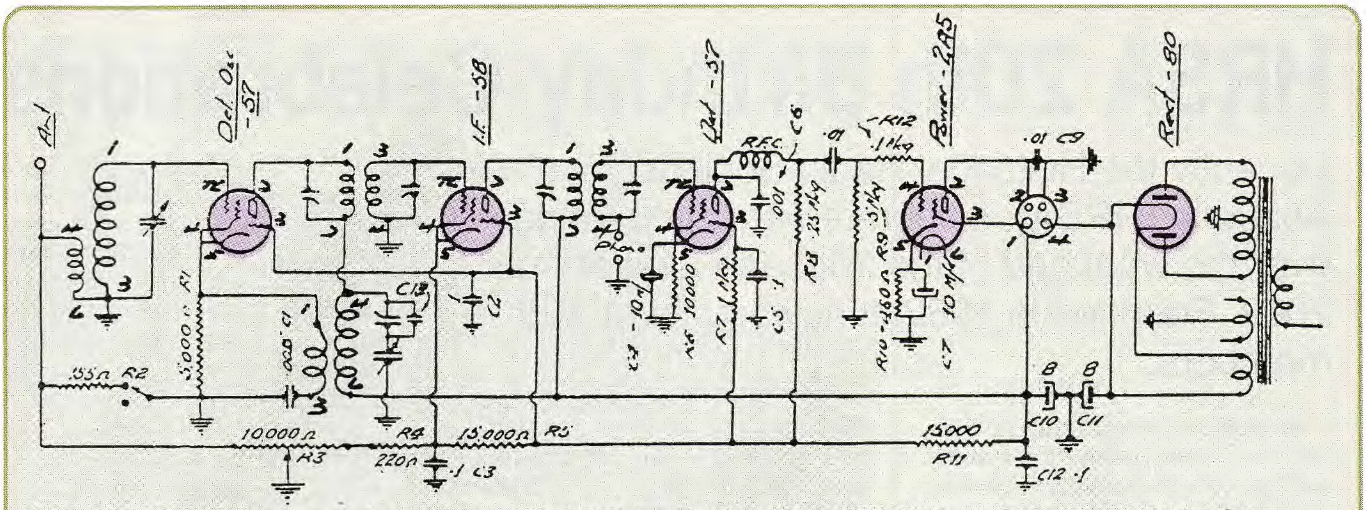


Fig.1: the Airzone 505/515 series used a superheterodyne circuit with 455kHz IF stages but no AGC. R3 (at the antenna input) functioned as the volume control.

tenuated the incoming signals but also increased the effective value of the 58 valve's cathode resistor (R4) from 220Ω up to a maximum of 10,220 ohms. Hence, R3 had the dual role of controlling the gain of the 58 and the amount of signal being fed to the 57 autodyne converter.

Local/DX switch

A number of sets also included a "Local/DX" switch. This allowed a further reduction of receiver gain when strong stations were being received. On Fig.1, the switch is shown in series with R2 (155Ω) – ie, the 155Ω resistor was switched into circuit in the "Local" position, when strong signals were present. However, the receiver featured in this article does not have this facility.

Careful inspection of the circuit shows that the receiver has no volume control apart from R3. This meant that the set could still have had some audio output when R3 was set for maximum attenuation unless further measures were taken.

In fact, Airzone got around this problem rather nicely by including a voltage divider consisting of R11, R5, R4 and R3 across the high tension (HT) line. When R3 is at maximum attenuation (ie, the wiper is at the far lefthand end position), the voltage at the junction of R5 and R4 could be as high as 60V positive with respect to the chassis. As shown, the 58's cathode is attached to this junction, while its grid is at chassis potential, so in effect the bias can be up to -60V.

This is more than enough to completely cut off the 58 valve. And that meant that no signal could get through to the detector and so there was no audio output.

The converter is the common autodyne arrangement from the early 30s. Its operating conditions had to be carefully selected in order for it to work reliably. First, the cathode resistor is a rather high value compared to that used in a straight RF amplifier. Second, the padder is wired to the top of the oscillator tuned winding to ensure more reliable operation. This also keeps HT off the tuning gang, which is much safer for the user.

Note: having HT on the gang could also pose other problems. For example, if the gang plates shorted, there could be quite a "melt down". It would only be a matter of whether the oscillator coil burnt out before either the rectifier or power transformer succumbed!

Autodyne problems

Early on, there was a problem with autodyne circuits getting enough feed-

This view shows the rear of the cabinet, with the chassis in place. Loosening two screws underneath the cabinet allowed the chassis to slide out for servicing.

HRSA 20th Birthday Celebrations

Recently the Historical Radio Society of Australia (HRSA), celebrated its 20th birthday over the weekend of the 20th and 21st of April 2002. Founded in 1982, it now has over 900 members.

Vintage radio collecting in Australia had been going on for many years prior to the inaugural meeting of the HRSA on the 17th April, 1982. I commenced my collecting way back in the early 1970s, collecting military radio equipment from WWII. However, there were others before that who were collecting and restoring old radio equipment. Often, they were looked upon as rather odd people: "collecting old radios, you've got to be mad!"

In Alice Springs, Len Davenport had established a radio museum, called the "Magic Spark Radio Museum". Len believed that there was a need for an organisation to promote the preservation of our radio heritage. He spoke with Ray Kelly (in Melbourne) at length about the establishment of a national vintage radio club or society.

Ray organised a meeting at his home on April 17th, 1982. The idea was enthusiastically embraced and it was decided to form a national vintage radio society, to be called the Historical Radio Society of Australia. Starting with only 25 members, the society got under way immediately and their first newsletter was produced in July 1982, consisting of just a few pages of duplicated sheets.

From those very early days the society has expanded greatly to over 900, with members in every state and overseas. "Radio Waves" is now a quality magazine of 30-44 pages on all aspects of vintage radio and is published every three months.

Members can obtain advice on restoration, information on where to obtain bits and pieces, advertise for parts or sets that they are interested in, obtain circuits of most radios and in some cases identify that odd-ball set. Recently, the club established a "Valve Bank" and members can obtain most valves at reasonable prices from this source.

In the middle of 2001, the HRSA committee commenced their planning of the 20th birthday celebrations, to be held in the Brentwood Community Centre Hall, Mulgrave, Victoria.

Celebrations started on the Saturday at 9AM with a "Flea Market" – members buying and selling all sorts of vintage bits and pieces. At 12.30PM, the "Class Auction" got underway with over 100 registered bidders and quite a number more who came to see the valuable and not so valuable go under the hammer. Some pieces of rarer equipment brought prices well over the $1000 mark while other less sought-after items brought as low as $5.

Radio displays

While the flea market and auction were on, a "Radio Display & Concourse" was also taking place. There were displays of early equipment from the Marconi spark era; 1920s, 30s & 40s receivers; coloured plastic/Bakelite radios; Australian battery portables; military radio equipment from WWII; posters; a display exclusively of the up-market Zenith (USA) portable receivers; transistor sets; and various other interesting items from our radio heritage.

The Bakelite cases of most radios were brown or occasionally cream. Some manufacturers did produce a variety of cabinet colours, either as mixes in the Bakelite or as a painted cover. These coloured sets are highly sought after, particularly blue ones which tend to sell for up to three times the price of a brown set. A number of these can be seen in one of the photographs.

Tony Maher, the owner of many of the battery portables on display, has been acutely aware that it is not possible or practical to operate bat-

Valve radio receivers in coloured Bakelite cabinets are now highly sought after (especially blue).

A display of receivers from the 1920s. Finding parts for some old sets can be a real challenge.

These early radios all have one thing in common: attractive wooden cabinets. These have all been restored to "as-new" condition.

tery portables from the batteries that were used in the past. Hence, he decided to design a DC-DC inverter to power these receivers.

He produced it as a kit and he has been besieged with requests for them. In this way, Tony is making our old valve portables useable as well as being display items. I applaud this as I believe that wherever possible our vintage radio equipment should be heard as well as seen.

The display was the best I've ever seen of this nature. The equipment was in immaculate condition and must have impressed the general public as well. The military equipment naturally didn't look anywhere near as "pretty" as the domestic radios, being more in keeping with its intended role. There were people around who could answer the questions of the visitors so that all knew more about our radio history than before they came to the display.

Those interested in finding out more can contact the HRSA at PO Box 2283, Mount Waverley, Victoria 3149. New Zealand enthusiasts can contact the New Zealand Vintage Radio Society (NZVRS) secretary at 2 Levy Rd, Glen Eden, Auckland, NZ. The NZVRS is older than the HRSA as it was established in 1979.

Both organisations have web sites. The HRSA web site is at **www.hrsa.asn.au**, while the NZVRS site is **www.nzvrs.pl.net**

Early portable transistor radios are now very much collector's items. These have all been fully restored.

back to sustain oscillation in the oscillator section. This problem was ultimately solved by the late Lay Cranch. He found that the primary of the first IF transformer impeded the feedback circuit.

In early circuits, the inductance acted as a choke and the capacitor was too small to allow sufficient feedback. This problem was solved by increasing the value of the capacitor and reducing the inductance.

IF amplifier

The IF amplifier is quite a standard circuit. The main difference between it and later circuits is that it does not have automatic volume control (AVC/AGC). It relied instead on manual volume (gain) control, as provided by R3.

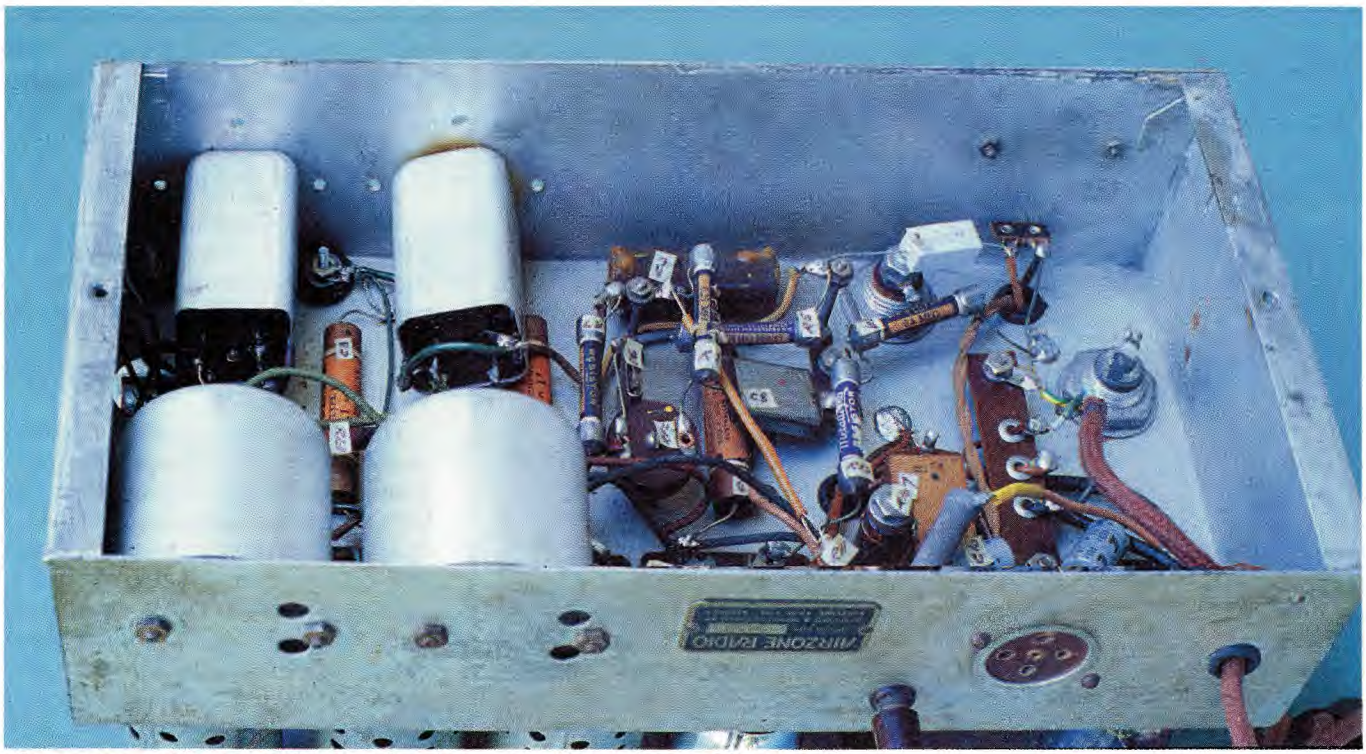
Most manufacturers at that time were using 175kHz IF (intermediate frequency) amplifiers, whereas Airzone used 455kHz IF amplifiers in this design. This meant lower gain than from 175kHz amplifiers but the image response was decidedly superior (which is why 455kHz later became the standard for domestic receivers).

The detector is an "anode bend" or plate detection type. This involves operating the 57 towards cut-off by using a higher than normal cathode resistor (R6). For best fidelity, the cathode should be bypassed only for RF (IF) frequencies but this reduces the overall gain. As a result, Airzone opted for higher gain but at the expense of increased distortion.

Electrolytic capacitor C4 should have had a 500pF mica capacitor across it to filter out any remaining IF signals. That's because electrolytic capacitors of that era had poor performance at both IF and RF frequencies after a short time in use. Filtering the IF energy at the plate of the 57 is standard practice with this design, to keep IF signals out of the audio output stage.

Phono terminals

The 505 and 515 both have a pair of terminals to allow the use of a record player turntable to be connected to the receiver. The input is connected across the terminals marked "Phono" at the bottom of the second IF transformer secondary. However, noticeable distortion would be evident at the audio output with the circuit values used. In addition, the receiver's



The component layout under the chassis is generally uncluttered but note that the coils sit over the top of three of the valve sockets. This makes it difficult to access components around these sockets for servicing. The IF adjustments are accessed through holes in the rear apron of the chassis.

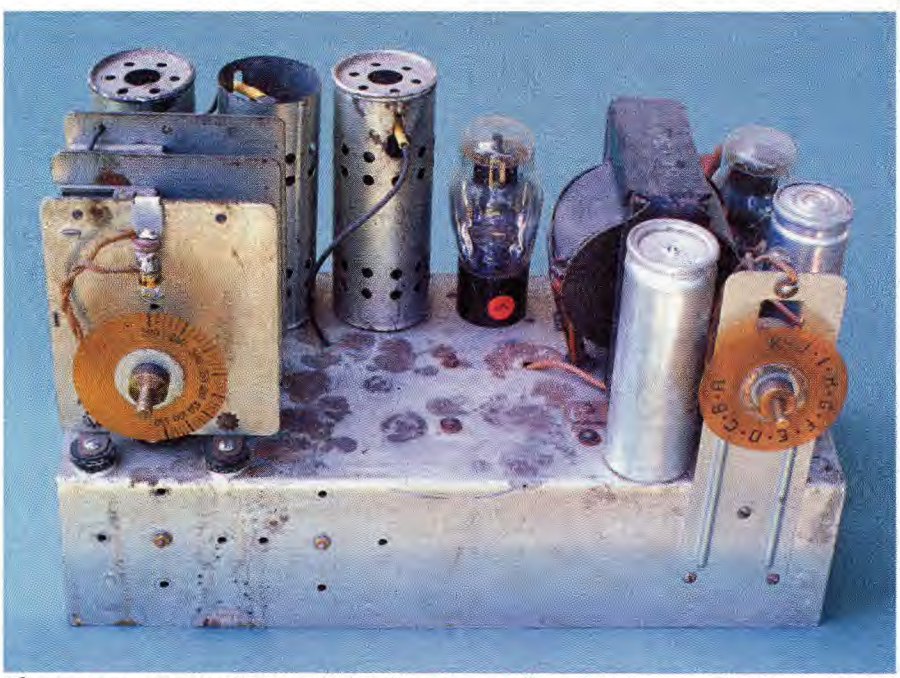
volume control would need to be set to minimum, to avoid radio stations coming in over the top of the record being played.

There is no volume control when playing records. For normal operation of the set, the phono terminals are shorted. The model 500 doesn't have this facility which is of doubtful value anyway.

Audio output

The audio output stage is quite conventional. The electrodynamic speaker and speaker transformer are plugged into a socket which sensibly disconnects the HT voltage from the set proper when removed.

The power supply is conventional, with a transformer and an 80 rectifier. The heater winding for the majority of the receiver is 2.5V and it is centre-tapped to reduce the amount of hum in the audio output.



The components on the top of the chassis are all easy to access. The two 8µF electrolytic capacitors near the power transformer were replaced but left in-situ on the chassis to keep the set looking as authentic as possible.

Restoring the 500

To remove the chassis from its cabinet, it is first necessary to remove the two knobs and the two bolts from underneath the cabinet. One interesting feature here is the fact that the bolts are located in slots. When loosened, this allows the chassis to be partly withdrawn so that valves may be replaced, as can be seen in one photograph.

At some stage during its history, this set had been converted from a 500 to a 500P. This meant that the 57 autodyne converter had been changed to a 2A7, the latter arranged in a much more reliable pentagrid converter circuit. The aerial and oscillator coils had also been replaced with much more modern units using adjustable slug cores.

The chassis was given a good clean up but the owner stopped short of repainting it as it was in good condition for its age.

Getting at the underside of the three

valve sockets holding the 58, the two 57s and other associated components below the coils and transformers is not easy. Why did manufacturers have to make life so difficult for service personnel when a more thoughtful layout would have made life so much easier? I've seen some radios and other equipment absolutely packed to the hilt with parts and yet due to thoughtful design layout are still easy to access. On the other hand, I have seen many chassis where access is difficult, like this Airzone.

The electrolytic capacitors were replaced but the 8μF chassis mount units were left in place to keep the set looking as authentic as possible. Several paper capacitors in critical positions, such as the grid capacitor to the 2A5, were also replaced. Some carbon resistors were out of tolerance and these were also replaced, as was R3 which was the worse for wear.

In sets of this age, it's not a bad idea to check that all the resistors are within tolerance (±20%). Some resistors can also become noisy and should be replaced, even if their value hasn't changed; eg, the plate resistor (R8) of the 57 detector.

The power cable was replaced with a modern 3-core fabric covered cable. It looks the part and has the vital earth wire which is sensible to have in sets of this age.

The receiver tuned circuits were then aligned without any difficulty. The dial is calibrated from 550 to 200 metres, which equates to 545kHz to 1500kHz (ie, the frequency range of the broadcast band at that time).

The IF adjustments are accessed through holes in the rear apron of the chassis. Two of the trimmers in the IF cans are at full HT voltage and should be adjusted using an insulated alignment tool. If you don't have the correct tool, you can cut down a large-diameter plastic knitting needle – just file a screwdriver blade on one of the pieces.

Once aligned correctly, the receiver had plenty of volume and reasonable sensitivity. The audio quality is typical of the era and type of detector used – in other words it isn't high fidelity but it's still quite listenable.

The controls are back to front to what we've become used to, with the tuning on the left and the volume on the right. The settings of both controls are visible through "peep hole" escutcheons. The volume control is easy to use but the tuning control is another matter. Due to the small size of the knob and the direct drive to the tuning capacitor, tuning is a finicky job at best.

Restoring the cabinet

The cabinet was in reasonable condition, so not a lot of work was required here. First, paint stripper was used to remove all existing varnish and paint from the cabinet. The trims were then spray painted black, as was the inside of the cabinet (quite a lot of cabinets during that era were painted inside). Finally, the cabinet was finished off with satin/semi-gloss clear pre-catalysed lacquer spray.

The end result is shown in one of the photos – the set looks like new!

Summary

Airzone was one of many manufacturers in the early 30s that experimented with new ideas, as demonstrated by the use of a 455kHz IF in this set. Converting the chassis to a 500P with a conventional purpose-designed frequency converter was a also good move.

The set itself certainly look the part, although it's a shame that looks took precedence over ease of tuning. The audio quality, although not high fidelity, is typical of the era and quite acceptable.

It is hard to assess what part of the market the set was aimed at, as it has some very good features as well as some cost-cutting measures. I suspect that it was intended as a middle-of-the-range receiver. It's a set that's well worth having in your collection, being typical of the 1930s era. **SC**