Vintage Radio

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The Astor Football GR/GRP 3-Valve TRF Mantel Receiver

Manufactured around 1948, the Astor GR/GRP receiver was nicknamed "Football" because of its cabinet shape. It's a low-cost 3-valve TRF set designed for tough times.

"WIRELESS" RECEIVERS were initially all tuned radio frequency (TRF) types. The superheterodyne circuit was not invented until Major Edwin Armstrong developed the concept during World War 1. Superhet receivers are more complex than TRF receivers but have many advantages where high performance is required.

By contrast, TRFs were traditionally used where cost, non-critical performance and simple circuit design were important. Many TRF radios are easy to operate but those using regeneration require operating skills that many non-technical listeners find hard to acquire. Although TRFs are rarely seen these days as domestic receivers, they are still used in the form of super-regenerative receivers for such things as garage door openers.

Most receivers manufactured from the mid-1930s onwards were superhets but manufacturers occasionally produced a simple, cheap TRF set to satisfy the low-cost end of the market. The Astor GR/GRP is one such example.

The Astor Football (GR, GRP)

The Astor "Football", as it is affectionately known, is a small, 3-valve, economy mantel broadcast receiver produced around 1948. "Football" wasn't its official name but the cabinet is around the same size and shape as an Australian Rules football, hence the unofficial nickname given to the set by users and collectors. It was intended for use as a kitchen or bedroom radio; anywhere radio signals were strong.

The Football's bakelite cabinet came in a few colours, with brown and cream being the most common. The cabinet is made in two parts, which are separated by undoing three screws, two underneath the cabinet through rubber buffers and the other through the back. However, the design leaves something to be desired, as the thread that goes through the cabinet to the rear retaining nut fouls the 6G8G valve and makes it difficult to replace the back.

To transport the set, four fingers are inserted through the back section of the case and it is then carried that way. However, an antenna is required for decent reception and the 5.2-metre permanently connected antenna doesn't lend itself to easy portability.

The set can have either of two type numbers: GR or GRP. GR refers to a set that uses a 50Hz power transformer and a 5Y3GT rectifier, whilst GRP refers to a set that uses a 40Hz transformer and a 6X5GT rectifier. Apart from that, the two sets are identical.

Circuit details

Because it is a TRF set, the Astor Football's circuit is quite simple. However, in order to obtain reasonable performance, reflexing is used to gain extra sensitivity. Fig.1 shows the circuit details.

The input tuned circuit (29, 13, 33, 34) is quite conventional, with no automatic gain control (AGC) voltage applied to a 6G86 RF valve. As shown,

the input signal from the antenna is amplified by the 6G8G and passed on to another tuned circuit (30, 12, 33 & 35). It then goes via an RC network to a detector diode in the 6G8G. The end of the untuned winding not connected to the 6G8G's plate is bypassed to earth via capacitor 6.

The detected audio signal is fed through resistor 18, capacitor 4 and resistor 16 to the grid of the 6G8G. The residual RF from the detector is largely filtered out by capacitor 9. Capacitor 8 prevents the audio and bias signals from being shunted to earth by the tuned circuit.

The 6G8G amplifies the audio as well as the RF signal. In the plate circuit, the untuned winding of the tuned circuit does not impede the audio signal. As far as the audio signal is concerned, there is only the plate load resistor (22) in circuit. The audio is developed across this resistor and applied via capacitor 3 to the grid of a 6V6GT audio output valve.

The 6V6GT amplifies this audio signal and applies it to a speaker transformer which in turn drives a 5-inch (125mm) loudspeaker. Note that there is no negative feedback in the audio circuitry, in keep with the Astor's role as an economy receiver.

The power supply is quite conventional, with either a 6X5GT or a 5Y3GT acting as a full-wave rectifier. The 6X5GT appears only to have been used in the units supplied with a power transformer intended for 40Hz operation. At the time this set was produced, Perth (WA) apparently had 40Hz mains while most of the rest of Australia had 50Hz mains.

Note that the 6.3V dial lamp is run from a 5V tapping on the heater winding in order to extend its life. Another point of interest is that the receiver's power consumption is around 35W, which is almost the same as most 5-valve sets of the era.

There is no conventional volume control. Instead, the volume is controlled by the back-bias system. This can be varied anywhere between -2V and -22V and is applied to the variable-mu 6G8G valve. The more bias, the less amplification.

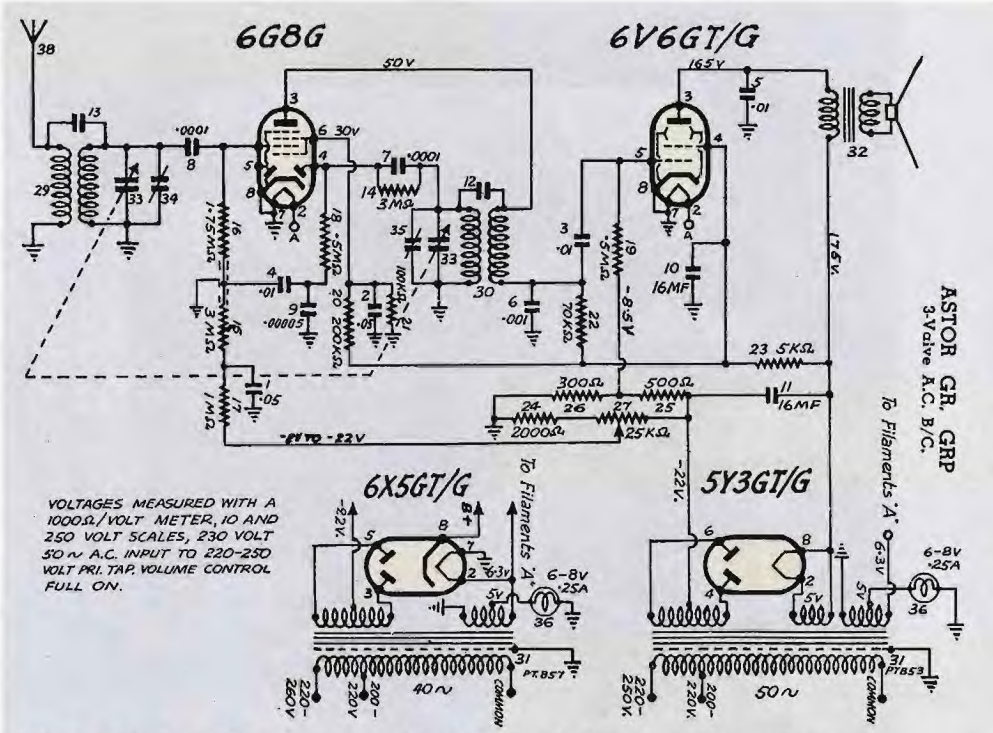
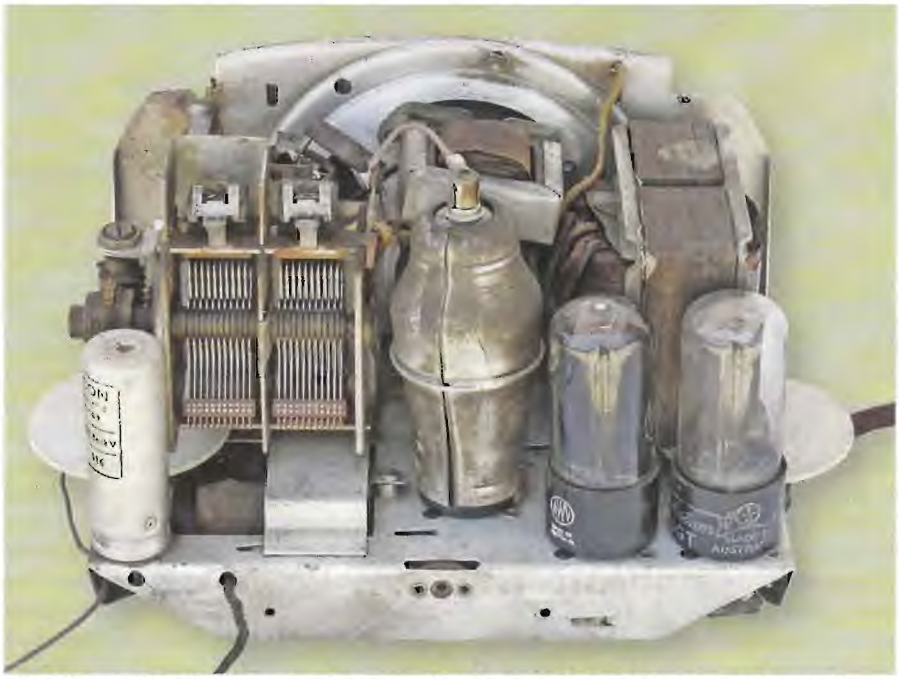


Fig.1: a 3-valve TRF circuit is used in the Astor GR/GRP receiver, with the 6G8G valve functioning as a reflexed RF and audio stage.



The above-chassis parts are close together but can be easily accessed once the valves have been removed. Note the metal shield on the 6B8G8 RF valve.

Restoring the GR

This particular receiver had been largely restored when it was given to me on loan. First, the bakelite cabinet was in good order and required no attention. Second, all the paper capacitors, one electrolytic filter capacitor and a couple of wires with perished insulation had been replaced. And third, the 2-core figure eight power lead had been replaced with a 3-core type.

The wires that had been replaced were bright blue and looked out of place. As a result, I replaced them with brown hook-up wire which looked similar to the original wiring.

The next thing I noticed was that the cardboard speaker cloth template was much the worse for wear. There were a couple of choices here – either

This view shows the underside of the chassis with the restoration nearly completed. Among other things, the mains cord should be rewired, so that its earth lead is attached to a crimp eyelet lug which is then securely bolted to the chassis (the soldered tag-strip connection to chassis shown here could become faulty, due to the joint going "cold").

I could make a new template out of thick cardboard or I could patch up the original by gluing strips of cardboard to it.

In the end, I decided to repair the existing template although in retrospect it would have been better to have made a new one. Of course, I only found some suitable cardboard after I had finished repairing the original template but that's always the way.

Next, the light-coloured speaker cloth had rotted so I replaced it with some new material. This was glued in place using Tarzan's Grip. Unfortunately, I only had dark-brown cloth, so I also had to change the colour of the dial pointer so that it could be seen. This was changed to white using a white-out correction pen and does not look out of place.

Parts layout

The parts under the chassis are all quite accessible, so the set is easy to service. The layout however, is something of a dog's breakfast. Because the set has relatively low gain, parts placement is not overly critical, although personally I like to see all components related to the operation of a particular section grouped together.

Above the chassis, things are rather different and there is little spare space. However, with the valves removed, all parts can be easily accessed for service.

This particular radio had apparently been used in a kitchen, as fat and grime were evident on the chassis and various components. This gunk was removed from the chassis (after removing the valves) using a kerosene-soaked kitchen scourer, after which the chassis was wiped down with a clean cloth. Kerosene is slightly oily and so some remains on the chassis and helps prevent further rusting.

Next, the knobs were cleaned with soapy water and a nailbrush to remove the finger grime that had built up over many years of use. However, while I was rotating the tuning control to gain access to all sections of the knob, I noticed that the fibre gear that drives the tuning capacitor has several badly damaged teeth. This means that tuning from one end of the dial to the other will eventually strip these rather delicate teeth.

This is an area of weakness in some Astor receivers but fortunately, a member of the HRSA makes replacement gears.

While looking at the dial-drive mechanism, I also noticed that all the pulleys that the dial cord runs over are riveted into place. This means that none are free to turn, which places further stress on the dial-drive mechanism but not on the fibre gear-drive, thankfully.

This is not an isolated incident as a previous Football that I serviced had exactly the same riveted dial-pulley problem. What's more, its a problem that cannot be easily overcome. Having said that, it's worked for around 60 years with no real problems, so it really isn't worth worrying about. Still, it really was a cheapskate method of constructing the dial-drive mechanism.

Trying it out

Having finished the repairs, I powered the set up while monitoring the various voltage rails. Everything was normal except for the plate voltages which came up slightly higher than shown on the circuit. However, this is understandable as the voltages marked on the circuit were obtained with a mains voltage of 230V AC while mine is 245V AC (despite the fact that the official voltage these days is 230V).

I had expected the radio to work properly from the outset but my confidence was misplaced. Instead, its performance was extremely poor and there was noticeable hum in the audio. So I had some troubleshooting to do.

First, I connected an electrolytic capacitor across each of the electros in the power supply in turn, to determine if one of these was faulty. This quickly showed that capacitor 10 was indeed faulty and this was confirmed when I checked it on my capacitance meter.

I replaced it with a 22µF 350V electrolytic capacitor, which I hid under the chassis. The old capacitor was simply disconnected but left in place to keep the set looking as authentic as possible.

With the new capacitor, the performance improved markedly, although it still wasn't brilliant. This isn't exactly a high-performance set but the performance was still well down compared to the one I had previously restored.

With the various voltages being relatively close to specification, I knew that the 5Y3GT rectifier valve was in good order. As a result, I tried replacing the 6V6GT audio output valve

but this gave no change. However, when I replaced the 6G8G, the set's performance improved dramatically. The original 6G8G was obviously well past its use-by date!

Alignment

All that was left now was to touch up the alignment. Alignment is a task that many newcomers to vintage radio endeavour to steer clear of and indeed, aligning some receivers is quite a task. Sets like the AWA 7-band series or a Barlow Wadley XCR-30, for example, can be quite a challenge.

By contrast, the Astor Football is extremely easy to align, with only three adjustments involved.

There is a standard procedure for aligning the receiver but for the average collector, a somewhat simpler method also works extremely well. First, connect the antenna that's normally used to the receiver, then adjust the dial pointer position for equal overshoot at each extremity of the dial. That done, tune to the low-frequency end of the dial and use a signal generator to check that the set is tuned to about 535kHz.

If you don't have a signal generator, just tune to a station that's close to the low-frequency end of the dial.

Because there is no adjustment to set the lowest frequency received, some sets may not tune down to 535kHz due to tolerances in the tuned circuit components. If so, there's not much you can do about it – just accept it.

The tuning should now be adjusted to 1400kHz or to a station that's close to this frequency. The dial is not marked with frequency indications so it will be necessary to check the station frequencies in order to do this.

Regardless as to whether a signal generator or a radio station is used as the signal source, the alignment procedure is the same. If the signal is received at a lower indicated frequency on the dial than where it should be, it will be necessary to screw both trimmer capacitors in to increase their capacitance. This will gradually move the tuning further up the dial, towards the correct spot.

Conversely, if the station appears higher up the dial that it should, reduce the trimmer capacitances. In both cases, it's only a matter of adjusting the trimmers to peak the signal at its correct dial location.

The selectivity of a TRF set mainly depends on the frequency that's tuned. In the case of the Football, the selectivity is about 10kHz at the low-frequency end (ie, at around 550kHz) and about 30kHz at the high-frequency end (ie, around 1400kHz). This is one of the deficiencies of TRF sets; ie, the higher the frequency tuned, the worse the selectivity.

These views show the front of the chassis without the speaker cloth (top) and with the new speaker cloth attached (bottom).

Summary

The Astor GR /GRP football is very much an economy set and corners were cut in its design, as shown by the dial-pulley arrangement. Basically, it is an uncomplicated TRF set with reflexing around the 6G8G. However, don't be put off by the idea of reflexing, as it is not a troublesome area in this set.

If there are problems, it is only necessary to measure the values of the various components in this section to determine where the problem lies.

The set is easy to work on below the chassis, although not quite so easy on top. It is dead simple to align but not very sensitive. However, for its intended use as a kitchen or bedroom set in a suburban environment, its performance is quite adequate.

There are few, if any, problems with this set that cannot be easily fixed. For this reason alone, it would make an ideal first restoration project.

In short, the Astor football is a favourite with many collectors and is well-worth having in a collection, as it was one of the last domestic TRF valve designs to be sold in Australia. **SC**