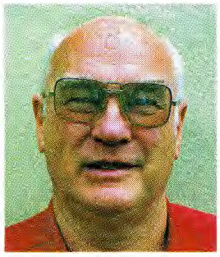
VINTAGE RADIO

By RODNEY CHAMPNESS, VK3UG



The 4-valve Precedent mantel receiver (circa 1953)

Designed for those on a budget, the 4-valve Precedent mantel receiver was released onto the Australian market in the early 1950s. It's a relatively simple set with many cost-cutting features but it still worked quite well in suburban areas.

A. W. JACKSON INDUSTRIES of Sydney produced Precedent radios and B & W TV receivers from the 1950s until somewhere about 1975, when colour TV was introduced into Australia.

The receivers were aimed at the lower end of the market. In fact, many people looked down on the brand and wouldn't be seen dead selling or using such receivers. But although they were cheaper than other brands, they were remarkably reliable, had simple circuitry that worked quite well, and were generally easy to service. However, they certainly were not the Rolls Royce of radios.

The 4-valve receiver featured in this article was in a rather sorry state when it first came to me, as can be seen in the photographs. The cabinet was cracked, the works were covered in a layer of muck, the power lead had perished and exposed power wires were quite evident at the back of the set. In addition, parts of the chassis and the power transformer were showing extensive rust.

This is the 4-valve Precedent mantel set before restoration. Its cabinet had a bad crack at the top and was held together by masking tape.

However, things were much better under the chassis, with only a number of cobwebs to be removed. Even so, it was obvious that quite a challenge lay ahead of me to restore the receiver. It would never be a valuable set but would be an interesting one just the same.

Essential checks

The first job was to make sure that the power transformer was in good condition – especially since its case was badly rusted. This was one set that would not be valuable enough to restore if its power transformer was faulty, unless a similar transformer was readily available.

As a result, the transformer was carefully tested with my high voltage tester. This involved checking for high-voltage breakdown between the various windings and the transformer frame. It all checked out OK.

Next, the audio output transformer windings were checked for continuity. In this case, a replacement would be required, as the primary winding was open circuit. By contrast, the intermediate frequency (IF) transformers and the aerial and oscillator coils all had continuity, so the restoration would not require any "hard-to-get" replacement parts.

Cleaning up

Unfortunately, the cabinet top had

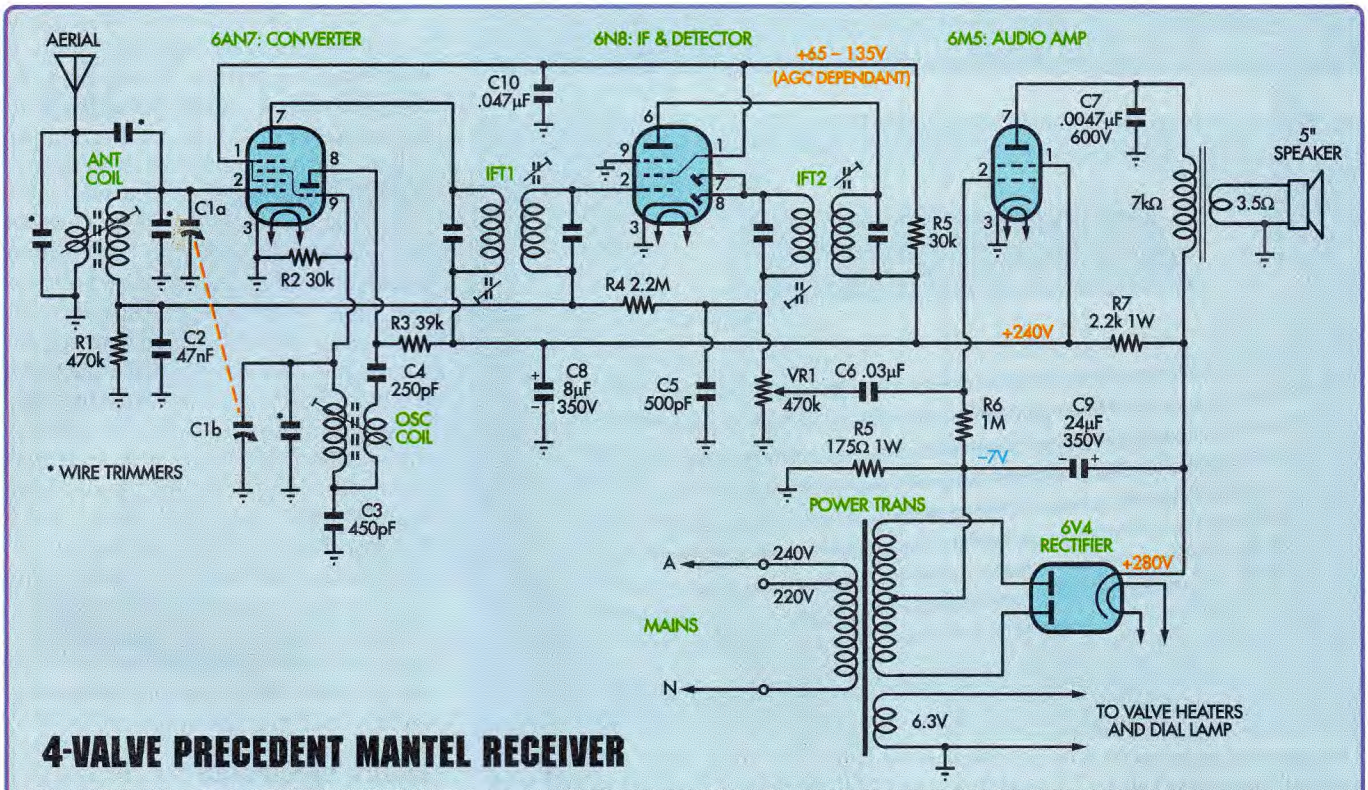


Fig.1: the circuit for the Precedent receiver is a fairly conventional "austerity-model" 4-valve superhet.

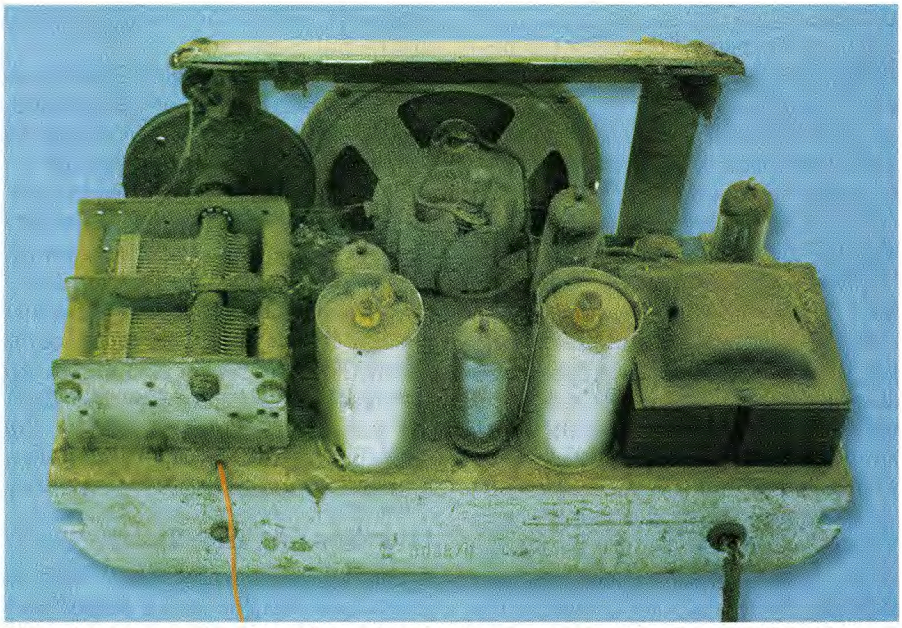
cracked and it had been "repaired" using masking tape. Obviously, a much better repair was needed and so the cabinet was scraped clean of the masking tape and then placed into the laundry wash tub, together with the knobs. It was then thoroughly cleaned using a scrubbing brush and soapy water.

The cabinet was then rinsed in clean water as the cracks needed to be free of any "muck" before being glued together later on. Both the cabinet and knobs looked first class after cleaning and were then set aside so that other work could be done.

The valves were also cleaned using soapy water but you have to make sure that the type numbers don't get rubbed off during this process. This involves holding the valves upside down (to keep water out of the socket) and then gently washing the envelopes but completely avoiding the type numbers.

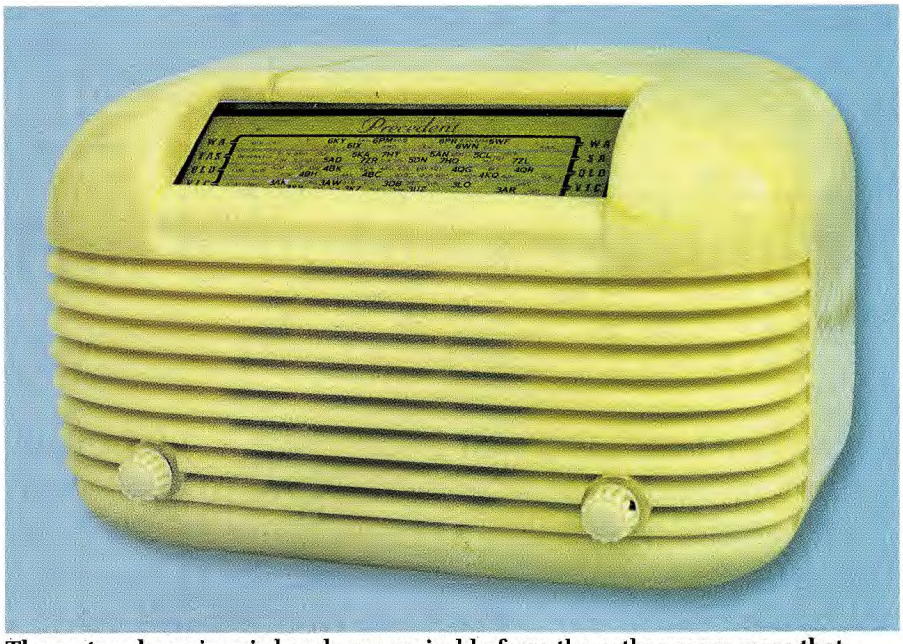
That done, the valves were rinsed in clean water and left to dry. Valves really do look good after they have been cleaned!

After they had dried, I scratched between pins 1 & 2 of the 6M5 with a screwdriver so that any silver migration between grid and screen would be disrupted. This prevents positive voltage being applied to the grid. It might sound like a strange thing to do but 6M5s have been known to have silver migration between these pins, which means that the valves are often (needlessly) thrown out because they are thought to be "gassy".



This view shows the state of the chassis. It was covered in a layer of dirt, the power lead had perished (exposing the wires) and parts of the chassis and the power transformer were covered in rust.

The next job was to clean up the chassis. It was quite rusty in spots but I stuck to my usual cleaning techniques. First, the chassis was dusted using a small paintbrush, after which I "huffed and puffed" and blew out as much dust as I could. Of course, a small compressor would be ideal for



The restored receiver is barely recognisable from the rather sorry mess that arrived in my workshop. The cabinet was repaired using fibreglass mixed with cream craft paint.

this job but I don't have one, unfortunately.

The next stage of the cleaning procedure involved using a kerosene-soaked kitchen scourer (or a segment of one) to scrub the chassis as thoroughly as I could. I use a screwdriver to push the scourer into odd corners and the end result, after wiping the chassis down with a rag, was a marked improvement in the appearance of the set.

In this case, I decided against painting the chassis, as this set isn't valuable enough to warrant this type of effort. The fact that it is quite rusty shows that the chassis wasn't well-plated in the first place.

Next, the dial scale was cleaned with a damp rag and it came up quite well. However, the method used to indicate the pointer location on the dial drive system is primitive to say the least. The pointer used is the common slide type, however it cannot normally be seen through the scale. So, in order to indicate the pointer position, a dial lamp is set back by about 50mm behind the scale and the shadow cast by the pointer on the scale indicates the tuning.

Unfortunately, because the lamp position is fixed, the shadow is quite hard to see at the extremities of the tuning range. In addition, parallax error greatly affects the tuning accuracy at the dial extremities.

Of course, this probably didn't matter for a cheap kitchen or garage radio, as most of the time it would simply be left on the favourite radio station.

In its favour, the dial drive mechanism is cheap and works reasonably well, although it does suffer from increased resistance at the low frequency end of the dial. In my case, I was just getting it all functioning correctly when the cord broke, so I ended up having to re-string the dial drive (not the easiest of jobs). In addition, the globe behind the dial scale had blown and had to be replaced.

Overhauling the circuitry

Having a circuit to follow always makes servicing so much easier but I couldn't find this set in any of the Australian Official Radio Service Manuals I consulted.

According to the markings on the loudspeaker transformer, it was probably made in 1953 but I was unable to find a circuit anywhere. In the end, I had to trace the circuit out with the aid of a valve data book and a multimeter. Fig.1 shows the details and as can be seen, it is a conventional "austerity model" 4-valve superhet.

Getting back to the set, the original 2-core mains lead had perished. **It was replaced with a 3-core lead, so that the chassis could be earthed in the interests of safety.** That done, the valves were all removed and the receiver then plugged into power.

A quick check with a DMM showed that all windings on the transformer were delivering the correct voltages and there were no signs of overheating, even after it had been running for some time. This indicated that there were no shorted turns in the windings.

As mentioned earlier, the speaker transformer was faulty and so it was replaced with an M1100 "Audio Line Transformer" from Dick Smith Electronics. The plate circuit was wired across the 5kΩ winding, while the speaker was connected to the 2Ω secondary. This gives a reasonable impedance ratio compromise between the primary (6M5 plate) and the secondary load (ie, the speaker).

Leaky electrolytic

A quick check with a DMM showed a high resistance (over 50kΩ) between the high-tension (HT) line and the chassis. That cleared the HT line of any shorts, so the multimeter was switched to the 400V range and one lead connected to chassis via a clip lead. That done, the 6V4 rectifier was plugged in, the set turned on and the voltages across the 24µF (C9) and 8µF (C8) capacitors were checked.

This quickly showed that the voltage across the 8µF capacitor wasn't rising to the correct value. And when the power was turned off, the voltage across this capacitor quickly disappeared. The reason for this was straightforward – the capacitor was leaky and in fact showed 12mA of leakage current after several on-off cycles.

Just to confirm it was faulty, I removed it and checked the circuit again. This time, the 24µF capacitor discharged slowly when the power was removed so it was in good condition. A replacement 8µF capacitor fixed the problem and the power supply then worked correctly.

Next, the paper capacitors were all checked but only one was found to be excessively leaky. This time, the culprit was C6, a .03µF audio coupler to the 6M5 grid. It too was replaced.

Having done all that, the other three valves were plugged in and the set

Photo Gallery: Zenith Radio Calstan Receiver (1947)

Manufactured by Zenith Radio Co Pty Ltd (Sydney) in 1947, the Calstan was a medium-sized, 5-valve receiver which was housed in a handsome timber cabinet. It used the following valve line-up: 6A8-G frequency changer; 6U7-G IF amplifier; 6B6-G detector, AVC rectifier and 1st audio amplifier; 6V6-GT audio output stage; and a 5Y3-GT rectifier. The Calstan brand was also well-known at the time for a range of test equipment, the word being an abbreviation of the phrase "calibrated-to-standard". (Photo courtesy Historical Radio Society Of Australia (Inc.).

switched on again. It quickly burst into life, with stations appearing right across the dial. Fairly obviously, all the valves were in good order - in fact, I find I have to replace very few valves in these old receivers.

Annoying whistle

Unfortunately, that wasn't the end of the set's problems. It had only been on a short while when it started to whistle on all the stations, particularly those in the middle of the dial. The volume control did have some effect on these whistles and it was obvious that the IF stage was oscillating.

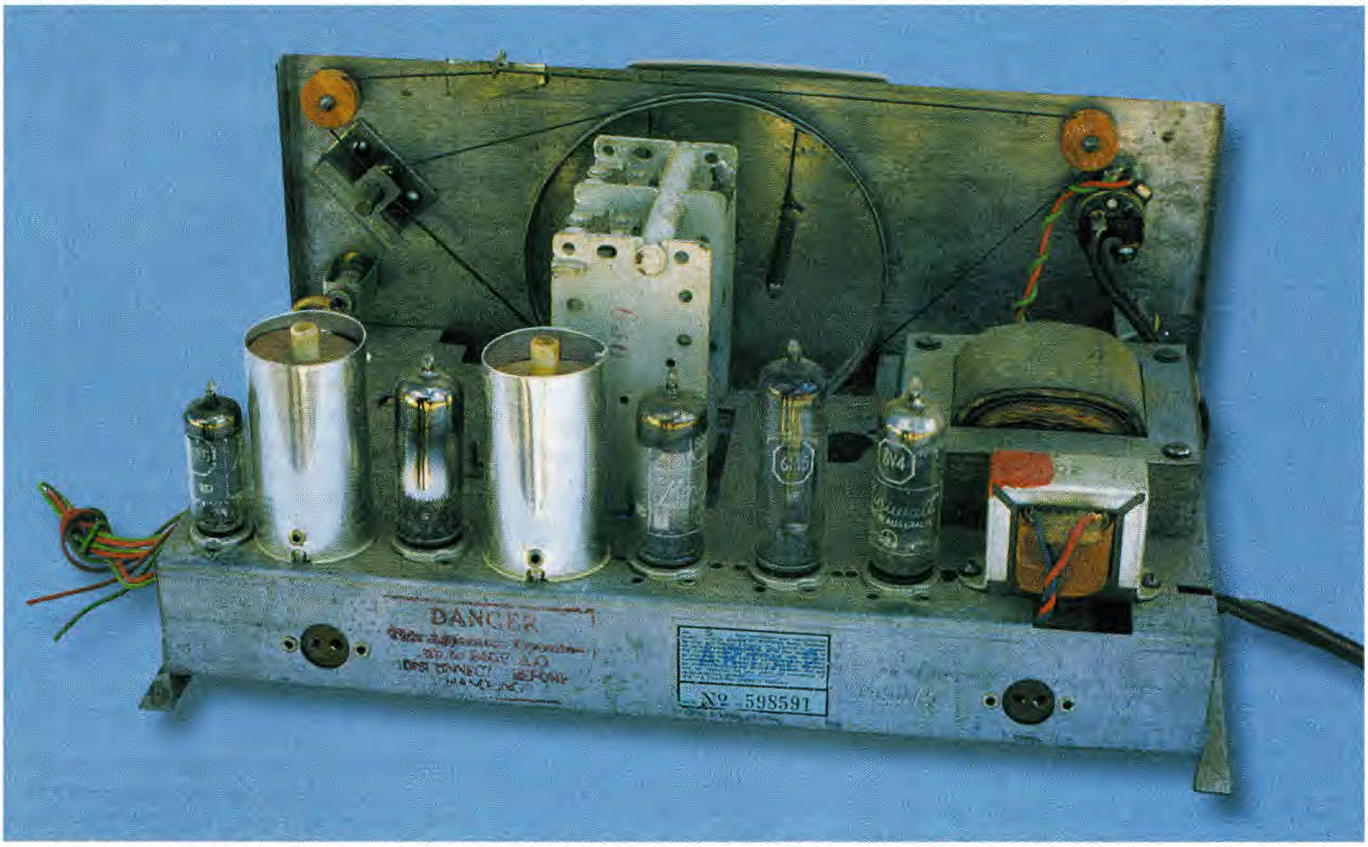
OK, so how could the set be made stable? First, I tried installing a new screen bypass capacitor from pin 1 of the 6N8 to earth and while that improved matters somewhat, the instability was still there. And as a matter of interest, the original paper capacitor had been fitted incorrectly, as its outer foil (shield) was connected to pin 1 of the 6N8 instead of to earth.

My next suspect was the .0047µF plate bypass capacitor (C7) on pin 7 the 6M5 audio output stage. Its job is to get rid of any IF (455kHz) components in the audio, so I tried another capacitor here and the whistle stopped. It's worth noting that neither of the original capacitors was excessively leaky (electrically) but it would appear that they were more inductive than the later types that were substituted.

By now, the little Precedent receiver was bringing in the stronger stations at very good volume. However, the volume control to be advanced quite a bit for the weaker stations so I decided to take a close look at the automatic gain control (AGC) system.

The AGC system used in this set is actually quite simple. However, it is a bit strange in that only one fifth of the developed AGC voltage is actually applied to the 6N8 and 6AN7 valves by virtue of the voltage divider formed by resistors R1 and R4. This was done to ensure that the AGC-controlled valves worked at nearly at full performance – even with strong signals – so that good audio volume could be achieved.

A few quick checks showed that with R1 in circuit, the AGC voltage at the detector is about -27V on the strongest local station. Conversely,



This 1958 5-valve radiogram chassis shows the quality improvements that Precedent made to its later model sets. Its dial mechanism is light years ahead of the 4-valve mantel set's dial-drive system.

with R1 disconnected, the voltage is only about -9V but the audio output is more even on all stations, with no "blasting" when tuning to a strong station.

At the time, this made me wonder if R1 had been added by a serviceman at some stage during the set's life to boost the audio output for suburban use. However, I subsequently came across another 4-valve set that uses a similar AGC circuit, so perhaps it is original.

In my case, I decided to leave out R1 as this gave better performance. Resistor R4 had also gone high in value and was replaced.

Unusual effect

As an aside, it's interesting to note that a rather unusual effect would have occurred if C6 had not been replaced. Because it had gone leaky, this capacitor would have passed some of the negative DC output from the detector to the grid of the 6M5 audio output stage. As a result, the 6M5 would have progressively been cut off as the volume control was increased on a strong station, resulting in decreased or no audio!

Note that neither the 6AN7 nor the 6N8 have any bias applied to them in the absence of a signal. This means that the receiver must to be tuned to a station in order for AGC bias to be applied to these valves. However, the set's designer could have applied delayed AGC and back bias to these two valves by adding just two extra resistors and a 47pF mica capacitor. It would have meant a very small increase in complexity for a better performing AGC system.

By now the set was performing quite well and so it was left to run on the bench to see if anything else showed up. As it turned out, it ran OK for several days and then started to motorboat (ie, it produced a noise from the speaker that sounded like the engine of a motorboat). This usually indicates a faulty electrolytic capacitor and this can be checked by bridging each capacitor in turn with an equivalent value.

In this case, the receiver's operation returned to normal when I bridged the new 8μF capacitor that I'd installed earlier. A faulty new capacitor? No, I'd managed to make a dry solder joint on one of its leads, which was rather embarrassing! Resoldering the joint fixed the problem.

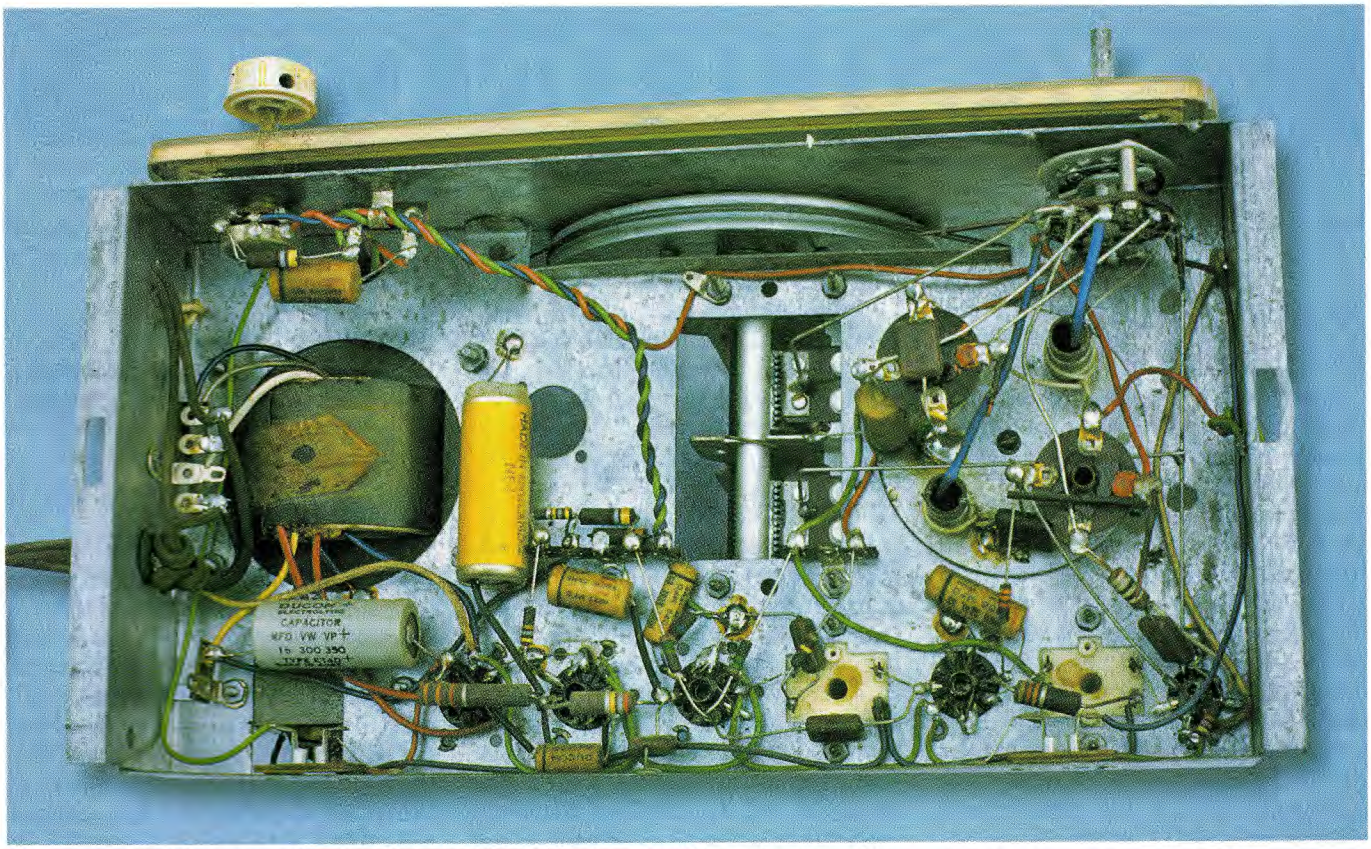
Alignment

This set isn't easy to align, not because it's a difficult procedure but because the IF transformer slugs are well sealed. In addition, all the trimmer capacitors marked with an asterisk (*) on the circuit are in fact made from a thick piece of enamelled copper wire which is overwound with thin enamelled copper wire.

Because the set's performance appeared to be quite satisfactory, I initially decided it would be too much trouble to try to peak the tuning adjustments. In fact, they obviously weren't intended to be altered after they had been set by the manufacturer.

In this set, the oscillator is a little different to normal in that it's shunt fed, with no DC voltage on either of the oscillator coil windings. However, capacitor C3 provides padder feedback to ensure reliable oscillator operation across the band.

As it stood, the IF amplifier was peaked at about 460kHz and I decided to leave it alone. However, the high-frequency end of the tuning range



The component layout under the chassis of the later (5-valve) Precedent receiver was clean and uncluttered. Its chassis is of much better quality than the earlier 4-valve set, although it was still aimed at the lower end of the market.

of the receiver only extended to 1580kHz, so some work was needed here. This involved taking a few turns off each of the oscillator and aerial trimmer capacitors, after which the core of the aerial coil was adjusted at the low-frequency end of the dial. The tuning range was then quite satisfactory and all the expected stations were received.

The sensitivity of the receiver is good at the high frequencies but it's a bit ordinary at the lower frequencies. However, any station worth listening to at my location was quite audible.

Cabinet repair

The techniques described in the article in the July 2001 issue were used to repair the Bakelite cabinet. Fortunately, it was just a matter of fixing the cracks and breaks and no sections had to be fabricated as is sometimes necessary.

Unfortunately, I couldn't get the break in the top of the cabinet to mate, despite using quite a bit of pressure. As a result, I had to glue it first and then apply fibreglass to the underside of the cabinet top. I also scraped out some of the glue on the top of the cabinet and then filled the resulting grooves with fibreglass that had been mixed with some craftwork paint.

Cream isn't an easy colour to match but the finished cabinet looks quite reasonable. And, at least, it won't fall to pieces.

Summary

This cheap, little 4-valve set really was designed for the lower end of the market. As mentioned above, the chassis was only lightly plated and it had rusted badly in spots. In addition, the layout both above and underneath the chassis is rough and ready.

The cost-cutting is evident everywhere. For example, the IF transformers are each made out of a flat piece of metal which has been rolled into a cylinder and the overlapping ends riveted together. And on a similar theme, the transformer windings are on a plastic former which is fitted with top and bottom plastic plates.

The dial system also leaves a bit to be desired. It does work but it's not up to the standard of most other sets.

Does it have any good points? Yes, definitely – it's cheap, its performance is not far behind that of most 5-valve sets and it's easy to dismantle. In fact, it takes less than a minute to remove the chassis from its cabinet.

Try doing that with an AWA "seven bander" – they take nearly half an hour to dismantle or to reassemble.

It's not a set that I'd crawl over hot coals to obtain, however. Instead, it's an interesting low-end receiver that's worthy of collecting, if only to show just how well low-cost receivers can perform.

Finally, it's worth noting that the quality of the Precedent receivers improved markedly in just a few years. For example, I have a 1958 dual-wave 5-valve radiogram chassis and that unit shows a significant improvement in all areas of design and manufacture. The chassis is better quality, the layout of the components and the design is better, the accessibility is improved (it was good beforehand), and the dial mechanism is light years ahead of the 4-valve mantel set's dial-drive system.

The later unit also looked far more professional, although it was still aimed at the lower end of the market. A. W. Jackson Industries and Precedent receivers are a small but important part of our radio heritage. **SC**