Vintage Radio

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The deadly & the difficult – when to say no to a restoration

The "Pilot Little Maestro" is a 5-valve medium-wave (MW) and long-wave (LW) receiver made in 1939. It's potentially deadly, as revealed in the text.

Deadly equipment and difficult faults can present real challenges when restoring vintage radio gear. Sometimes, you just have to say "no" to a set that's just too dangerous to use unless it's correctly modified.

GENERALLY, we expect a vintage radio to be intrinsically safe due to its inherent design and as a result of either careful restoration or proper maintenance throughout its life.

Of course, if we are restoring an old set to working order, then nothing can be taken for granted. In fact, it is only to be expected that some faults may have developed in the set, particularly if it has been stored for many years in a garage or shed in less than perfect conditions.

In particular, equipment that's been attacked by rodents and various creepy crawlies will need careful attention to ensure a successful (and safe) restoration. This same goes if the set has been subjected to damp, dusty and hot/cold conditions.

I have seen pictures of receivers that have been restored from absolute wrecks to pristine condition by dedicated enthusiasts. However, when the ravages of time and storage inadequacies have taken their toll, it is time to sit down and determine whether restoration really is worth the effort.

Of course, an extremely rare piece of equipment will be well worth it, provided it isn't like grandad's axe. You've probably heard the saying – it's had five new handles and three new heads but it's still grandad's original axe!

Well hardly and the same applies to rare vintage radios if the parts aren't original or, at least, the correct replacements.

If only a few parts of a set are recoverable, will it really be a genuine restoration or just a replica that happens to use some original parts? Not that there's really anything wrong with replicas. They are sometimes the only way of showing us how technology achieved things in times gone by.

Making the assessment

Assuming that the power cord itself is OK, the first thing to do when assessing whether an AC-powered radio is worth restoring is to check the power transformer. There are a couple of tests that will quickly reveal whether a power transformer has withstood the ravages of time. But first, if the set has been stored in a damp location, it's worthwhile heating the chassis with the transformer still attached in a kitchen oven at around 50-60°C for a few hours.

This will help to dry out any moisture in the transformer and make the

An above-chassis view of the Pilot Little Maestro. As originally designed, it was a AC/DC set with one side of the mains connected to chassis but this particular unit has been modified to run from an external power supply for safe operation.

following tests more realistic.

The next step to test the insulation between transformer's primary winding and the frame and also between the primary and secondary windings. The secondary high-tension (HT) winding also needs to be checked to ensure that it has no shorts to frame. This will usually involve lifting the centre tap of this winding from the chassis (or lifting the low-value resistor in series with it).

I do this insulation test at 1000V using a high-voltage, high-impedance tester. Mine was obtained as a kit from Altronics several years ago (Cat K-2555). If this test shows the insulation resistance to be greater than around 200MΩ between the various sections, the next test can be carried out.

This involves removing the rectifier valve, then connecting power to the transformer and running it for about 30 minutes. If, at the end of this period, the transformer is only slightly warm, it is fairly safe to say that it is in good order, provided there is continuity in each of the windings.

By the way, don't leave the equipment unattended during this test. If there is a fault in the transformer (eg, shorted turns) it will quickly overheat and will need to be turned off promptly.

From my experience, faulty power transformers are quite rare even after several decades in storage, often in less than ideal conditions. I have, however, come across a number of transformers which have perished leads emerging from the windings. Left as they are, disaster is just around the corner in the form of short circuits and a burnt-out transformer.

Depending on how the transformer is made, I have in some cases taken off the cover plates and installed new lead-out wires. Alternatively, if that is not possible, I have carefully removed the old insulation from the various leads and replaced it with fresh insulation.

Usually, the insulation has become hard and it can be cracked off using a pair of pliers. I then slip on new spaghetti insulation over the bare wires to make the transformer safe to use. I also often tie some of the leads together with plastic spaghetti and also use some clear nail polish to hold the sleeves in position where they emerge from the windings on the transformer.

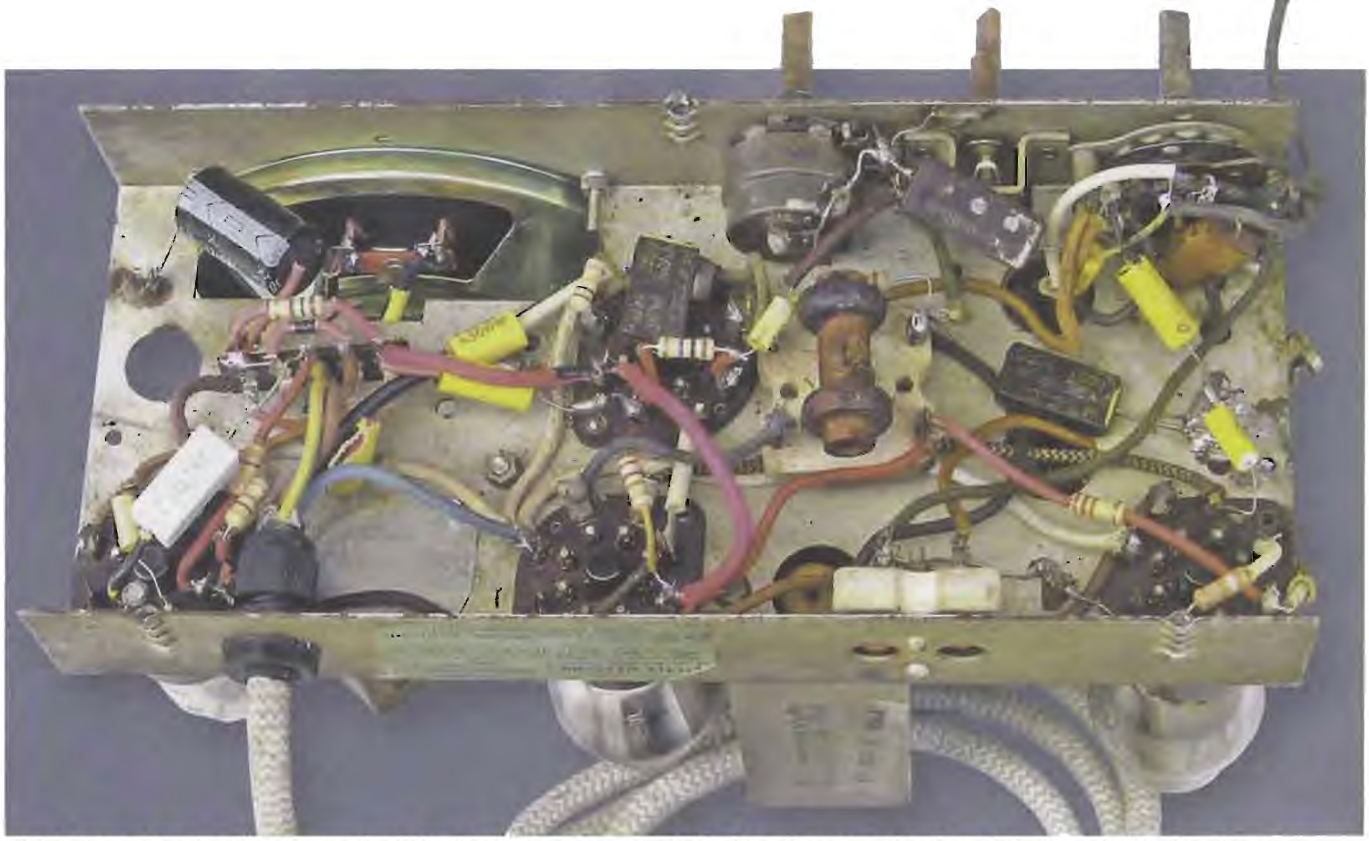
If the power transformer is faulty, it may mean that restoring the receiver is not an economic proposition. Alternatively, it may be impossible to restore if a suitable replacement isn't available. However, substituting a transformer from another set is often practical, providing it has a similar rating and fits the available chassis space.

Dial scale

The value of a receiver drops dramatically if the dial scale is broken or missing. To get around this problem, some restorers have become quite skilled at using computers to make new dial scales.

In some cases, they lay the broken pieces out in position and then scan the dial into a computer. Then, using a drawing program, they use this as a template to make another scale which can be printed out onto plastic film and fitted to a glass backing.

Some restorers even provide a service to others by supplying dial glasses



This below-chassis view shows the Pilot Little Maestro after it had been restored and modified. It's basically close to original except for the power supply wiring. Note the long metal control shafts. They protruded through the front of the wooden cabinet and, with the original power supply arrangement, could deliver a potentially lethal shock to an unsuspecting user if one of the push-fit knobs came off.

for a whole range of sets.

Most other items in a receiver can either be repaired or replacement parts salvaged from other wrecked sets. Of course, the closer those parts are in appearance to the originals, the better.

Cabinet restoration is often a big problem for many people, myself included (although I can do minor repairs successfully). The fact is, major cabinet restoration work is a craftsman's skill. It's a skill that some have though and I've seen some magnificently restored cabinets over the years.

It's important to consider all of the above factors before taking on a major restoration job. But that's not all you have to consider. You also have to think about safety, especially when it comes to AC/DC sets (ie, sets without a mains transformer).

A deadly receiver

We come now to vintage radios which, due to their design, are inherently dangerous or, in fact, even deadly.

Not that long ago, I was looking at a couple of sets that belonged to a fellow restorer. I was rather keen to write them up for SILICON CHIP, as they both looked quite interesting. One was a Philco AC/DC mantel receiver and this was featured in the January 2009 issue. The other was a "Pilot Little Maestro", a 5-valve medium-wave (MW) and long-wave (LW) receiver made in 1939. We only used LW for a short time in Australia but LW had been used in Europe for quite some time before the war.

This set is a British 240V AC/DC unit and was apparently adapted from an American design that ran on 110V AC/DC. As with nearly all AC/DC sets, the valves heaters are all in series.

The valve line-up included a 6A8G, a 6K7G, a 6Q7G, a 25AG5 and a 25Z6G. These valves all used 0.3A heaters and the total voltage drop across these heaters was around 69V. This meant that a further 171V needed to be dropped across a resistor in series with the heaters, so that the latter would not draw more than 0.3A from the mains.

By contrast, the high tension (HT) current would have been around 50mA, so the total power drawn from the mains would have been about 85W, of which 51W would have been lost across the heater series resistor. In practice, this resistor was actually formed into the mains power cord and care would have been necessary to ensure it had adequate ventilation and that it wasn't placed near flammable material.

In this set, one side of the mains is connected directly to the chassis via the on/off switch. That's par for the course with AC/DC sets but in this case, the controls protrude through the front of the wooden cabinet. This means that if one of the push-fit control knobs were to come off, the exposed shaft could well be sitting at 240V!

In addition, the cabinet back is held in place using just four wood screws. There are no warnings on the back of the set about the possibility of electric shock, if the back is removed.

In short, I consider it to be a very dangerous set.

Modifications

A close inspection revealed that this particular set had been considerably modified by a previous owner. First, the 25V valves had been removed. A 6BW6 had then been substituted for the 25A6G, while a silicon diode replaced the 25Z6G rectifier. The filament supply was provided by a 6.3V filament transformer.

The set still had the mains con-

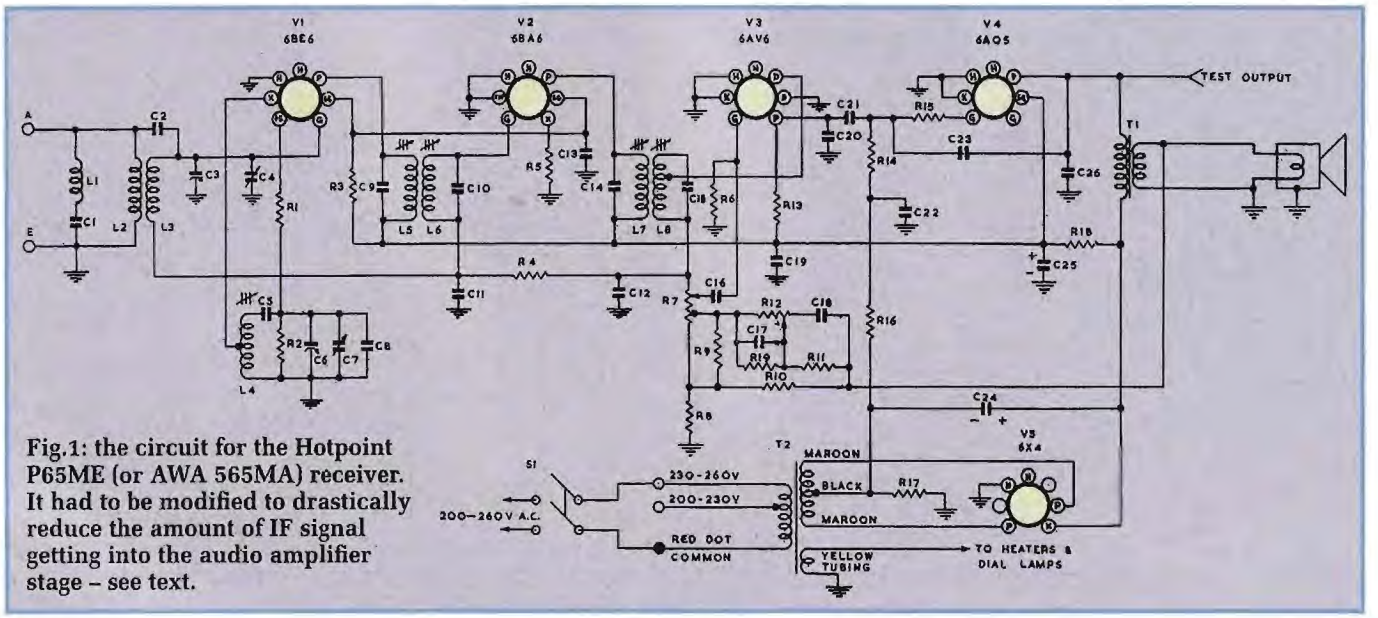


Fig.1: the circuit for the Hotpoint P65ME (or AWA 565MA) receiver. It had to be modified to drastically reduce the amount of IF signal getting into the audio amplifier stage – see text.

nected to the chassis and the HT was produced by using the silicon diode to rectify the incoming 240VAC. But that wasn't all – the standard of the revised wiring was atrocious.

In view of this, I refused to work on the set as I didn't think I could make it safe without spending a lot of time on it. However, a fellow vintage radio buff (Marcus) did have the time to make the set both safe and usable. He agreed that it was a death trap as it was and so decided to convert the set to AC operation only by using an external power supply. That way, the mains could be completely isolated from the chassis.

To cut a long story short, after quite a bit of effort restoring the set and making up an external power supply, the set is now working satisfactorily. It might not be completely authentic but the main part of the set is close to original condition with only the power supply wiring altered extensively.

This conversion is stage one, as Marcus has suggested to the set's owner that he obtain a power transformer from a defunct set that will fit the chassis. That way, they can eventually do away with the external supply.

The performance of the set as modified is good and it also works quite well on long-wave. It's just a pity that this AC/DC set could well have caused a fatality in its original condition.

Difficult faults

Most vintage radio restorations follow a fairly routine path. The cabinet is easily assessed and the work on that is relatively straightforward for those with reasonable woodworking skills.

Next, a careful examination of the chassis will soon reveal any mechanical items that need attention, while many component faults will also be quite obvious. These faults include capacitors with cracks, bulges or extruded melted wax and resistors that show obvious signs of overheating.

A close inspection will also soon reveal perished wiring, shorts, poor soldered joints and any damage due to rodents and insects.

Of course, capacitors and resistors also need to be electrically checked to make sure they are in good order. Old paper capacitors, for example, are usually leaky and many will need replacement. Valves are more reliable than many people believe and I find that I only have to replace them occasionally.

Once all the faults have been fixed, some sets will also require alignment – especially where a previous owner has had a bit of a fiddle.

However, while most restorations are routine, occasionally a particularly difficult fault will be encountered. These can cause a range of symptoms including instability, distortion, tuning and alignment difficulties and other weird faults. Let's look at a couple of examples that I've had to deal with.

Hotpoint P65ME/AWA 565MA

A friend of mine (Richard) had been having problems with a couple of his sets. Both were unstable, with multiple whistles across the band and generally just sounded unpleasant. They were also experiencing interference problems on the shortwave band.

The first set we tackled was a Hotpoint P65ME. This is quite a nice looking set and a good job had been done on its restoration.

If there is instability and it appears to be due to feedback in the intermediate frequency (IF) amplifier, the first step is to make sure that little or no IF energy is getting into the audio amplifier stage. Amplification of the IF signal by the audio stages can easily generate sufficient positive feedback to make a set unstable.

Fortunately, I'd had previous experience in solving what is basically a design shortcoming in this set. This involves several simple circuit modifications. Fig.1 shows the relevant circuit details of the set.

The first thing I did was to cut the connection between the bottom of L8 and the top of resistor R7. A 47kΩ resistor was then fitted between these two points and a 100pF mica capacitor added between the bottom of L8 and the chassis to provide additional IF filtering (see Fig.3).

In addition, a 47pF capacitor was connected between the grid of the 6AQ5 and the chassis (Fig.4).

Together, these modifications drastically reduced the IF signal on the grid of the 6AQ5. The set was now much more stable but a whistle could still be heard when tuning across the band.

Next, I removed the 6BA6 IF amplifier and checked the AGC (automatic

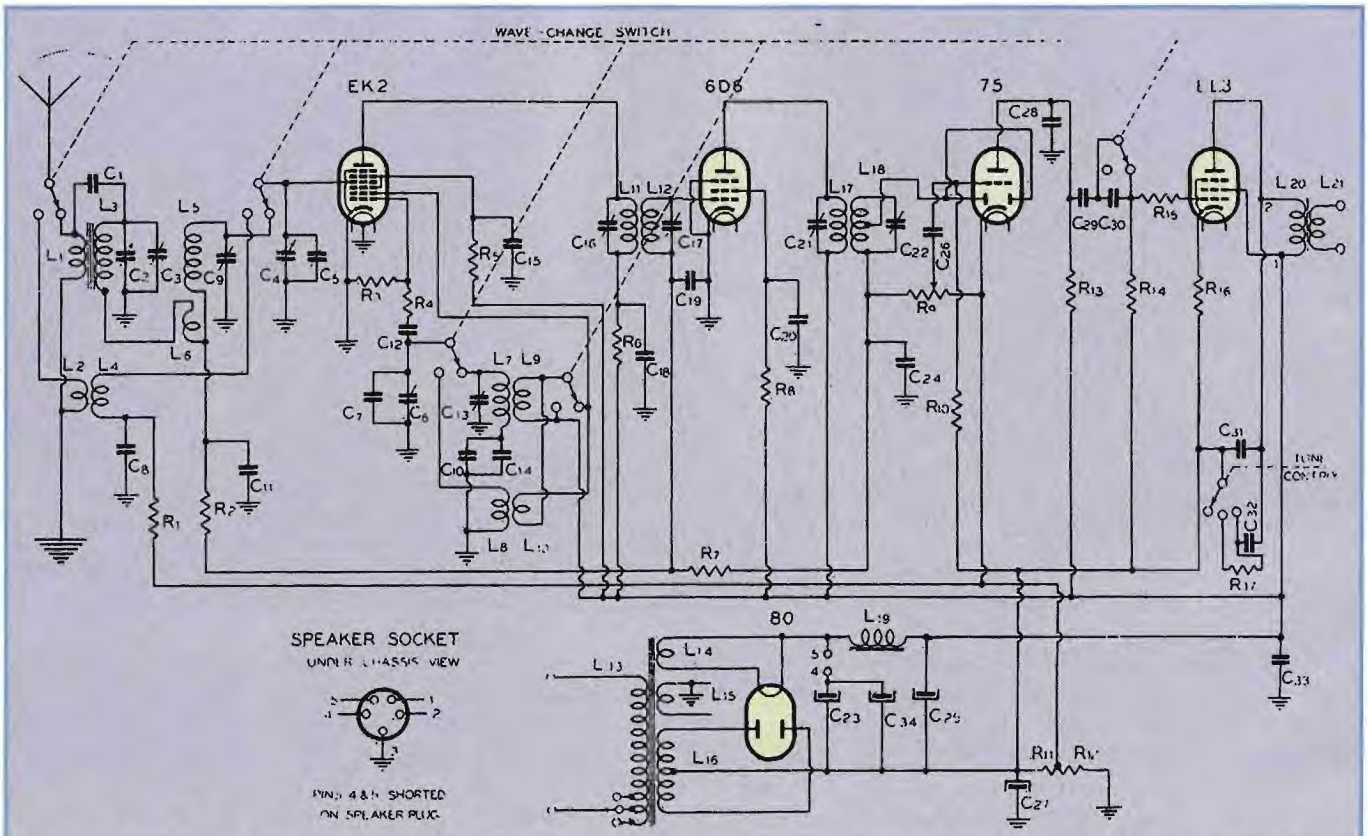


Fig.2: this Philips 1252 circuit also required several modifications to make it stable. This involved decoupling the HT line to the early stages and fitting a screen-stopper resistor to the EL3NG audio output valve – see Fig.4.

gain control) voltage. This measured 0V so I reinstalled the 6BA6 and removed the 6BE6. The set now had several volts of AGC bias when there should have been none.

Simply touching the 6BA6 or placing a finger on its grid altered the AGC voltage level, so the IF amplifier was obviously going into oscillation. This signal was being detected by the diodes in the 6AV6 which in turn provided the AGC voltage.

We substituted another 6BA6 and that completely fixed the problem. So a new 6BA6 and the added IF filtering made the set better than ever.

I later suggested to Richard that he try refitting the old 6BA6 in the set, along with an earthed metal shield for this valve. My reasoning here was that the 6BA6 has an internal shield that is wired to pin 2 of its base. If a weld had broken in the set's original valve, the shield would not be functional and so the valve would oscillate.

However, when Richard plugged the old 6BA6 back into the set, the instability was absent. There are two possibilities here: (1) the valve has an intermittent break in the shield line; or (2) the socket itself might have had some contact resistance which reduced the efficiency of the shielding.

This external power supply was built specifically for the Pilot Little Maestro. It delivers 180V DC (for the HT line) and 6.3VAC (for the valve heaters) and completely isolates the set from the mains, making it safe to use until a suitable transformer can be fitted to the chassis.

Philips 1252

Richard's Philips 1252 is a very attractive console set but its performance was also woeful. In particular, the IF coils could not be peaked without the IF amplifier going into oscillation, the tuning had many nasty unstable signals right across the shortwave band (7-22MHz) and the audio quality had a harsh edge to it.

Once again, Richard's restoration looked good. And as with his Hotpoint receiver, it appeared that the instability in the IF stage was due to excessive IF signal levels finding their way into the audio amplifier stages. As before, the cure was to add additional IF filtering.

Fig.2 shows the circuit details. In this case the line going downwards on the circuit from the bottom of L18 was broken and a 47kΩ resistor inserted into the break. A 100pF mica capacitor was then wired from the bottom of L18 to the chassis. Finally, a 47pF mica capacitor was wired from the

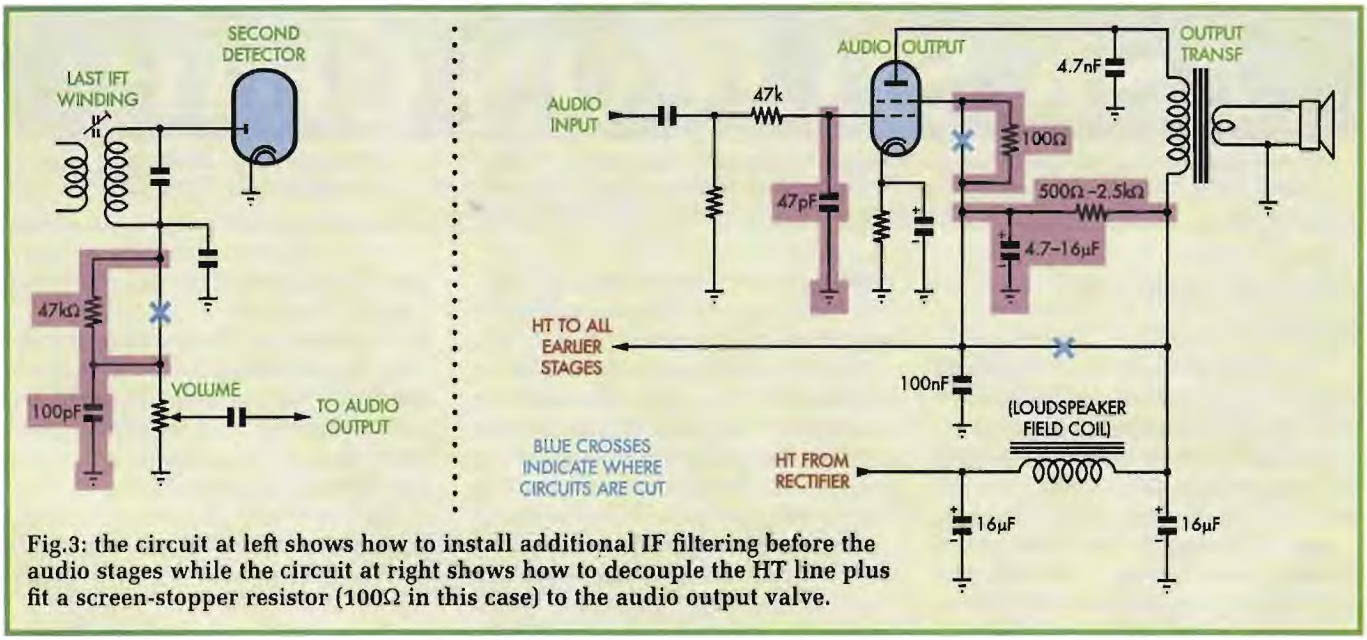


Fig.3: the circuit at left shows how to install additional IF filtering before the audio stages while the circuit at right shows how to decouple the HT line plus fit a screen-stopper resistor (100Ω in this case) to the audio output valve.

grid of the EL3 (EL3NG in this set) to the chassis.

This simple modification drastically curtailed the amount of IF signal being fed to the audio amplifier but that didn't cure all the set's ills.

Many sets using field coils (as in this set) have very little decoupling of the HT line after the field coil. As a result, any variation in current drain by the output valve plate circuit will slightly vary the HT in the early stages of the receiver. And this in turn can cause instability.

The answer here is to increase the decoupling of the HT line. This involves decoupling the HT line to both those early stages and to the screen of the output valve using a 1kΩ series resistor and an electrolytic capacitor (typically 16µF) – see Fig.3.

I fully expected this modification to finally cure all the set's problems but we got a rude shock. On the positive side, the IF could now be tuned to a peak without the set spilling over into oscillation. However, the nasty "birdies" on the shortwave band were still there and the audio was still harsh.

Acting on a hunch, I touched the body of the resistor that's used to decouple the front-end and the audio output stage and this caused the nasty sounds to alter. This indicated that the audio output stage was still bursting into supersonic oscillation despite the extra filtering that had been added. This was confirmed when we found that placing a hand near the EL3NG output valve had a similar effect.

Photo Gallery: Healing Golden Voice Console Radio

THE CONSOLE radios of the 1930s and 40s were typically fine examples of the furniture-maker's art. A good number of them shared exactly the same chassis as a large mantel radio from the same manufacturer or were only slightly modified.

Consoles had a number of advantages, including a large cabinet which had plenty of space to mount both the chassis and a large speaker, the latter delivering better sound and volume than the smaller unit found in its mantel counterpart.

The valve lineup in this radio is 6J8G, 6U7G, 6B6G, 6V6G, 5Y3G. Photo by Kevin Poulter for The Historical Radio Society of Australia (HRSA). Phone (03) 9539 1117. **www.hrsa.net.au**

Richard had a spare EL3NG and substituting this gave a noticeable improvement but the set was still a little "edgy" in its audio quality. As a result, I decided to try fitting a screen-stopper resistor, as some valves will oscillate at all sorts of supersonic frequencies if a screen-stopper is absent.

In this case, a 100Ω screen-stopper resistor was added directly between the screen and the output of the HT decoupling network that had been fitted earlier. Fig.4 shows the details.

Once this had been done, the audio sounded clean with either valve inserted into the audio output socket. In addition, the "birdies" (whistles) on shortwave also disappeared.

In short, the manufactuers didn't always get it right. **SC**