

Technology from the good old days

Vintage radio restoration

There are many old-time valve radio receivers collecting dust in garages and antique shops. Collecting and restoring these old radios can be a rewarding and interesting experience.

by JOHN HILL

Collecting and restoring various items from our past is a popular hobby for many. Typical collectors items include old cars, motor cycles, clocks, furniture — you name it and someone somewhere collects it.

Although I always considered myself immune to such childish behaviour, I now have to admit that I have been bitten by the collecting bug, with my particular interest centring around old valve radios. One of the most pleasing

aspects of my new hobby is that it appears as though I have become interested in it at about the right time.

Unlike vintage motor cars (which are now almost impossible to find), there are stacks of old radios around and they are not only easy to locate, but relatively inexpensive to buy.

To give an example of old radio availability, I recently managed to obtain 32 complete sets during a two week holiday period. The average price was \$8.00

which, as far as hobbies are concerned, isn't costly by any means. In some instances, people are happy to give away their old radios just to get rid of them.

The price of old radios is something that varies considerably. Radios in working order are worth more than those that aren't; wooden cabinets are more desirable than plastic; console models bring more than mantle models; while the true vintage radios of the 1920s are worth ten times as much as sets of the 1930s era or later.

Realistically, an old radio is only worth whatever someone is prepared to pay for it and, in the case of valve radios, not many people place much value on them at all. Many old radios, often in working order, are disposed of at the tip. Others find their way into the hands of dealers.

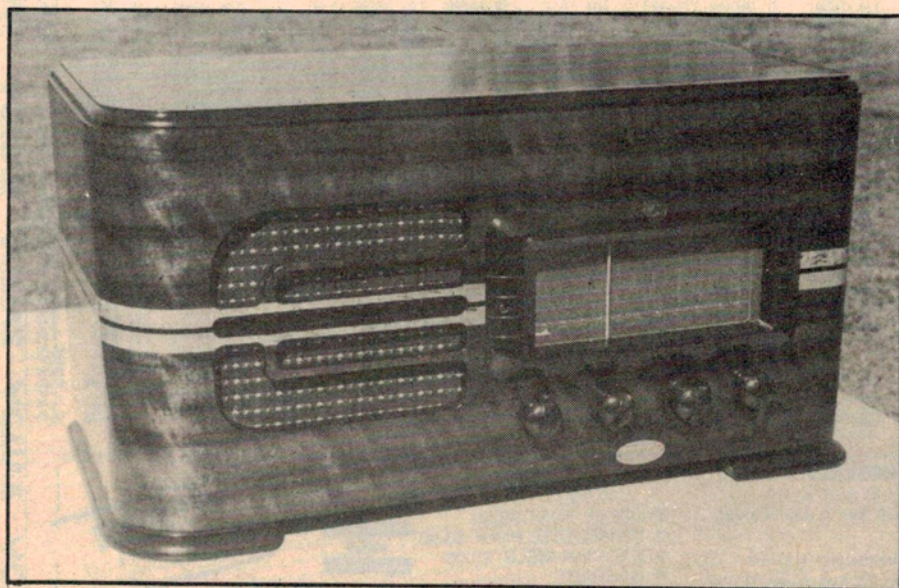
Dealer prices

Dealer prices are in accordance with demand and the guys I buy from don't seem to have much demand. Then again, I only buy sets that no longer work and most of these sell for around \$10 or less. However, 20 years from now, the situation could change dramatically.

George is an antique dealer I buy a few radios from and a typical transaction goes something like this: "How much is the old radio, George?"

George rarely replies, but plugs the set into the power point to see if it goes. He never seems to find the time to do this until it looks as though someone might buy it. In most instances the radio fails to respond and appears to be quite dead.

"You can't ask much for them when they don't work, can you George?" is my standard remark after about a minute of silence from both George and the radio.



A four valve battery operated Hotpoint. Battery sets offer special problems to radio restorers in that they require a 90-135 volt "B" battery.

Eventually George finds his voice and mutters something like "How does five dollars sound?"

I buy a lot of radios from George because he is realistic with his prices and he is able to scrounge around at auctions and sales for me. Buying from the right antique dealer is perhaps the easiest way of getting onto old radio sets.

One striking aspect of valve radio is the quality of the sound. The cheap transistor radio has been with us long enough for most of us to forget just how good many valve radios were. Some of the larger console models have 25-30cm loudspeakers in them and the sound has to be heard to be believed.

Perhaps the tragic part of collecting these old radios is the constant reminder that the majority of them were entirely made in Australia. Like so much of Australian industry, radio manufacturers have gone down the gurgler and what was once a thriving industry has faded away to almost nothing. Sounds a familiar story, doesn't it? At least radio collectors are preserving a unique piece of Australian history.

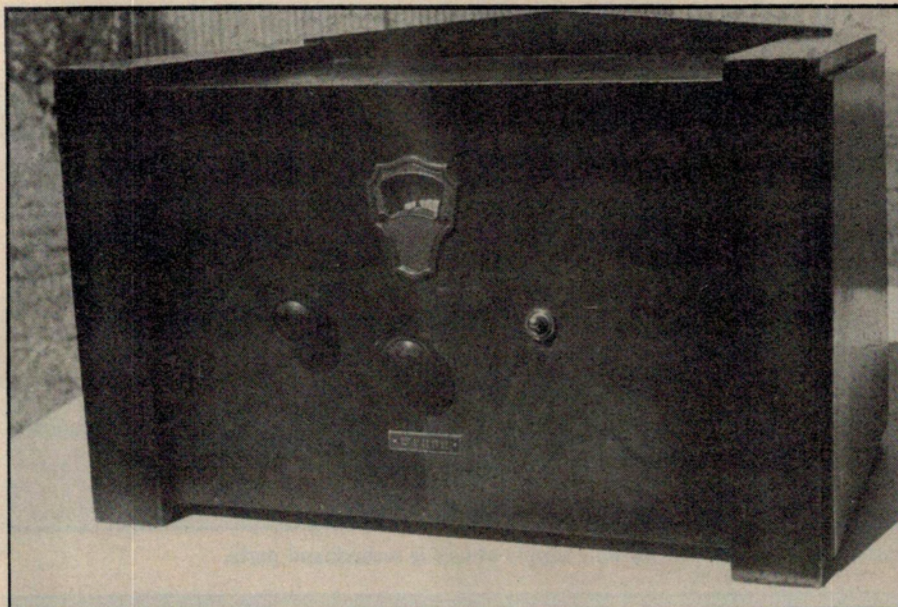
Anyone starting out on the radio restoration caper will find that they are pretty much on their own, unless they happen to have a few of the right contacts. It is most important that they will be able to do their own repairs, because most people in the trade don't want to see a valve radio, let alone repair it. The average radio-TV repair man has no valves, suitable spares or desire to work on old radios.

Radio restoration is similar to vintage car restoration in that the restorer has to utilise secondhand bits and pieces to best advantage. Not many modern components can be used in valve radios and one usually has to make do with cannibalised parts from other receivers.

Valves

Valves in particular present a major problem to restorers in that no-one makes, stocks or sells them any more. Some of the older repair places may have a few valves on a dusty shelf, but they are mainly TV valves and the old radio valves of the 1930s and 40s never seem to be there.

It is therefore important, when starting out, to buy up all the old wrecked sets one can lay hands on. Radios with smashed cabinets, broken dials and missing knobs can usually be bought for \$2 or so and are an essential part of collecting. Wrecked and unrestorable radios are about the only supply of valves and other spare parts one is likely to find and as such are almost as



Vintage receivers like this late 1920s Seyon are few and far between. This one is a three valver with a separate loudspeaker.



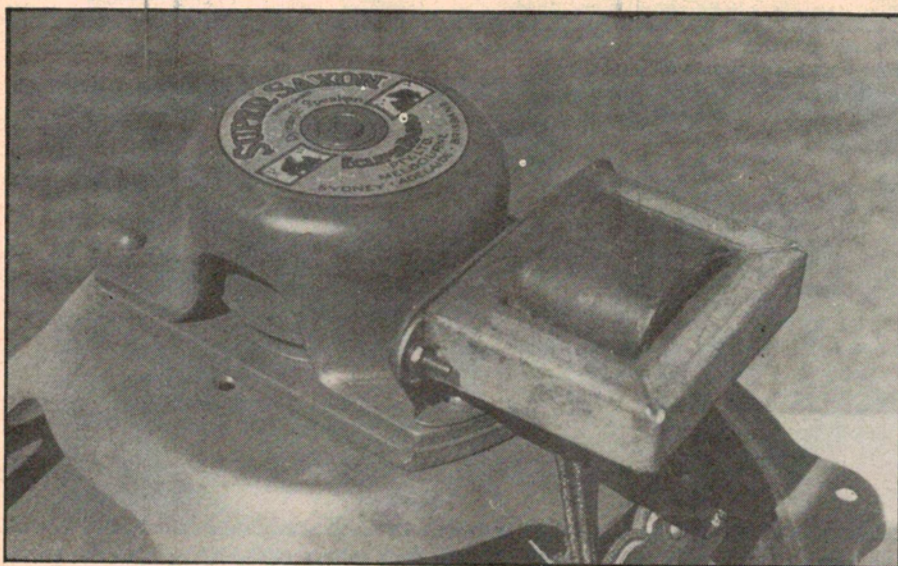
Old paper capacitors should be replaced with high voltage (400-630V) polyester equivalents.



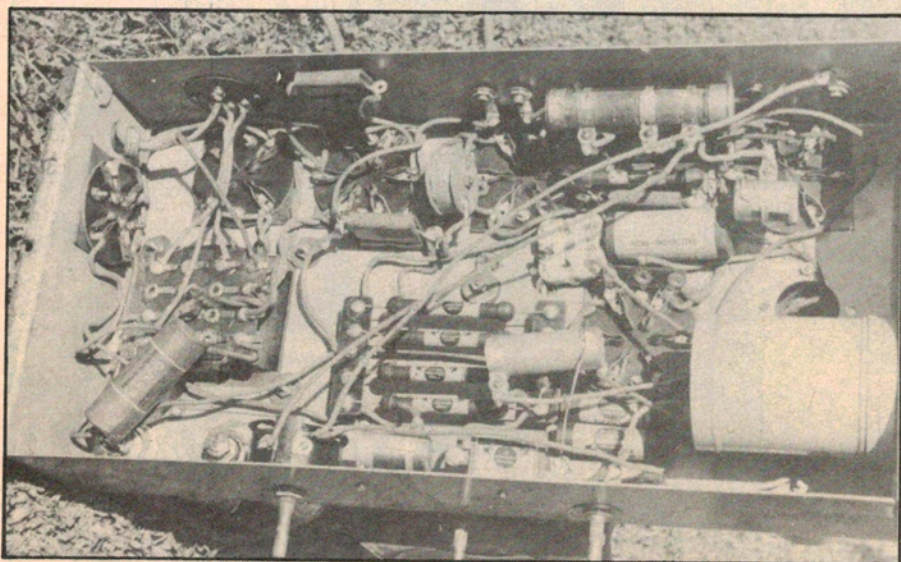
Old valve manuals are an essential part of a restorer's equipment.



Radio wrecking is about the only supply of usable secondhand parts.



Double trouble with old radios. Both the loudspeaker field coil and loudspeaker transformer can burn out and give trouble.



It might look like a rat's nest, but it is accessible and easy to service.

valuable as restorable radios.

Secondhand valves can vary from totally useless to perfectly OK, with varying degrees in between. But while buying up wrecks is one way of obtaining valves, there are also other sources of supply.

Believe it or not, there are numerous people in the community with valve collections. Retired radio repairmen and others who have been in the trade sometimes have sheds full of bits and pieces and are glad of the opportunity to sell it or even give it away. They never thought they would meet anyone silly enough to actually want the stuff.

I have located and obtained three such valve collections and all were within one kilometre of where I live. If I can do that so close to home, then there must be other collections around just waiting for a bid. An advertisement in a newspaper could bring results.

Buying out a few valve collections can give one's own collection a considerable boost and increase the scope of restorations. To get properly organised, a valve collection needs to be tested, cleaned, sorted and cataloged. There is nothing worse than a great assortment of unknowns. My own valve collection numbers many hundreds and is still growing.

Testing valves is a problem and the best that the average restorer can do without a valve tester is to check the filaments or heaters for continuity, then plug the valves into a radio that is in good working order. If a valve works, well and good; if it doesn't, then discard it.

Unfortunately, if just starting out, one may not have many radios that can be used as valve testers. Collectors in this situation will have to do the best they can.

A supply of usable valves, whether new or secondhand, is of the utmost importance to the valve radio restorer. Without valves, valve radio ceases to exist.

Most old valve radios don't work when first salvaged and plugging them into the 240V power supply can do serious damage. In some instances, time and non-use have a bad effect on ageing components and it is advisable to give a set a thorough check out before plugging it in. Checking out the valves and cleaning the base pins and sockets is a good starting point.

Capacitors

One of the most common causes of trouble with vintage radios is with the

capacitors. The two types that cause trouble are the paper capacitors (referred to as "condensers" in the good old days) and the electrolytics. Mica capacitors are unlikely to give trouble. Let's take a close look at these troublesome components and see what problems they cause and how these problems can be resolved.

Paper capacitors are so named because the dielectric insulating the two layers of foil is made of waxed paper (no fancy plastic in the early days of radio). Unfortunately, age and high voltage application causes the wax paper to break down and most old paper capacitors have serious leakage problems. In many instances they become resistors and allow sufficient current to flow to register on an ohmmeter. Readings of 500k Ω to 2M Ω are quite common when checking old paper capacitors.

Now if a capacitor leaks when a few volts from an ohmmeter is put across it, what's it going to do if put back into service with several hundred volts across it? That's right — ZAP!

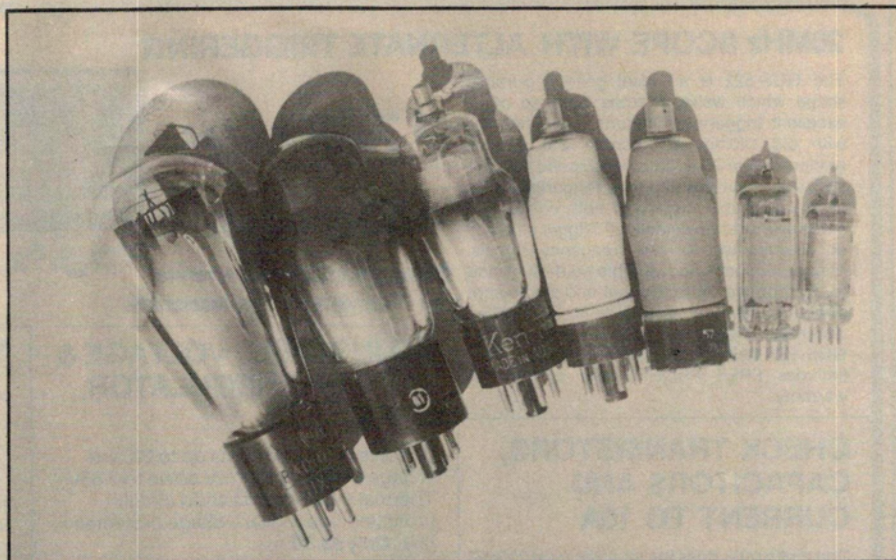
It is wise to replace paper capacitors with modern high voltage equivalents. If all paper capacitors are not replaced, then at least replace those with any measurable leakage. If one wishes, low voltage paper capacitors can be replaced with 100V capacitors which are cheaper to buy.

Another good reason for checking out the paper capacitors is that many of them have been chewed by rats and mice while the set spent 20 years or so in someone's shed. Vermin are quite fond of the wax coating on paper capacitors and it is not uncommon to find some capacitors have been eaten away.

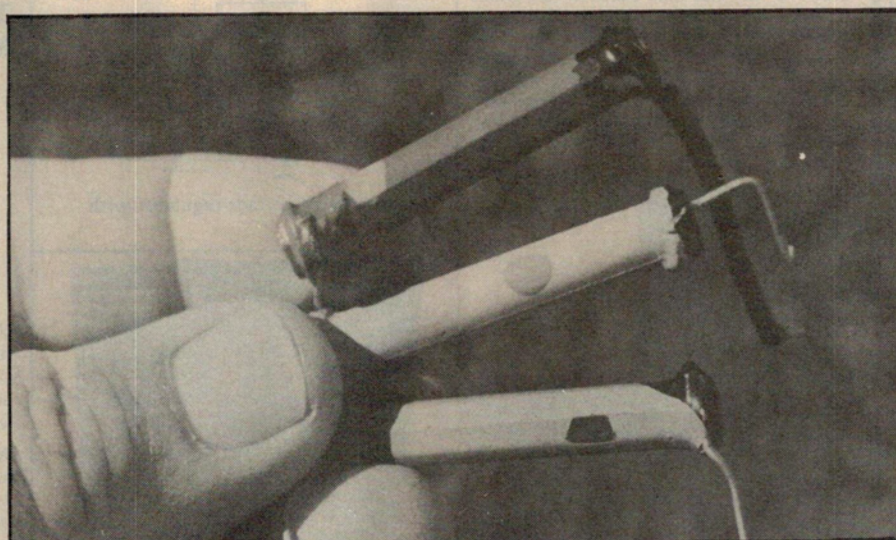
Electrolytic capacitors, whether vintage or modern, contain a fluid which eventually leaks away or dries out over a period of time, thus rendering the capacitor useless.

Old electrolytics are a mixed bag; some still work OK after 40 years, while others are completely clagged at half that age. Some become open while others short circuit. Once again, the replacement of old electrolytics is an excellent idea and can prevent a lot of trouble.

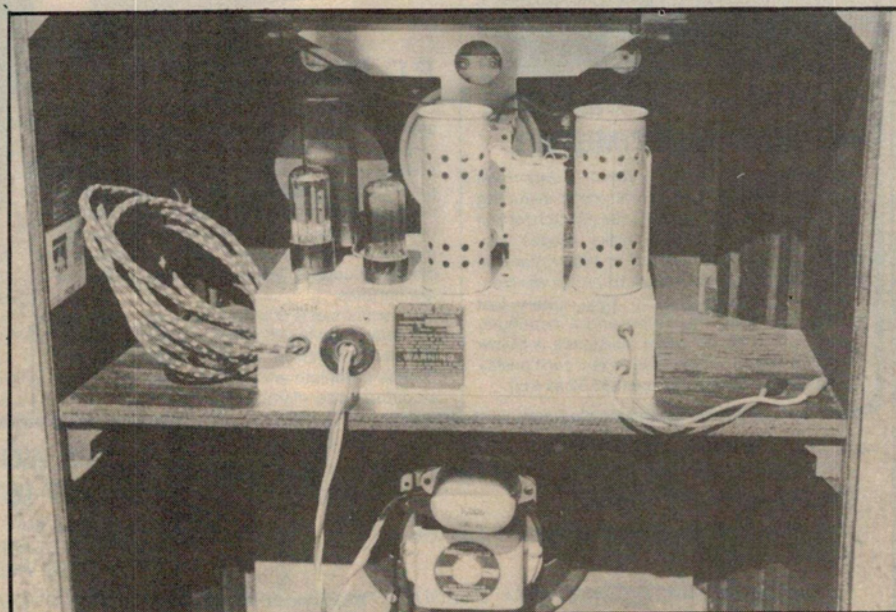
Unfortunately, old radios use different electrolytics to the ones usually encountered in modern circuits. Valve radios require electrolytics with voltage ratings ranging from 350 volts to 600 volts. Obtaining these high voltage electrolytics is a bit like trying to buy new valves, in that no one seems to manu-



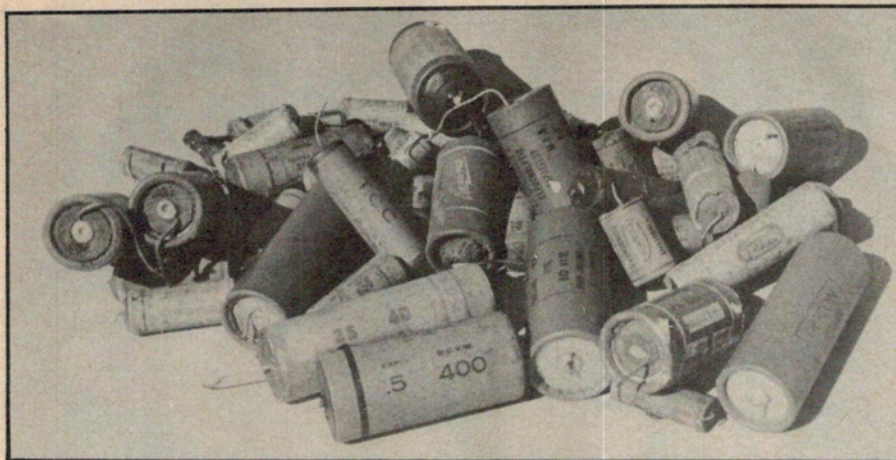
Valves come in many shapes and sizes.



Old style body, end and dot resistors.



Back view of a 1937 Airzone after restoration.



There are few things more useless than old electrolytics and paper capacitors.

factory or stock them any more. Shopping around may produce some, but they seem to be disappearing fast and are no longer listed in catalogs.

However, there is a solution. A 100 μ F 63V electrolytic is common and sells for 60 cents. If six of these are connected in series, one ends up with a 16 μ F electrolytic with a 380V rating. As the capacitance of an electrolytic used in a valve radio is not critical, such a set up would work with most old radios, thus getting the restorer out of trouble. The multiple series connected electrolytic may look a bit strange and will cost \$3.60, but it's better than no electrolytic at all.

Seven and eight capacitor arrangements could also be useful, depending on the voltage rating required.

High voltage electrolytics are not the only electrolytics used in vintage radios. Some have quite low voltage ratings of 40 to 50V and are quite easily replaced with current stock.

The best advice one can offer regarding ageing capacitors in valve radios is to replace all the paper and electrolytic types. Making a clean sweep removes doubts, increases gain, improves sound clarity and eliminates many of the crackles, pops, hums and other strange noises that are common in old radios.

Resistors

Resistors, both fixed and variable, have always been part of the radio scene and there is little difference in today's resistors to those of yesteryear. There are physical differences, however, and these are in size and method of identification.

The old style resistor was quite large and the resistance value was clearly labelled. If a resistor was 1M Ω , it said so. None of those confusing bands of colour.

Actually, the old system seems like a good idea when you think about it. If one has to decode the colour bands to find out the resistance, why not write it in the first place?

However, this was not to be. In the years that followed, resistors where colour coded and are still that way today, although the method of colour coding has changed in recent times.

A modern resistor has three colour bands which indicate the resistance value in ohms. The first band from the end is the first figure of the reading, while the last band is the multiplier.

Colour coded resistors prior to the above system were based on the same colour values, but were read in a different order: body, end and dot. The body and end colours represent the first two significant digits while the dot defines the multiplier in powers of 10. If this type of resistor is not read in that order, the reading will not match up with the value.

Whilst the old system (which is common in valve radios) is known as "body, end and dot", often the dot is not a dot but a band. To add to this confusion, some resistors only have two colours: body and end — no dot. Actually, the dot is there but it can't be seen because it is the same colour as the body. In fact, it isn't even put on.

Fig.1 shows the basic scheme for the obsolete colour code. The areas marked "A" represent the body colour, area "B" the end colour, and area "C" the

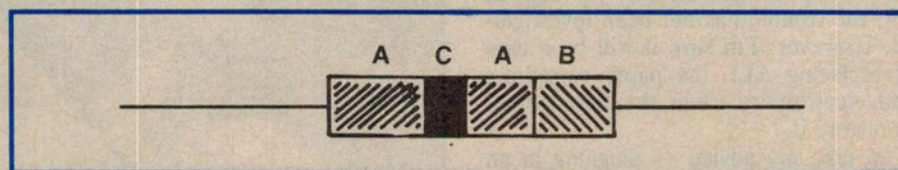


Fig.1: the obsolete resistor colour scheme. Area "A" represents the body colour, "B" the end colour, and "C" the dot or band.

dot or band. Thus, if A is red, B is violet and C is yellow, the resistor value is 270k Ω .

Establishing the value of a resistor is important for two reasons. Firstly, if a resistor is burnt out it must be replaced with one of a similar value. Secondly, old resistors are inclined to go high and they should all be checked for value with an ohmmeter. The colour code may indicate that a resistance was 0.5M Ω when it was manufactured, but after 30-40 years it could rise to 1M Ω or even higher. Resistors that have gone high, beyond their tolerance, should be replaced.

It is advisable to check out the resistance of each resistor in order to establish that they are of the correct value or if they have burnt out. If a resistor measures considerably less than it is supposed to, the low reading may be caused by other resistances (not necessarily resistors) in the circuit that are in parallel with the resistor being checked. If doubt exists regarding any resistor, it should be disconnected at one end and its value checked again. Checking resistances whilst they are connected into the circuit may not give a true reading.

Finally, fixed resistors should always be replaced with a resistor that is an appropriate substitute. Don't replace a one watt resistor with a 1/2 watt resistor, although the reverse is quite OK. Always replace high wattage, wire wound resistors with similar wire wound replacements.

If all the resistors in a vintage radio are checked and suspect ones replaced, then that old set has a better chance of going when it is plugged in. A few other additional checks will increase the odds even higher.

The HT choke

Most of the older valve radios have a high tension choke. The purpose of the choke is to smooth out ripple in the rectified DC which substantially reduces 50Hz mains hum. The choke can be a transformer-style component bolted to the chassis, or it can be incorporated into the loudspeaker. A loudspeaker of this type is known as an electrodynamic loudspeaker and differs from more modern speakers in that it operates with

an electromagnet, not a permanent magnet. The choke or field coil energises the magnet circuit.

Why this type of loudspeaker evolved is a bit of a mystery because permanent magnet loudspeakers were already in use at the time, yet the era of the electrodynamic loudspeaker lasted nearly 20 years.

The reason for mentioning this is because every now and then the choke or the field coil of a loudspeaker burns out (usually caused by a shorted capacitor or corrosion). This, in turn, effectively cuts off the high tension supply to the anodes and screens of the valves. Therefore, a routine ohmmeter check on the choke or field coil can save a lot of time in tracking down a problem. No high tension on the anodes or screens is a good indication of choke or field coil trouble.

It is interesting that later model valve radios dispensed with chokes and substituted a cheaper high wattage resistor instead. These can also burn out.

An ohmmeter check on the primary of the loudspeaker transformer is also advisable as these can give trouble too.

While some readers may consider so many checks and replacements to be unnecessary, keep in mind that most old radios were banished to the shed decades ago because something went wrong and the set stopped working. To plug such a radio into a power point and expect it to go some 20 years later is asking a bit much. On the other hand, a couple of simple checks and a few routine replacements will bring most valve radios back to life once again.

One of my own sets recently demonstrated the importance of this procedure when I chose to ignore my own advice.

This particular radio is an STC Console model with a "magic eye" tuning indicator. Having never seen a tuning indicator in operation, I switched on the set to see if it worked.

The dial lights came on which looked promising, but as no sound was forthcoming I peered into the back of the set to see if there was anything abnormal. Abnormal! The anodes of the rectifier valve were glowing red hot!

As you can well imagine, there was great haste to turn the set off and, as yet, the trouble has not been investigated. However, I'm sure it will be a case of replacing ALL the paper capacitors and electrolytics when the time comes to restore it.

So take my advice — plugging in an unchecked valve radio is asking for trouble.



Paper capacitors of AWA manufacture often split or blow their ends off when they short circuit.

Although restoring valve radios is an interesting and rewarding hobby, perhaps this article should close with a word of warning.

Always keep in mind that some of the voltages beneath the chassis of a valve radio are lethal and could result in some unsuspecting restorer's early demise. In other words: be careful or you may end up dead! There are even a few AC/DC sets around with live chassis — so beware!

In fact, it is a good idea to steer well clear of transformerless sets unless you know exactly what you are doing.

Remember, always switch off the power, pull the cord and discharge the electrolytics before working on a set. Simply switching off isn't good enough in some instances.

Normally, an electrolytic capacitor discharges itself within a few seconds of switching off, but if the high tension

choke (or loudspeaker field coil) is burnt out, then there is nowhere for the charge to go until a path is provided for it to follow. As such, a capacitor could have a potential of around 400V, so it is wise to treat it with respect.

An insulated clip lead fitted with a series 10kΩ 5W resistor can be used to discharge the electrolytics. Do not directly short the capacitor terminals together with a screwdriver or clip lead — you could fuse the internal wires running to the terminals of the capacitor if you do.

This article on valve radio restoration has concentrated mainly on repairs of an electronic nature, but there are other problems facing the vintage radio restorer. Some radio components, such as dials, desperately need mechanical repairs, while the cabinets also require attention. More about such things in the next article. Ⓔ



Vermin, namely rats and mice, can do considerable damage to old radio components. A thorough checkout before plugging the set into the mains will detect such hazards.