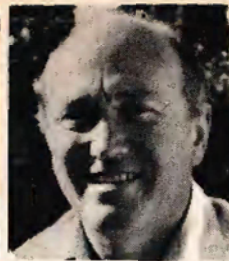


VINTAGE RADIO

By JOHN HILL



Checking and repairing the valves

A good collection of valves is essential for the vintage radio enthusiast. In most cases, these will have to be scrounged or salvaged from derelict chassis. Here's how to check the valves for serviceability.

The valves are the heart of a valve radio and must be in good condition if the set is to function correctly. Faulty valves can cause any number of problems, from totally silencing the receiver to intolerable distortion, weak reception and intermittent operation.

Therefore, if a valve radio is to be restored, it is essential that the valves be checked and any faulty or suspicious ones discarded.

When I'm faced with a valve problem, the first thing I do is to check them with a valve tester. A well-designed valve tester can perform a

number of functions, the most important one being an emission test. Good valves have strong emission whereas poor valves have weak emission. (Emission is the ability of the cathode to emit electrons. If emission is low, virtually no current can flow through the valve).

Valve testers usually have a built-in meter which is graduated from 0-100%. Any reading from zero to 45% is considered poor; 45-55% is questionable; and 60% and above is considered good.

The average valve tester is a comparatively simple device, al-

though the internal wiring and switching is quite intricate. The usual set-up is to tie all the grids and plates together for a total emission readout.

My "Heathkit Tube Checker" has a switching arrangement which allows each valve component to be disconnected one at a time so that every base pin can be individually checked for internal problems. All readings are indicated on the meter which tells the operator if there are internal defects in the valve, such as a broken wire to the base pin being checked.

Whilst a valve tester is a handy instrument to have, it is not an essential piece of equipment for the vintage radio enthusiast.

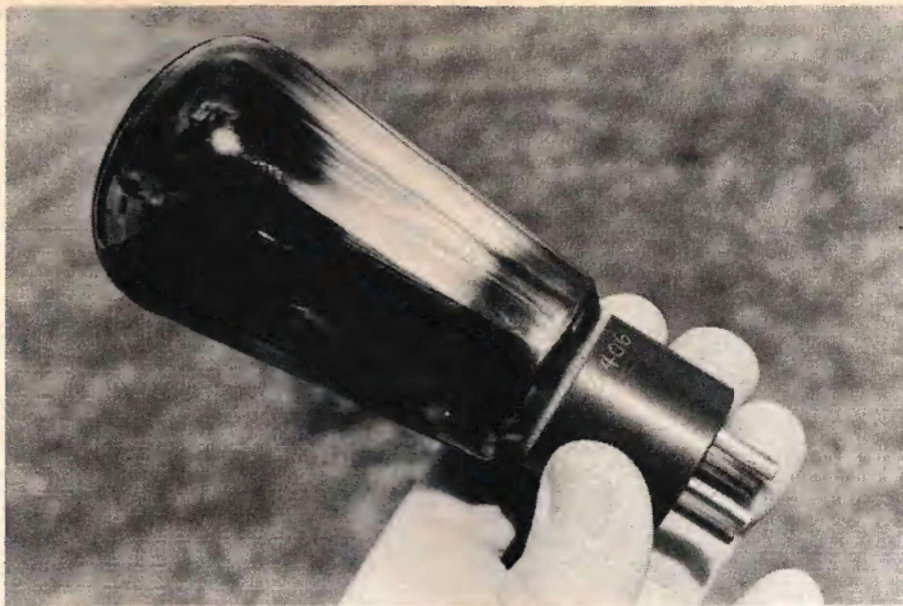
I did quite well without one for several years and I certainly do not put all my trust in a valve tester. Although a valve tester gives the operator every indication that a valve is either serviceable or suspect, one really doesn't know for sure if a valve works or not until it is plugged into a radio set and given a run under actual working conditions.

To my thinking, the ultimate test for a valve is an emission test followed by a test in a radio to see if it really does work. If a valve passes both tests there cannot be much wrong with it.

When testing a valve it is always a good idea to give it a gentle tap to make sure there are no loose components inside that may vibrate and cause trouble. Tapping a valve with faulty internals can induce arcing as well as intermittent on/off and loud/soft situations. A suitable valve "donger" can be made by fitting a rubber grommet to one end of a pencil.



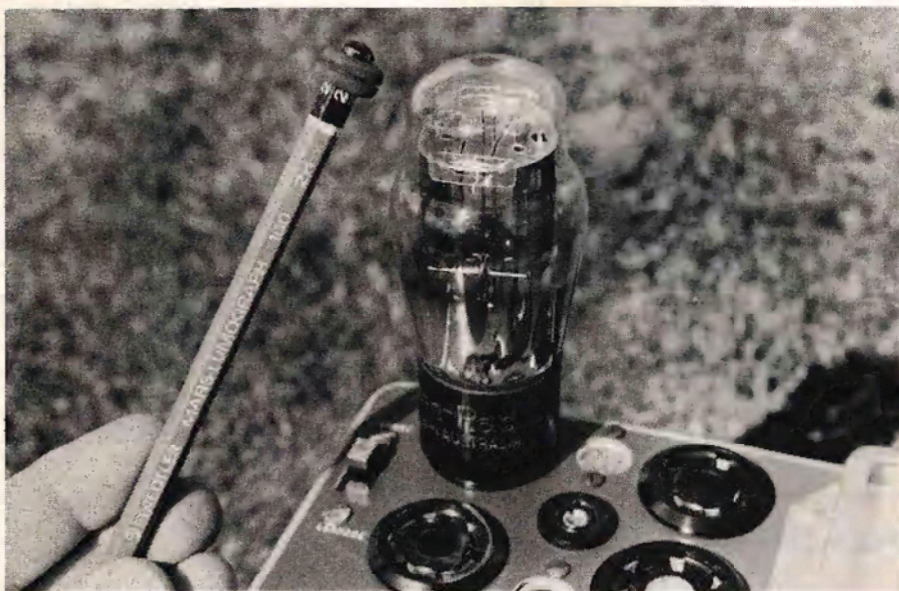
A box of old triodes from the 1920s. All checked out OK in the valve tester. A good collection of valves is essential for the vintage radio enthusiast.



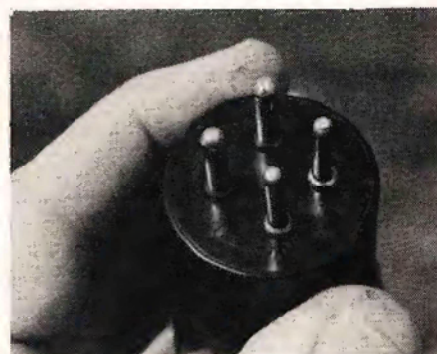
Big was beautiful back in the good old days. Shown is an E406, an early AC output valve. The type number has been scratched into the base for identification.



A x2 magnifier is handy for inspecting valve filaments and cathodes. The cathode in a good valve will be coated with a whitish compound.



A valve should be gently tapped during testing to show up any intermittent faults. A rubber grommet fitted to the end of a pencil makes a suitable valve "donger".



Resoldering the base pin connections will often bring a faulty valve back into service. Remove the old solder and clean the wires and base pins before resoldering.

Heater checks

A few years ago I bought about 120 secondhand valves (mainly octal and pre-octal; ie, having a Bakelite base with eight pins) at a time when I had only one receiver. Naturally, any of the valves that fitted that radio were tested in it, but that still left around 100 or so untested.

I made some attempt to test the others by checking the continuity of the heaters and found that about one in every twenty was burnt out. The rest were therefore declared "good" and time has proven that most of them indeed were. There were very few duds among those that checked out OK with the ohmmeter across the heater pins.

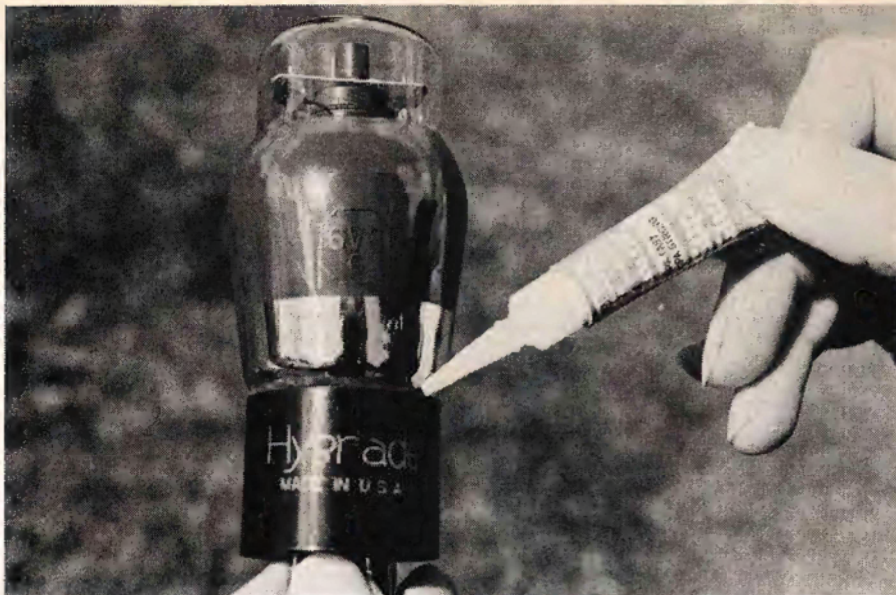
The above test is not a conclusive one as it only checks out the heaters and no other elements of the valve. However, a burnt out heater is a

I now have few problems regarding the testing of any commonly used radio valve. I can either test in the valve tester or in a restored radio receiver and either method will give fairly reliable results. But such a convenient situation takes time and money to develop.

On the other hand, anyone just starting to restore their first radio may face quite a problem in finding out if the valves in the set are serviceable or not. If the set goes, the valves must be working; if it

doesn't, there is uncertainty as to whether the problem is a defective valve or some other component.

There is really no answer to this dilemma other than to have a selection of known good valves that can be used as substitutes. But getting such a collection of valves together takes time and it is unlikely that a new chum to vintage radio restoration will have them. Similarly, it can take years to collect and restore enough different radios to test a wide range of valves.



Loose valve bases can easily be repaired with a few drops of "Super Glue". In some cases, it may also be necessary to resolder the pins.

fairly common type of valve failure, so checking heater continuity is a good test when no other means of testing is available.

Cathode inspection

With the exception of some rectifiers, battery valves and a few early AC valves, most valves have a cathode that is heated by an insulated filament (heater) running through it. Some discussion on this cathode may be of value because it has some bearing on the usefulness of the valve.

In most valves, it's possible to inspect the cathode using a x2

magnifier. When the cathode is viewed in this manner, it is clearly seen that the metal tube which forms the cathode is coated with a whitish compound that looks very much like icing sugar. Cathode coatings may vary from one manufacturer to another, but regardless of what it is, its job is to emit copious amounts of electrons when the cathode is heated.

Now the reason for mentioning this is that when a valve is totally worn out, the cathode coating has all but disappeared. I have observed a number of such valves where the cathode was almost bare with

only a few wispy traces of the original coating remaining. These valves still worked but their performance was weak indeed.

This knowledge can help a collector who has no valve tester sort out possible good valves from relatively poor ones. If an inspection of the cathode reveals that the coating has all but disappeared or is cracked or broken away, then the valve is suspect. Unfortunately, not all valves allow you to make a cathode inspection.

A similar procedure can be applied to rectifiers such as old 80s and 5Y3s. In this type of rectifier the filament is the cathode and is also coated with an electron emitter. Good rectifiers have well coated filaments while poor rectifiers have near bare filaments.

The rectifier valve is a very important component in a valve radio. If it's weak, the set will be starved of high tension current and will perform poorly. A set with a weak output can often be cured by replacing a worn-out rectifier.

Bright emitters

Early valves, made before 1922, didn't have coated filaments and to obtain sufficient emission, brighter filaments were used. These were similar in brilliance to incandescent lamps. However, it was later found that filaments containing thorium or coated with calcium and other special compounds gave adequate emission at much lower temperatures.

These early valves were known as "bright emitters" while the later ones were referred to as "dull emitters". Dull emitters use considerably less filament current, work at much lower temperatures and last longer.

Many valve designs from around 1930 on have a "top cap"; ie, an external connection on the top of the valve. Most top caps are hooked up to a grid but some can be the plate connection, so it pays to be careful where you place your fingers.

A common problem with this type of valve is that the top cap can become loose or even fall off. Such a valve is not lost — it only needs repairing. Resoldering and regluing the top cap with "Super Glue" will cure this minor problem.

Bakelite and plastic: what's the difference?

A number of readers have taken us to task over the terms plastic and Bakelite, as used in this series on vintage radio. As they have pointed out, Bakelite is a plastic. We'll now set the record straight.

Bakelite was one of the first plastic materials to be used on a large scale. The trademark *Bakelite* is named after the inventor, L.H. Baekeland (1863-1944).

There are two broad types of plastic: thermosetting and thermoplastic. Bakelite belongs to the thermosetting type and is made by applying heat and pressure to a mixture of phenol (or cresol) and formaldehyde. Thus, the chemical

name of Bakelite is phenol formaldehyde.

Once moulded and set, a thermosetting plastic like Bakelite is very rigid and stable and was an ideal material for radio cabinets.

Later radios were mostly made from thermoplastic materials such as cellulose acetate, polyethylene, polyvinyl chloride (PVC) and polyvinyl acetate (PVA), with fillers and dyes added for rigidity and colouring. These latter materials, as the name *thermoplastic* suggests, are not as stable; they deform under heat. In practice, they haven't lasted as well as Bakelite either.



Although not essential, a valve tester eliminates a lot of uncertainty when checking valves. This is the author's Heathkit Tube Checker. Valves can also be tested by direct substitution in a known good chassis.

Whilst the above remedy sounds simple, some valves are more difficult to repair than others because the protruding wire sometimes breaks off short. When this happens, it is necessary to nibble away some of the glass and carefully solder on a short extension.

In some cases, the valve will have completely lost its top cap. It therefore makes sense not to throw away defunct valves, since the top caps and bases can be salvaged and used to repair damaged valves.

The base of an old valve can also

become loose and a number of glues (including "Super Glue") can be used to re-attach it to the glass envelope.

Pin connections

One often troublesome fault in very early valves (1920s types in particular) involves the pin connections. The solder at the joint seems to decompose with age, eventually forming a poor or open-circuit connection. The remedy is to first remove the old solder and carefully clean the wires from the glass

envelope. Once this has been done, the pin connections can be resoldered.

Resoldering the base pins will often reclaim a faulty valve and that applies to all base type valves, 1920 models or otherwise.

Collecting valves

Unfortunately, new valves are no longer readily available for most radios. But if you're in the know and have the right contacts, it's surprising what is available on the secondhand market.

If you have any doubts about the scarcity of new valves, then try to buy an old 80, a 2A5 or 6B7 and see how you make out. If you would like a more challenging assignment, how about a B406 or an E415. New or secondhand, some of these old-timers take a bit of finding. Even if they can be found, they don't always work.

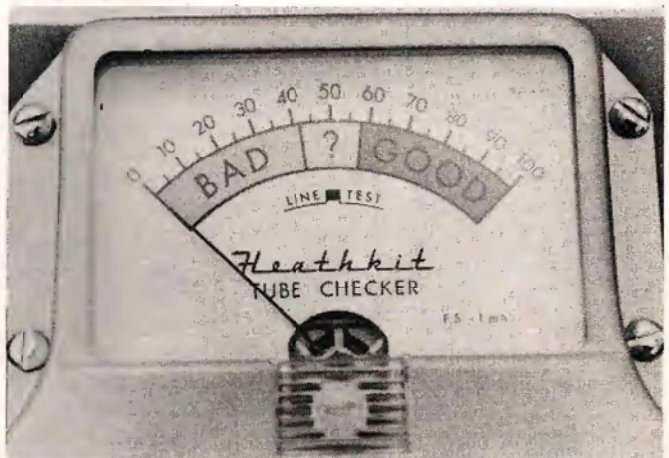
The only new radio valves that are likely to be available are the more recent miniature types. As far as earlier valves are concerned, it's usually a case of scrounge or go without.

Those who may have doubts about using secondhand valves should not worry unduly because there are a lot of good used valves around just waiting to be collected. It's up to you to start looking and find them. Wrecking radios unfit for restoration is a good source of supply.

Next month's vintage radio topic will be on capacitors.



Loose or detached top caps can be a problem with old valves. The valve can be saved by carefully resoldering the cap and then re-gluing with "Super Glue".



Close-up view of the meter on the Heathkit Tube Checker. It gives a readout of total emission in percentage terms. Any reading above 60% is considered good.