VINTAGE RADIO

By JOHN HILL

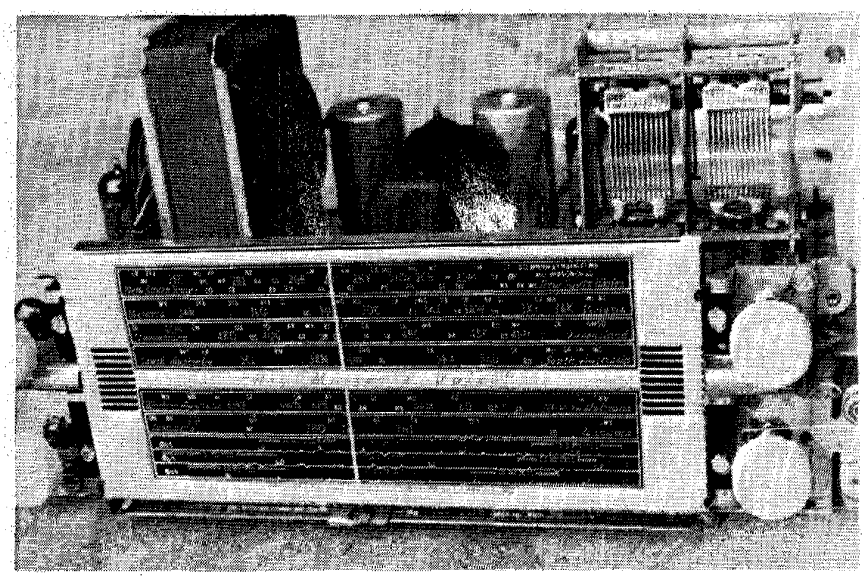
Testing old radio valves

The best way to check old valves is to use a valve tester but these are now difficult to obtain. Fortunately, there are other methods that will allow you to sort your valves into good & bad categories.

One problem with radio valves is that while they may look OK on the outside, it can be rather difficult to assess what they are really like on the inside - and that's where it counts. Most vintage radio enthusiasts are forced to use secondhand valves and there is often no means available to find out just how good or how bad these old valves may be.

As mentioned in previous articles, a valve tester is a very useful instrument that has been specially designed to measure cathode emission. Unfortunately, a valve cathode does not emit electrons indefinitely and only has a limited useful life. Gradually, over a period of years, valves get weaker and weaker until they finally cease to work efficiently. Many an old worn-out valve will still light up and function, but that doesn't necessarily mean that it is in good condition. A valve tester will check this aspect of valve performance.

Valves can have other faults apart from poor cathode emission. The heaters can burn out or internal elements can warp with the heat and alter the valve's characteristics. Sometimes, the parts can distort to such an extent that adjacent electrodes touch and short circuit. Dropping a valve can also initiate any of these problems. What with one thing and another, untested secondhand valves are a bit suspect and can present a few headaches for vintage radio enthusiasts.



If you don't have a valve tester, you can check whether or not a valve still works by plugging it into a working receiver. However, this method won't reveal weak valves in the RF stages due to the compensating action of AGC (automatic gain control).

Valve testers

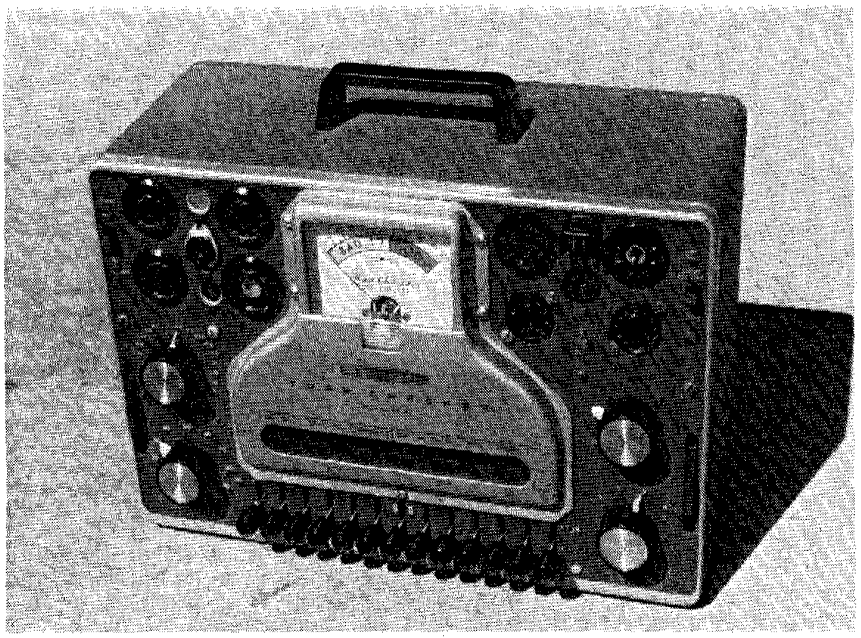
A valve tester can pick up most of these problems. A good tester has a switch connected to each base pin so that all individual elements can be checked. Internal short circuits can also be detected and are indicated by a light on the control panel. As stated earlier, a valve tester is a very useful instrument.

Valve testers are relatively simple in principle, but somewhat complex in construction regarding switching and wiring. Basically, a tester ties all the grids, anodes and diodes of a valve together and measures the strength of the cathode emission to all of these elements collectively. Disconnecting any one element should cause the meter needle to drop, thus proving that it is both operative and connected into circuit.

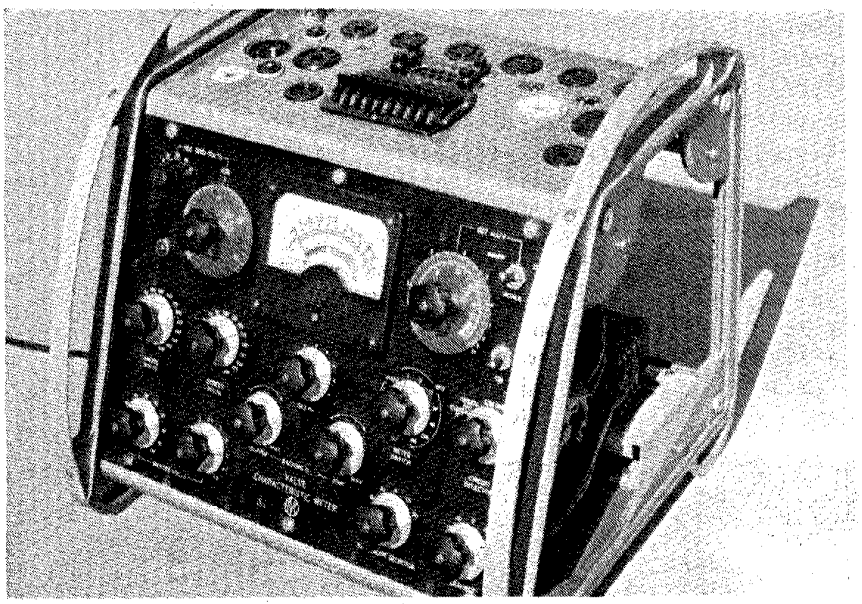
A valve characteristics tester is a similar instrument to a valve tester but is considerably more complex.

In simple terms, a valve characteristics tester sets up the valve so that it is tested under actual working conditions. Screen grids and anodes are loaded up to normal working voltages and control grids can also be set up with their specified negative bias. A valve set up in such a manner can be properly checked under working conditions. This is not the case with a standard valve tester.

Finding a working valve tester of any type is not an easy task. So far, I have collected four testers but only one is in good working order. An-



This Heathkit Tube Checker is the author's only working valve tester. Its main disadvantage is that it is unable to accommodate European-type valve bases, although suitable adaptors could be made up with very little effort.



This AVO Valve Characteristic Meter is a very up-market instrument (what a shame it doesn't work). A valve characteristics tester checks a valve under simulated working conditions.

other problem frequently encountered with valve testers is that their instruction manuals have long been lost and if you are unfamiliar with these instruments, you simply won't know how it functions or how to use it.

My working tester is an American Heathkit unit which is of comparatively recent vintage. It was originally bought in kit form and has been assembled very professionally. It is a useful and well made instrument.

Being of American design, the Heathkit valve tester has the disadvantage of not having sockets that will test British and European valves; eg, British 4-pin and 5-pin types and those horrible P-base or side contact valves. Adaptors could be made without too much effort but the small volume of "foreign" valves requiring testing has not made this worthwhile.

The Heathkit scroll

Suitable test data was also a problem with my Heathkit tester. This particular tester uses a "scroll" which is located inside the unit behind a narrow window on the control panel.

The idea is to wind the paper scroll around until the valve type to be tested shows in the window, after which all the necessary information relating to that valve can be read off. But although that sounds a reasonable idea in theory, it did not work so well in practice.

First, the scroll was not tracking straight and one edge of it was beginning to crumple up. Second, being a relatively late model tester, the scroll had mostly late model valves on it. Common vintage radio valves such as 6A8, 6D6, 6B7 and dozens of other valves from the 1930s and 1940s were simply not on the scroll.

Fortunately, the instruction manual on how to assemble the Heathkit came with the tester and the manual also included information on how to set up the instrument for newly developed valves that were not listed on the scroll. Naturally, the same technique could be used for the older valve types not listed.

Compiling a comprehensive data test sheet was a long and drawn out process. The tester was set up to read 100% with new valves. Wherever possible, three new valves (preferably of different manufacture) were used and an average reading decided on - not that new valves vary much from one brand to another.

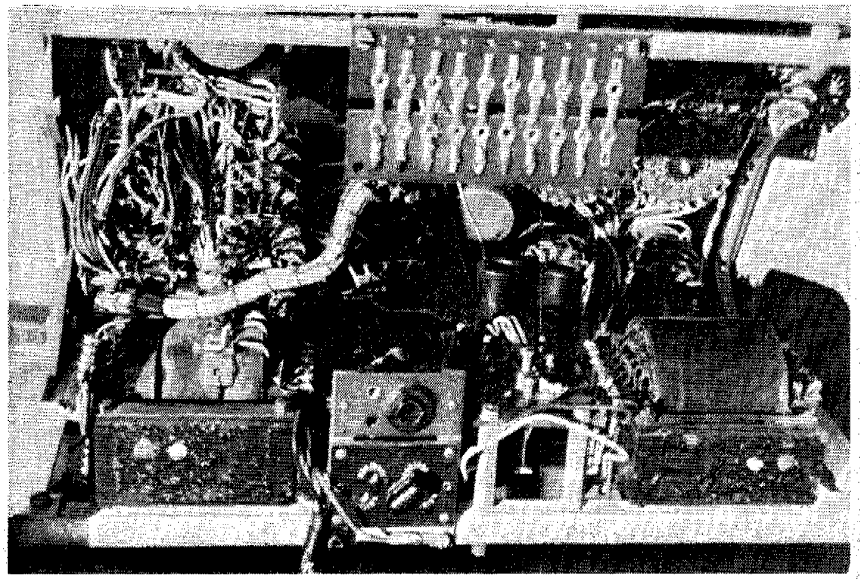
In cases where no new valves were available for comparison, the "intelligent guess" method was used instead. That statement may sound a trifle

Service Tip

Symptom: valves light up, HT is present but no audio response when the grid of the audio valve is touched.

Cause: the most common fault is an open circuit primary on the output (speaker) transformer. The output valve gets excessively hot and the screen grid may glow if the set is left switched on. Replace the output transformer. The audio output valve should also be replaced as the heat distorts the valve elements and this changes the characteristics of the valve.

Vintage radio service tip is supplied by Resurrection Radio, 51 Chapel St, Windsor, Vic 3181.



While a valve tester is simple in theory, it can be quite complicated regarding internal wiring and switching. Wasn't the printed circuit board a great invention?

unscientific but is not as bad as it may appear.

I had 23 number 42 output valves to test and no new valve as a guide. It seemed reasonable to assume that some of these valves could well be in as new condition so the tester was set up to read around 95 percent on the better valves. Some time later when a couple of new valves were tested, the guesstimated test data was found to be spot on.

For smaller batches of valves, the intelligent guess method of establishing emission levels becomes less accurate. Even so, it does give some indication and provides a comparative figure to work with until a new valve becomes available.

Providing one has reasonably accurate valve data, a valve tester is an extremely convenient device when servicing a broken down radio. Testing a set of unknown valves is a good starting point and will either clear each valve of suspicion or indicate good reasons for their replacement.

Substitution checks

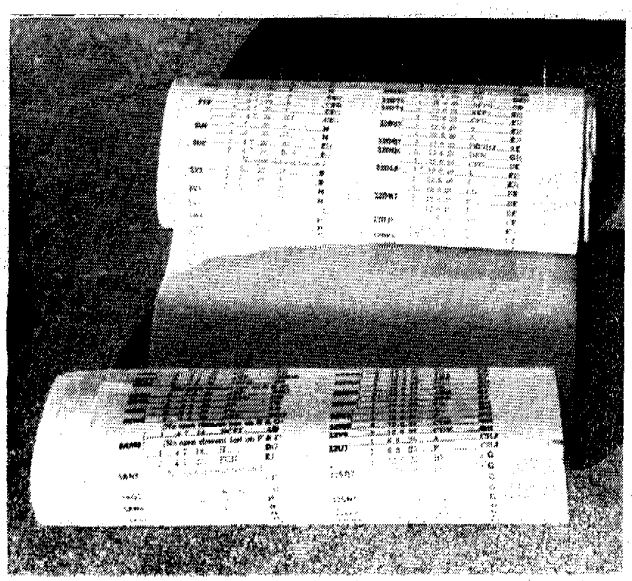
In the days before the valve tester, the best test that could be arranged was to plug the valves into working radios to find out if they would operate (the substitution test). This was accompanied by giving the glass envelope a few dongs (with a rubber donger) to show up any near short circuits between the valve elements. Sometimes a valve will arc internally when struck in this manner, indicating that some of the high voltage elements are uncomfortably close together.

While such a test is better than no test at all, it gives little indication as to the degree of cathode emission. It simply tells you whether or not the valve is working. Whether it is working well or is only in fair condition is often difficult to determine.

One of the reasons for this is the fact that the AGC (automatic gain control) circuit compensates for weak signals and, to some extent, weak valves. This is particularly the case with valves used in the front end of a receiver; ie, radio frequency amplifiers, intermediate frequency amplifiers and frequency converters.

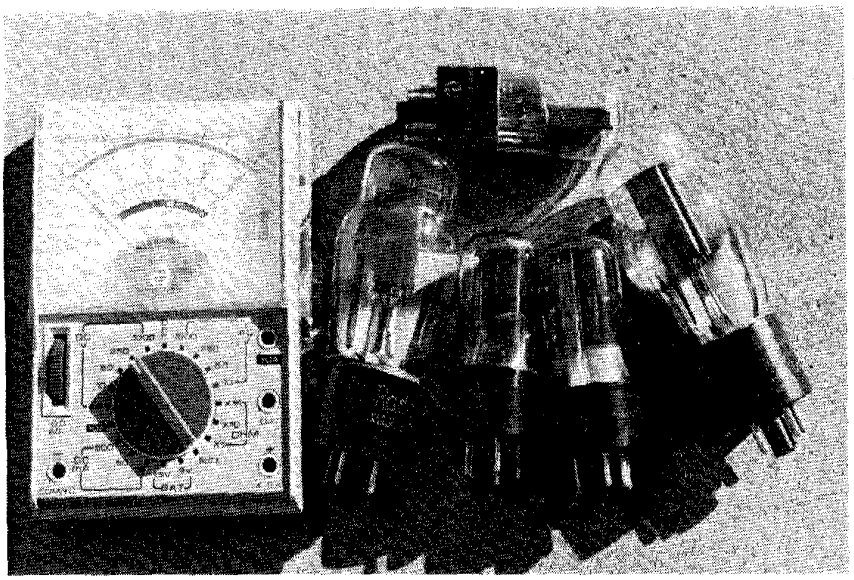
When checking valves by the substitution method, make sure that the receiver is tuned to a relatively weak but steady signal; eg, a distant station in daylight hours. Checking valves under these conditions may be a little more meaningful.

Another reason why substituting a valve may not be a reliable test is that the characteristics of a particular valve type must vary a little from valve to valve. Replacing a frequency converter, a radio frequency amplifier or an intermediate frequency amplifer valve can easily alter the tuning of

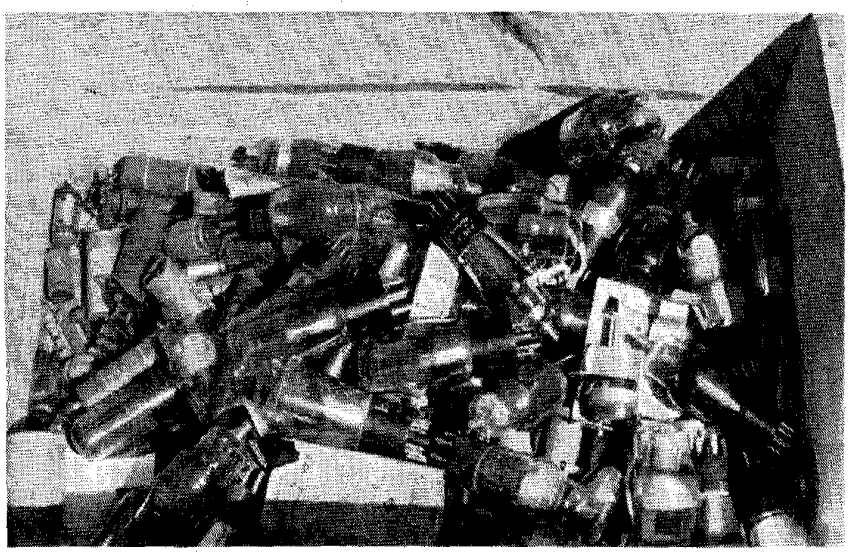


This is the scroll from the Heathkit valve tester. Very few vintage radio valves were on it and a comprehensive test data sheet had to be compiled for the older types.

Tapping a valve with a suitable donger often reveals internal faults and short circuits. You can make your own donger by fitting a couple of grommets to a pencil.



Audio output and rectifier valves can be tested for serviceability using a working radio and a multimeter as described in the text. Although this won't give you a percentage readout, it does allow valves to be sorted into good and bad categories.



This box of odd valves and other radio junk was obtained from the local flea market. Testing indicated that all but three valves were serviceable.

the receiver and a perfectly good valve may appear to be worse than it is simply because the set is not aligned to suit that valve.

Valves used in the audio section of a receiver respond to substitution testing better and a weak output valve that tests at about 30% will sound like a 30% valve when substituted for a good valve.

Current measurements

There is another technique that can be used to test valves and, once again, a working receiver is used.

With this method, a milliampere meter is placed in the plate or cathode circuit and comparative readings on the meter will indicate differences in valve efficiency. A good valve will have more current flowing than a poor valve. Although such a set up will not give a percentage read out, it will at least allow a quantity of valves to be sorted into poor, good and excellent categories.

Unfortunately this method of checking can get a bit vague with some valve types. In the case of a 6B6 triode, the anode or plate current is only about one milliamp, so the meter would need to be a very sensitive type with a digital readout if any significant variation in current is to be detected.

On the other hand, the currents flowing in the anode and screen grid circuits of an output pentode are considerably greater and meter variations are much more obvious.

Power rectifiers are also easy to check by the substitution method and this can be done with a DC voltmeter connected between the high tension supply and earth. Checking the voltage means that the receiver wiring does not have to be unsoldered as is the case when using a milliampere meter for measuring current flow.

Again the testing process is quite simple. Rectifiers with good cathodes and plenty of emission will produce a much higher output voltage than rectifiers with poor emission. Although a percentage read out is not possible, the good performers can be easily separated from the bad, depending on the voltmeter reading.

When it comes to valve testing, everything points in favour of a valve tester. But even these useful instruments are not infallible. A tester will only indicate the emission level of a valve and whether or not it is likely to work. Whether it really works well can only be determined by further testing in a receiver.