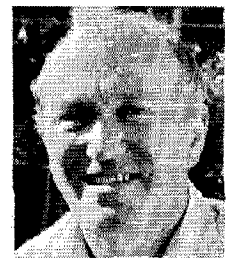
VINTAGE RADIO



By JOHN HILL

Watch out for incorrect valve substitutions in old receivers

There are many traps to watch out for when repairing old valve radios. Often, valve radios are obtained with an incorrect valve fitted or with the valves in the wrong sockets.

I was repairing a radio recently and ran into a distortion problem that took quite a while to solve. As is often the case, once the fault had been found and rectified, it was all fairly obvious and I should have solved it much sooner than I did. Sometimes, what should be obvious isn't very obvious at all.

The receiver in question was a mid-1950s 5-valve Philips mantel, a relatively small, budget-priced radio which is quite straightforward in design and normally a simple one to repair.

This particular receiver had been well worked over long before it found itself on my workbench. Someone had already replaced the paper capacitors with polyester types and several of the mica capacitors had been replaced with an assortment of styros and ceramic disc types.

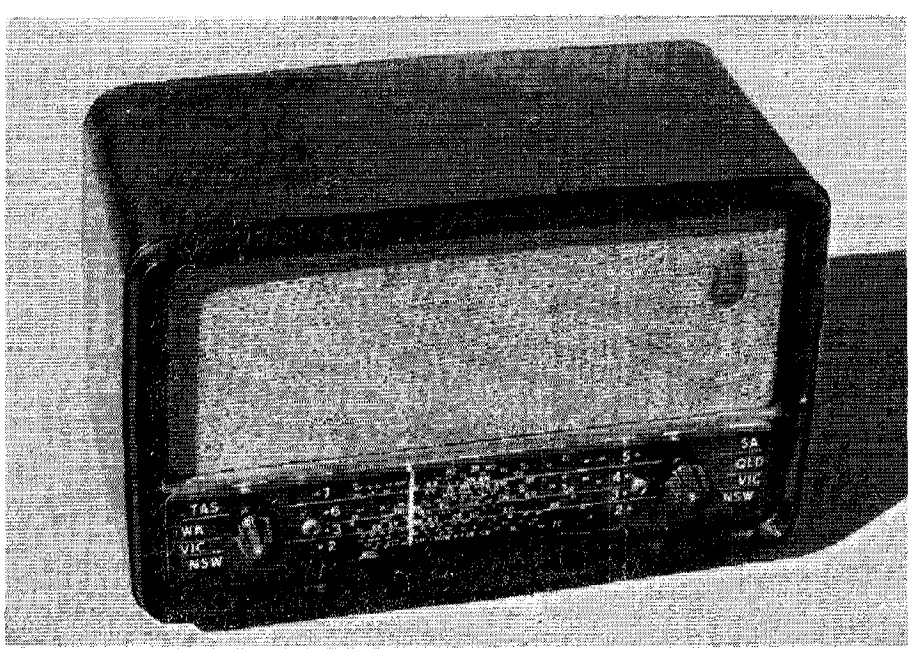
Someone had also installed a few resistors and these stood out like neon signs because they were the old, large, one watt types and not the smaller units that were originally used in the receiver.

The electrolytics, however, had not been replaced and looked in very poor condition. These were removed and new 450-volt capacitors installed in their place.

All things considered, the underside of the chassis looked far from original, as there had been many replacements and alterations, some of which were not very neat.

The valve complement consisted of: 6AN7, 6N8, 8BD7, 6M5 and a 6V4 rectifier. The valves were checked in a valve tester and all tested good.

The reason for the receiver not working was soon found to be an open primary winding in the output transformer, which is a fairly common fault. A new transformer was installed and the set worked once again.



Although the receiver in the text was referred to as a 5-valve Philips, it is in fact the Fleetwood version of that radio. The set had been worked on extensively in the past & came fitted with a substitute valve that was not working correctly.

Distortion problems

However, it did not work very well, the most obvious symptom being noticeable distortion in the sound. What's more, after the set had warmed up and was starting to work, there was a background squeal accompanying the sound for about a 10-second period before it faded away.

Squeals and distortion can sometimes be due to a faulty valve and, although all of the valves tested OK, valve testers cannot diagnose a valve with a built-in squeal.

After replacing the valves, one at a time, the same faults remained. Both the squeal and the distortion were still there, which quickly disproved the theory that it might be a crook

valve that was causing the problem.

It was a very hot day and my patience was wearing thin. It was time to put the job aside and do something else.

That night, I lay awake thinking about my distortion problem and went through all the likely possibilities. It was well after midnight when it suddenly dawned on me. The 6N8 was the wrong valve for that particular line up. Almost never does one find two valves with twin diodes in the one receiver. Why use a 6N8 with diodes and a 6BD7 also with diodes in the same set? Surely the 6N8 had been used as a substitute for a 6BH5.

The next morning, I withdrew the 6N8 from its socket and slipped in a 6BH5 to take its place. The result was as expected – no squeal and no distortion. Someone at some time had installed an incorrect valve and I wasn't observant enough to pick it up. In fact, all I had to do was check off the valves in the receiver against those listed on the sticker attached to the rear dust cover. There it was in full view for anyone who cared to look – a 6BH5 was used as the IF amplifier, not a 6N8.

These are the two valves mentioned in the text: the 6BH5 & the 6N8. While both valves can be used as intermediate frequency (IF) amplifiers, they require slightly different socket connections. In the case of the Philips set, someone's failure to make the necessary modifications resulted in a distorted output.

Pin connections

If one checks the base pin connections of these two valves, everything works out reasonably well until pins 7, 8 and 9. Pin 9 on a 6N8 connects to the suppressor grid and, in this case, it wasn't earthed. There is no connection at pin 9 on a 6BH5.

In a 6BH5 valve, the suppressor grid is earthed internally via the cathode, whereas in the 6N8, the suppressor connects to pin 9 and must be earthed externally from the socket connection if the valve is to function properly.

Therefore, using a 6N8 as a substitute for a 6BH5 was simply asking for trouble because it was operating without the suppressor grid.

In a pentode valve, the electrons from the cathode strike the plate with such velocity that some bounce back and would be attracted to the positively charged screen grid except that the suppressor repels them back to the plate. Without the suppressor grid, noticeable distortion results.

If pin 9 had been earthed, then the 6N8 would probably have worked quite satisfactorily and the two valves could then be interchanged. Table 1 shows the base pin details of the 6N8 and 6BH5 valves.

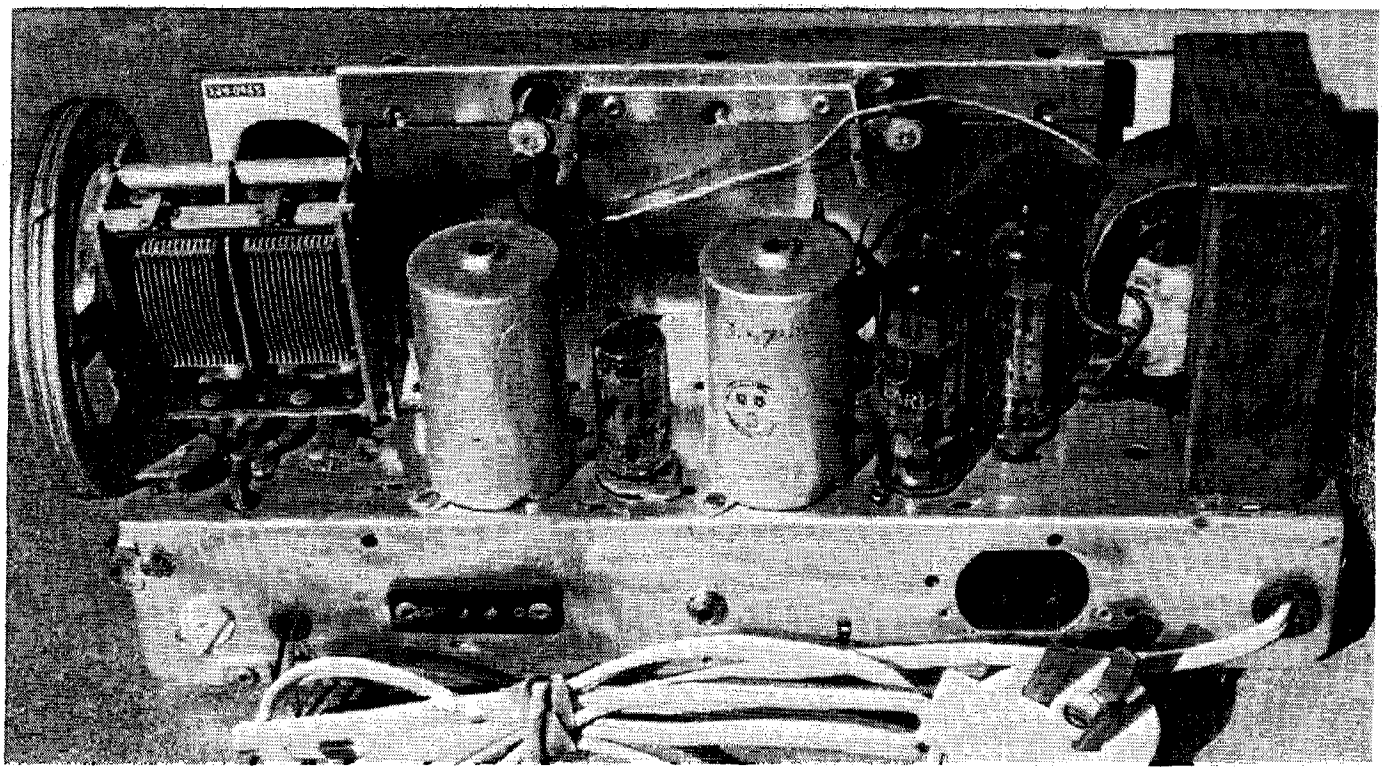
Many valves use only some of their base connections. For example, the 5Y3 (left) has just 5 pins, while the 6V6 (right) has 6 or 7 pins. Receiver manufacturers often used vacant socket terminals as convenient mounting points for other components & so a substitute valve may require considerable socket rewiring.

Table 1: Pin Connections For The 6BH5 & 6N8 Valves

Pin No.	1	2	3	4	5	6	7	8	9
6BH5	G2	G1	K,G3,IS	H	H	A	IC	IC	NC
6N8	G2	G1	K,IS	H	H	A	D1	D2	G3

Obscure faults

What I have just described is one of the seemingly endless problems that regularly confront the vintage radio repair man. Due to many obscure reasons, quite a number of old valve radios have "built in" faults that can be difficult to locate. The new chum to valve radio repairs can encounter many a headache. Whether he can solve them or not depends on his abil-



Like all radiOs, the HMV Little Nipper will only work with the right valves in the right sockets. None of its valves are interchangeable. It is always an advantage to know what valve types go where because sometimes old radios are obtained with incorrect valves or with the valves installed in the wrong sockets.

ity and perseverance.

Those magnificent old radio servicemen from yesteryear, who have spent all or most of their working life in the trade, have a sixth sense when it comes to troubleshooting. They have encountered every conceivable problem so many times that they almost instinctively know what it is going to be.

On the other hand, vintage radio repairers are often hobbyists, like myself, and each repair is a new and baffling experience. When this is the case, it takes a long time to become reasonably proficient and even then there are plenty of faults that can really fatigue the grey matter.

A wrong valve, as in the previously mentioned Philips receiver, was something that I should have picked up immediately but my brain was out of gear and free-wheeling at the time. I will try to save face by blaming my lapse on the extremely hot weather at the time.

Radios having an incorrect valve or two are a common occurrence when buying non-working receivers from secondhand dealers. Some dealers even have a big box of miscellaneous valves which they use to fill up the empty valve sockets of any receivers that may need them.

I have encountered this on many occasions – radios with two or three rectifiers, a radio frequency valve in the output socket, and so on. In fact, the variations are almost unlimited – just fit a couple of TV valves here and a frequency converter there; anything to fill the empty sockets and make a receiver look complete.

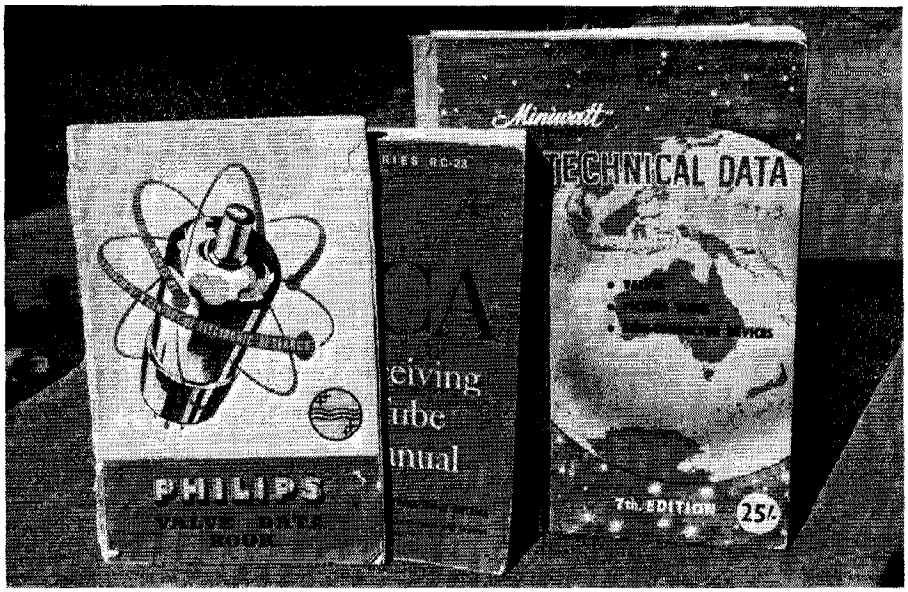
Then again, a receiver may have all the right valves but some may not be in their correct sockets. It is therefore important to learn the functions of various valve types and know how they work in relation to a superhet receiver.

Of course, there is a decided advantage in buying a radio that actually works but then one always pays more for goers than non-goers. What's more, as the radio described earlier clearly demonstrates, just because a set is working, it doesn't necessarily mean that it has the right valves in it – working and working properly are two different things.

The difference in the case of the little Philips receiver was just one valve with a slightly incompatible base pin configuration.

Substitute valves

There are not many substitute valves



Valve data manuals are invaluable when it comes to substituting valves. These manuals contain details of various valve types & show their socket connections.

Equivalent manuals are also handy guides when looking for substitute valves. An equivalent valve is one that will fit into the socket & work without modifications to the circuit. A substitute valve, on the other hand, may require extensive socket rewiring or even the fitting of another type of socket.

in the true sense of the term. If another type of valve is used as a replacement, it may need socket alterations (as was the case with the 6N8), and/or other changes such as different plate, screen and cathode resistors, so that the replacement valve can work as intended. There is nothing quite like using the right valve for the job. Regrettably, the right valve is not always available or affordable and a compromise is the only way out.

While we're on this subject, there is another aspect to be wary of regarding the use of substitute valves.

Many valves do not use all of their base pins and, in the case of some octal based valves, not all of the pins are fitted. For example, 6V6 valves often have 6 or 7 pins while 5Y3s have only 5 pins. The missing pins are not fitted for the simple reason there are no connections to them anyway and it makes economical sense not to have them.

However, it is frequently the case that the socket connections corresponding to the missing pins have components soldered to them. Radio manufacturers often used these socket terminals as connection points to join other components and, in some instances, three or four separate components may be conveniently joined at a blank valve socket pin.

This situation can cause problems when substituting another valve if what was once a non-connection becomes a valve pin connection. Naturally, any components soldered to that particular socket terminal must be removed and mounted somewhere else.

Obviously, any radio repair involving valve substitutions is quite difficult if one does not have a comprehensive valve characteristics manual. A valve manual provides all the necessary base pin information and is a much needed guide when it comes to substituting valve types.

Now for a quick change of subject. I recently came home from a fortnight's holiday with a gramophone and four radios, including a 1936 console. Amazingly, there was still room for my wife and all our holiday luggage in our little Ford Laser.

I might add that packing the car was a fairly delicate operation. And, with spare wheel located underneath all the junk, I was thankful that no roadside wheel changes were necessary on the way home. **SC**