VINTAGE RADIO

By JOHN HILL

Vibrators – a slice of history

Although crude by current standards, the vibrator made battery-operated receivers a lot more convenient to run. By using a vibrator, an expensive high-voltage "B" battery for the HT supply was no longer required.

In the early days of my vintage radio collecting I bought quite a number of receivers from George, a local secondhand dealer. George had made a special effort to round up all the old radio sets he had, searching his shop and storage sheds at home to come up with what, to the uninitiated, looked like the greatest pile of junk you could possibly imagine. It's not every day a dealer attempts to unload such a heap of "rubbish", or finds someone who actually wants to buy it.

However, George was always a reasonable man and he knew the difference between a collectible old radio and one that was only suitable for spare parts.

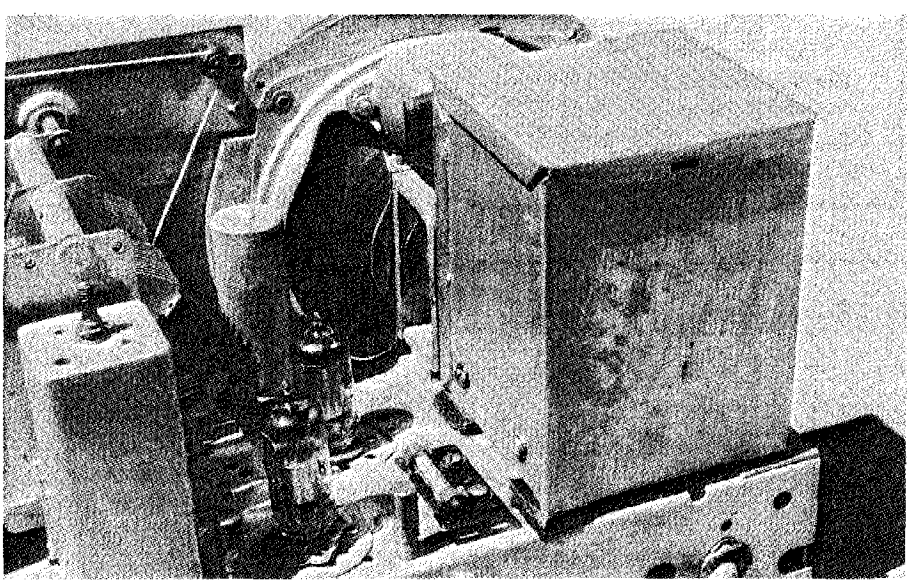
To cut a long story short, I took the lot and they averaged out at about $4 each. Most were stripped for spares but not all of them. There was this particularly neat little Radiola mantel of late 1940s vintage. It had an attractive bakelite cabinet and I was determined that it would be restored.

When I finally found time to inspect the little AWA it wasn't quite what I thought it was. Expecting to see a 240V receiver inside the cabinet, I was disappointed to find alligator clips dangling on the end of the power cord. It was a 4-valve vibrator set and, at that stage of my radio collecting career, it was a mystery to me. The vibrator Radiola was the first receiver of that type I had encountered.

After some book research, I had a better idea of what it was all about. The small AWA receiver was unusual as far as vibrator radios went because it was a 4V model as distinct from the more common 6V and 32V types.

A 4V supply is nowhere near as convenient as 6V and, in order to operate the Radiola, a 6V motor cycle battery was used in conjunction with a 2Ω wirewound resistor to give the required 4V. With almost no repairs, apart from a valve replacement, the old battery receiver was working once again and it seemed to be functioning fairly well.

About 20 operating hours later everything went quiet, although the vibrator was still buzzing away merrily. It was then that I started to lose interest in vibrator radios and when a 240V chassis came along, the little Radiola became a mains-powered model.

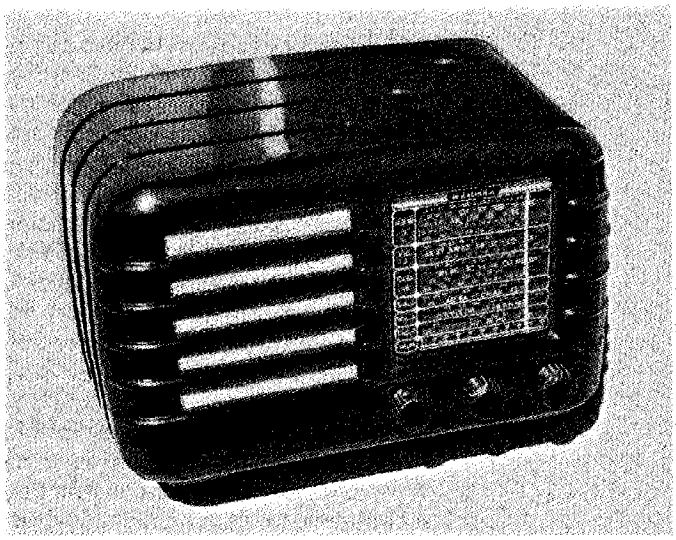


This rear view of the chassis shows the vibrator's shielded box at right. Vibrator power supplies require extensive shielding to prevent objectionable hum and RF interference.

A clever invention

By modern standards, a vibrator is a fairly crude device no matter how you look at it. Yet, in its day, it was a clever invention that made battery receivers a lot easier to live with. The vibrator, or vibrator cartridge, is a plug-in device, somewhat similar to a valve and made that way for much the same reason; it had a limited life and was expendable. It even used a standard valve socket, different types using 4-pin, 6-pin and 7-pin sockets.

With a vibrator, it was possible to make a radio power supply which required only one battery – usually a 6V battery, similar in size to a car battery, but designed for vibrator service. Compared to a straight battery



This Radiola model was a popular radio receiver in the early post-war years. It was available in both mains-operated and battery/vibrator operated versions (vibrator version shown).

A new 4V vibrator unit to suit the Radiola was unearthed in the author's miscellaneous parts cupboard. Vibrators of this type would be rare items today as they went out of use with the advent of the transistor radio.

receiver with 135V of dry cell "B" batteries, a vibrator set was a lot cheaper and more convenient to run, if one had the means to charge the battery.

A vibrator radio uses the one power source for the valve filaments and the high tension. But everyone knows that DC cannot be transformed, so where does the high tension come from? Well, that's where the vibrator comes in!

The vibrator's task is to change the low DC voltage into low voltage AC, in the form of a square wave at approximately 100Hz. This is done by using two sets of electrical contacts mounted each side of a vibrating reed. The vibrating part is similar in construction and operation to an electric buzzer or bell.

The vibrator contacts switch the DC voltage alternately between opposite ends of a centre tapped transformer, so that the current flows alternately in opposite directions through the primary – see Fig.1. But while such a system does produce high AC voltages in the transformer secondary, there are disadvantages.

The first problem is that because a supply generated in this way is basically a square wave, with spikes and other irregularities, plus inevitable sparking at the contacts, the system produces an incredible amount of radio frequency interference, referred to as "vibrator hash". Numerous RF chokes and capacitors need to be employed to help suppress (but not entirely eliminate) this interference. In addition, the entire vibrator power supply must be shielded all the way from the battery clips to the high tension output.

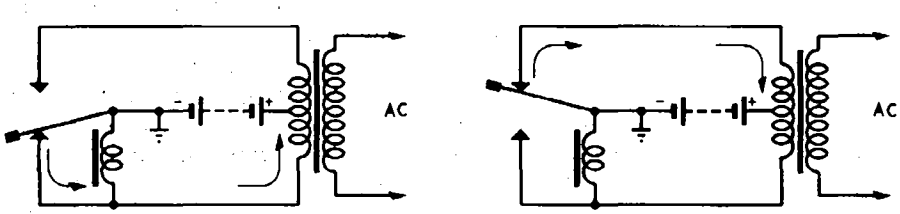


Fig.1: basic scheme for a non-synchronous vibrator. The vibrator contacts switch the DC voltage alternately between opposite ends of a centre-tapped transformer, so that the current flows alternately in opposite directions through the primary. The resulting AC output was then fed to a rectifier.

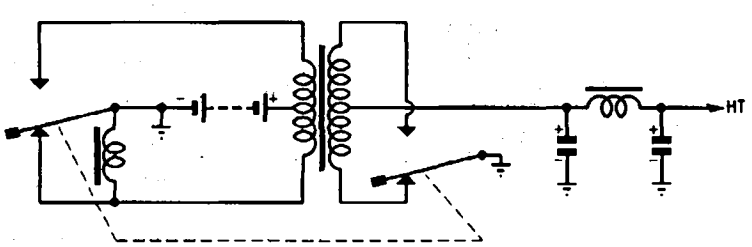
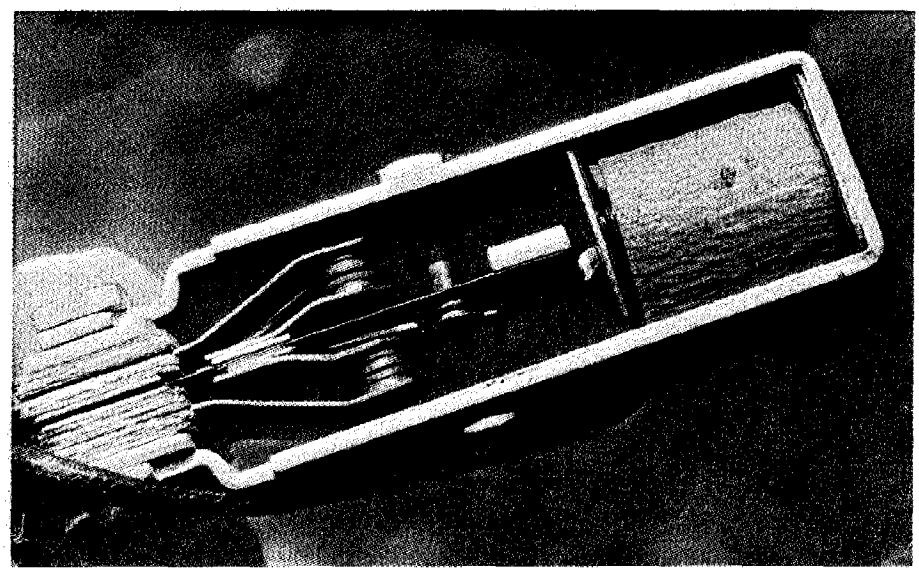


Fig.2: the synchronous vibrator arrangement. This type of vibrator employed a second set of contacts which were used to mechanically rectify the high tension current in conjunction with a centre-tapped transformer secondary.

After transforming the switched DC to a higher voltage, it must then be rectified and effectively filtered to smooth DC before it can be used as a hum-free high tension voltage. Rectification of the high tension voltage can be done in several ways.

One way is to use a rectifier valve as would normally be used in a mains-operated receiver. The type of vibrator that uses a separate rectifier has two sets of switching contacts and is known as a non-synchronous vibrator.



Removing the cover reveals the workings of this synchronous vibrator. The solenoid unit (top) controls the vibrating reed (centre) which carries two sets of switching contacts on either side.

The non-synchronous vibrator was usually used in valve car radios, together with an ordinary AC-type rectifier valve. In car radios, power consumption was of little consequence and they normally had AC-type valves throughout.

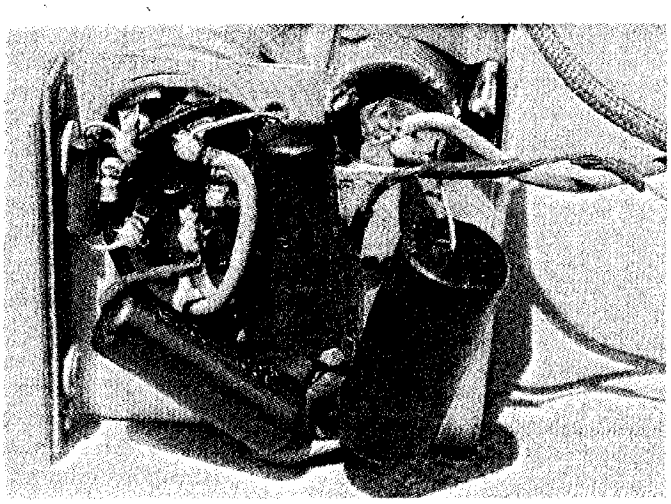
Domestic vibrator radios were usually more economical in their operation and used mostly battery valves and a synchronous vibrator which has two additional sets of contacts inside it. These extra contacts are used to mechanically rectify the high tension current in conjunction with a centre tapped transformer secondary without the need for a rectifier valve – see Fig.2. This process produces a very lumpy DC voltage with a considerable amount of hash and needs very effective filtering.

Because of inefficiencies – partly in the vibrator cartridge and partly in the transformer – there were losses in the system. Also, the vibrator cartridges had a limited life. Even so, the replacement of the odd vibrator unit must have been a considerably lesser expense than the huge cost of dry cell "B" batteries.

Cleaning the contacts

One of the problems restorers face regarding vibrator receivers is the lack of replacement vibrator units. It has been a long time since these things were used and they had relatively short life spans.

However, most vibrator units can be dismantled by removing a circlip and unsoldering a metal tab. Once inside, it is not difficult to clean the contact points with a fine grade of wet and dry paper followed by a piece of clean white paper to remove any dust or abrasive particles that may be trapped in between.



Removing the vibrator assembly from its shielded box revealed a defective electrolytic capacitor and a number of paper capacitors, all of which needed replacing.

All contact gaps are adjustable either by screw thread or by bending. All contacts should be open when the vibrator reed is at rest except the contact that operates the reed. Point gap doesn't appear to be critical but wide variations may affect the high tension voltage. In the case of a synchronous vibrator, the gaps should be staggered so that the primary contacts close before and open after the secondary contacts. This helps to lessen the RF interference.

Not all vibrators can be serviced in such a convenient manner as some were made with similar construction techniques to that of metal valves. With this type, the vibrator contacts work in a vacuum or an inert gas. As there is no air present, the arcing at the contact points cannot form oxides with the contact material. Hence, these vacuum or gas type vibrators have a substantially longer life and higher current rating, although they are throwaway items when they stop working.

The old Radiola

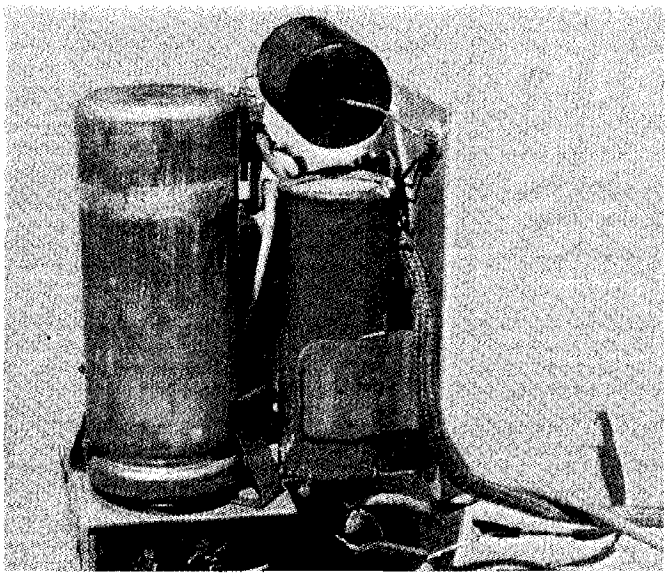
Recently, I decided to get my old Radiola vibrator radio working again, mainly because I had acquired a spare cabinet for that particular model. And as I have never written anything about vibrators in the past, it seemed like the right time to do so.

Restoring the little Radiola was no different to restoring any other receiver and the usual replacement of paper and electrolytic capacitors was a good starting point. There are two large 400µF 12V electros in the circuit and these were practically useless and needed replacing.

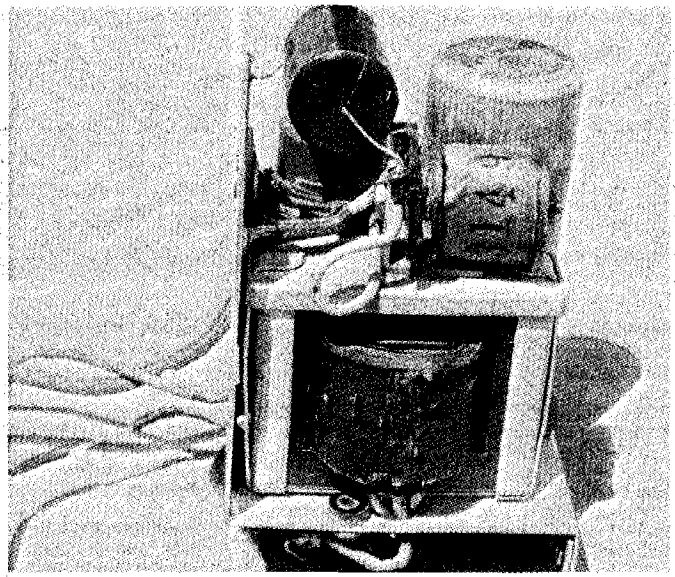
At that stage, the receiver was working again but had a very objectionable hum in it. As there was only one high voltage electrolytic mounted on the chassis, it appeared that the other was possibly housed in the vibrator box.

On removing the vibrator assembly (which is built on it own small chassis) from its shielded compartment, the elusive electrolytic was found and replaced. It was totally ineffective and had no capacitance whatsoever.

The removal of the vibrator chassis revealed another four paper capacitors that were previously hidden. They too were replaced. Obviously, proper restoration cannot be done to a vibrator radio unless the vibrator and its



The vibrator assembly in the old Radiola is built on its own chassis. The vibrator unit is at left, with the original faulty electrolytic capacitor immediately to its right. What looks like a paper capacitor at the top of the assembly is actually a sealed RF choke.



This view shows the vibrator assembly from the opposite side to the previous photo. The lower portion is occupied by the vibrator transformer. It is reasonably compact in size due to the fact that it only produces a high tension of 90V.

accompanying circuitry are removed and serviced accordingly.

Cleaning the vibrator contacts was straightforward and they were in excellent condition. As an added bonus, I found in my parts cupboard a new, still in its original packet, 4V vibrator bearing the same serial number as the one in the receiver.

The little Radiola is perhaps one of the last few domestic vibrator radios made. All the other vibrator sets I have encountered have been much older. Its valve line up is: 1R5, 1T4, 1S5 and 3V4. This is in distinct contrast to most vibrator receivers which seem to be 1930s models using 2V valves and 6V vibrators. The Radiola is the only vibrator radio I have seen with 1.4V valves and a 4V supply.

No doubt there are others but they are relatively uncommon in my area.

To finish off the restoration, a new dial cord was fitted and the noisy volume control cleaned. An alignment improved the set's performance considerably.

On the subject of performance, the Radiola's quarter watt output and small 5-inch (125mm) loudspeaker does not rate it in the "ghetto blaster" category. Now I remember why I was keen to install a 240V chassis into the AWA's original cabinet.

Even so, the little 4-valver performs surprisingly well and makes the most of its quarter watt output. It is a very sensitive receiver and is capable of picking up many interstate stations in daylight hours.

Finally, if you are unconcerned by originality, vibrator problems can be overcome simply by feeding an appropriate low-level AC voltage straight into the primary of the vibrator transformer. This does away with both the vibrator and its accompanying hash. And if you are clever enough, no doubt there is a solid state alternative to the old vibrator.

However, having a vibrator radio working in its original form is a much more satisfying restoration. **SC**