Vintage Radio

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How NOT to build vintage gear . . . plus cleaning away the gunk

There are lots of things to consider when building or restoring vintage radios, including function, performance, reliability, ease of service and safety. However, there are a few things that you must not do.

A front view of the old PA amplifier with the cover removed. Note the three volume control labels, one of which is actually for a 4-position switch! The chassis can not be placed upside down with the valves in place, which makes servicing difficult.

RECENTLY, I TOOK A LOOK at an old 15W public address (PA) amplifier that I had acquired some years ago, my aim being to restore it to working order. The unit had been stored in my workshop for a number of years and I hadn't really looked at it closely until now. From the outside, it appeared to be a commercial unit but as work progressed, it soon became evident that this PA amplifier was actually home-made.

In fact, during the 1940s and early 1950s, chassis kits complete with top and bottom covers were produced so that home constructors could make their own PA amplifiers. Commercial PA amplifiers were not particularly common at that time and "Radio & Hobbies" magazine described many PA amplifiers over the years. This particular amplifier (not an R&H design) had been built into one such chassis kit, hence my initial impression that it was a commercial unit.

Anyway, I placed it on the bench, dusted it down and ran a damp rag over the outside of the case to clean it up. I then removed the top cover which protects the valves, the power transformer, two filter chokes and the audio output transformer. This was also dusted out and I then ran a damp cloth over the chassis and the transformers.

Next, I took the six valves out of their sockets and carefully cleaned them with warm, soapy water. With octal valves, I hold them upside down and rub the soapy water onto the glass envelope to clean the dust and other muck off the envelope. However, I take care to avoid rubbing the labels as they are all too easily washed off along with the muck.

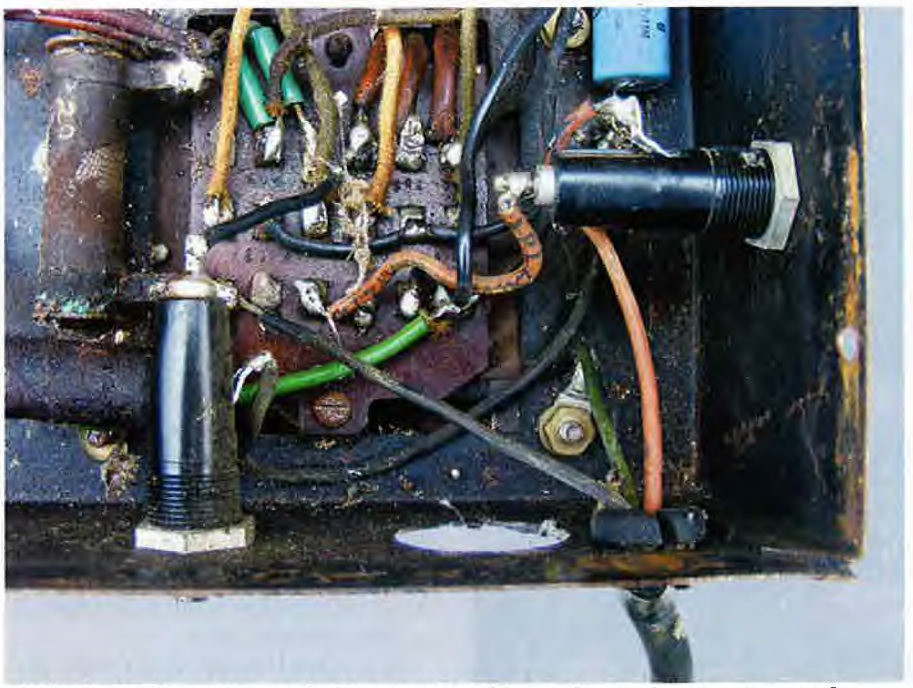
Once the envelopes were clean, I wiped the valve bases with a slightly soapy rag, taking care to ensure no moisture could get down inside the bases. Finally, I wiped the glass envelopes with a clean damp rag and left the valves lying on their sides to dry.

By this stage, the top of the chassis was looking reasonable although I wasn't particularly thrilled with the previous owner's paint job. First, the paint had not been applied evenly to the chassis, probably because spray paint cans weren't on the market at that time. Even worse, the chassis hadn't been painted at all between the HT chokes and the power transformer, indicating that painting took place with these parts bolted in place.

But what was really strange was that the power transformer had been painted red. It really looks out of place but even so, I still thought that this was a commercially-built piece of equipment with just some rather ordinary paintwork.

The under chassis shocks

It was now time to work on the under-chassis area. Leaving the valves out (so that they couldn't be damaged),



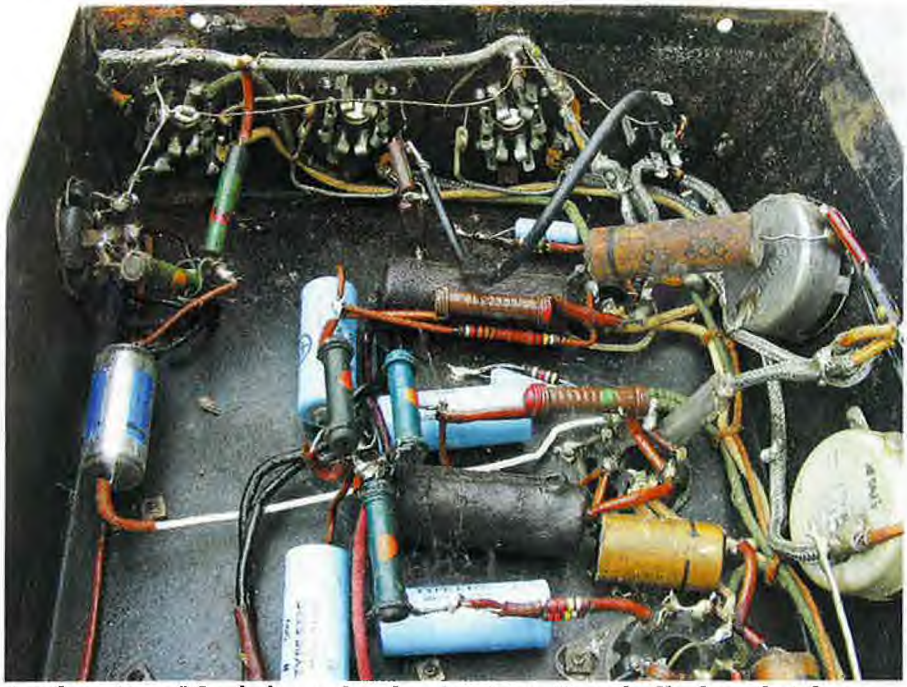
The hole for the mains cord clamp was too big, so the cord was not securely clamped. As a result, the cord has pulled back through it, leaving the internal mains wires under tension (especially the Neutral lead).

This photo clearly shows some of the dodgy under-chassis wiring. Many of the smaller components have long leads and are simply soldered together in mid-air. This allows the leads to flex and short against other parts.

I turned the chassis upside down and removed the metal sheet shielding the underside. This amplifier weighs a hefty 14kg, so the valves would have almost certainly been damaged if they had been installed (some of them are higher than the transformers and chokes).

With the shield removed, I took a look inside and was stunned at the poor quality of the work. The wiring was so bad that there was no doubt this was a home-made amplifier. Even the worst manufacturers would not have taken so many stupid short cuts and I was unimpressed to say the least

It was so bad that there was nothing for it but to abandon the restoration. At the very least, it would require a complete strip down and rebuild and it



Another view of the dodgy under-chassis wiring. It's so badly done that there was no point in restoring the old PA amplifier to working order.

just wasn't worth the effort. However, since it was so badly laid out and built, I decided that it would make a good article on how NOT to build or wire such equipment, or any vintage radio gear for that matter.

So what is so terribly wrong that I was forced to abandon the restoration? First, as mentioned, the valves are higher than the transformers and chokes, so the chassis cannot be upended without damaging these valves. I have another PA amplifier that I can easily tip upside-down with no likelihood of damage to the valves or any other components (see accompanying photo). However, that's a relatively minor point and I could live with this inadequacy.

It's the under-chassis wiring that's really atrocious. To begin with, there are no tagstrips on which to mount any of the small components and this is obvious from the photographs. Instead, the valve socket pins and some of the larger chassis-mounted parts formed many of the tie points for the smaller components, with the rest of the components then strung together in mid-air!

In some rare instances, stringing components together in mid-air without tag strips or mounting boards may be acceptable. However, when it is systematic as in this particular chassis, it is to be condemned. The leads were twisted together and then soldered and this makes the parts quite difficult to remove if they become faulty. What's more, in some circumstances, the leads and components could flex far enough for short circuits to occur.

Many years ago, I had to service a home-made high-frequency (HF) transmitter that was wired in a similar manner to this amplifier. Unfortunately, because of the types of components used in a transmitter, there were not many chassis-mount parts that could be used as tie points. In the end, I told the owner that I couldn't service it as it was and suggested that I rebuild it – which I did.

I remember that in order to remove the old, tangled web of floating wiring, I first disconnected the wires going to the valve socket pins and to the few large fixed parts. I was then able to lift the entire mess out as one complete tangled clump of wires and small components. It all reminded me very much of an inner spring mattress!

Strange microphone sockets

Getting back to the amplifier in question, the microphone sockets were fitted to one end of the chassis. However, these were actually octal valve sockets which are not really suitable for microphone use. The other end of the chassis carries a fuseholder, while the back edge carries another of these fuseholders, along with the mains cord entry.

The mains cord attachment is definitely unsafe. Admittedly, the previous owner had used a cord-grip cable clamp but its mounting hole was too large and it did not grip the cord with sufficient tension. As a result, the mains cord has pulled through this clamp, leaving the mains wires inside the chassis under a great deal of tension (see photo). In fact, the wires are under so much tension it's a wonder the connections haven't failed.

Labels & valves

The front panel controls have metallic labels that could be bought from the radio retailers of the era. These nickel-plated labels look OK but one of the three labelled "volume" controls is actually a 4-position Oak switch! Your guess is as good as mine as to what this control actually does.

The valve line-up uses a 6SJ7 preamplifier followed by another 6SJ7 which functions as an amplifier. This then feeds a 6U7G phase-splitter which in turn drives push-pull KT61s in the output stage. A 5Y3GT as used as the rectifier. The grid lead of the 6U7G is not shielded and I suspect the amplifier may have had some hum in the audio as a result.

In short, if an item is being home-built, it's important to take the time to properly lay out the chassis and include proper tie points (eg, tagstrips). It's also important to keep inputs and outputs separated as much as possible. Valve shields will be necessary in some cases to ensure stability and to minimise hum, while shielded cables are necessary for low level audio leads and (often) radio frequency (RF) leads.

You also need to take into account the number of parts to be fitted and their size, so that everything fits in the available space. And you need to ensure that capacitors and tuned circuits are kept well away from heat-producing sources such as valves and high-wattage components.

It's not unusual for the heat from valves to damage cabinet tops, even in commercial equipment. This can occur even when asbestos or some other material has been used to shield the cabinet. Asbestos sheets were sometimes fitted next to the output and rectifier valves in some early AWA radios. If you come across this material, remember that asbestos is a carcinogen and needs to be treated with extreme care.

These two photos show one of my other old PA amplifiers. Unlike the original unit, this PA amplifier can be tipped upside down for servicing without damaging the valves, the chassis itself providing the necessary protection.

Unfortunately, chassis layout is often a compromise. Achieving the best layout in terms of electronic stability and performance sometimes means that terminals, volume controls, on-off switches and various plugs and sockets could finish up in inconvenient locations. These problems can often be overcome by using extension shafts on controls or by placing the controls in more practical locations and using shielding and/or shielded cable.

This PA amplifier is a great example of how not to do any of these things, except that there's nothing wrong with the locations of the transformers and chokes!

Cleaning chassis & parts

Now let's take a brief look at some of the techniques used to clean old radio chassis. Unfortunately, some of the methods used over the years have proved to be rather destructive, both to the chassis and to individual components. In addition, some chemical cleaners can be hazardous to your health if not used correctly.

Several years ago, a friend who is an industrial chemist put together a list of safe, non-destructive cleaning techniques for vintage radios. With his permission, I have rewritten the information in a format suitable for this column.

Both chemical and mechanical methods can be used to remove the accumulated muck and corrosion from our radios. However, in this short article, I'm only going to concentrate on the mechanical methods.

It's incredible what sort of material, both organic and inorganic, can be found stuck to old radios and to their components. Getting the gunk and corrosion off is often only partially successful but if cleaning is pushed too far, it can be quite destructive. Some component materials react with the gunk on them while in other cases, the contaminant can soak in and be absorbed.

Clearly, if you can identify what the contaminant is, then you have a better chance of correctly removing it. However, it may sometimes be better not to remove it completely in order to avoid damage. The same applies to the chassis – should it be thoroughly cleaned and repainted or just superficially cleaned and left in its weathered state?

That's a decision that must be made by the restorer on a case-by-case basis.

Mechanical cleaning methods

OK, so let's take a look at the main mechanical cleaning methods:

Brushes: using a brush is one of the best methods when it comes to removing dust from delicate objects. For radio parts and chassis, you will need a set of brushes with soft bristles, eg, paint brushes. You can also use small specialised brushes from art suppliers and hobby shops.

Don't use stainless steel wire brushes to clean radio chassis or other parts.

The power transformer had been painted red but there was no paint on the chassis between the HT chokes and the power transformer.

They can really do serious damage (and yes, I've seen the results of this type of heavy-handed treatment).

Vacuum cleaners: vacuum cleaners can be used in conjunction with brushes, either as dust extractors or blowers. However, be careful when using a vacuum cleaner around a radio chassis. They can easily destroy the cone of a loudspeaker and possibly damage other parts as well.

Don't use a vacuum cleaner in conjunction with volatile solvents, as sparking at the commutator in the motor could ignite the fumes.

Blowers: a speed-controlled air-blower is the preferred device for blowing dust and light muck out of equipment. Wherever possible, this should be done outside the workshop, otherwise the dust will settle on other equipment.

Using air-compressors to blow out vintage radio gear is not generally recommended. A high air velocity can actually blow some parts to pieces or worse, blow particles at high-speed into your eyes if you are one of those people who neglects to wear eye protection. In addition, the air from most compressors will contain water and oil if not heavily filtered.

That said, air-compressors do have their uses, especially if fitted with a small hand-held nozzle with an adjustable trigger that can regulate the air flow.

Damp cloth & water: it's amazing what you can shift using just a damp cloth and water (including valve numbers and station markings on glass dials if you are not careful). The new generation of "micro-fibre" cloths can pick up an amazing amount of dust without scratching but as always, there are limits.

Abrasive techniques

Knives, chisels, screwdrivers and various abrasives (eg, steel wool) all have their place when it comes to cleaning up old radios. Of course, serious butchery can be done with these but sometimes their use is necessary to get results. It's just a matter of applying common sense and a deft touch.

Steel wool, for example, can be used as a fine abrasive on timber and other hard surfaces, usually without scratching. It can even clean muck off valve glass envelopes but again, take care to avoid type numbers.

Sandpaper, emery paper and wet and dry paper of various grades are suitable for cleaning the chassis and various other hardware items. Start with the coarser grades and then progress to the fine grades to remove any scratch marks. Kitchen scourer pads are good for cleaning chassis too, particularly when soaked in kerosene.

Car polish can also be used as a mild abrasive, as can toothpaste. Alternatively, you can mix baking soda (sodium bicarbonate) in water to make a mildly abrasive paste.

Baking soda is also found in some dry powder fire extinguishers and was used in the old "soda acid" type water extinguishers. It is often used to neutralise acid on lead-acid battery leads and terminals and as a mould inhibitor in refrigerators.

Devices which contain lots of brass and formaldehyde plastic often exhibit the formation of verdigris within the device. A sachet of baking soda may prove useful in preventing this if it can be fitted inside the device. Note that the sachet must be permeable, eg, made of cloth.

Screwdrivers, knives and chisels can be run along surfaces to lift or loosen some of the muck. This must be done with care to avoid scratches but if the muck is really caked on, this may sometimes be unavoidable.

In some cases, it may be necessary to do some restorative work after the surface has been thoroughly cleaned. Rust converters and similar chemicals can be useful here, as can fillers such as car bog compounds.

In summary, provided you're careful, the chassis and other major parts can generally be restored to good condition. Sometimes, you will need to combine mechanical cleaning methods with chemical cleaners but don't overdo it otherwise you could do irreparable damage. **SC**