More musings on the EBL31, including an EBL31/EL84 Adaptor

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I read with interest the article *Brief Encounters with the EBL31* by R.J.Grant in the Winter 2009 Bulletin. I embarked upon my own voyage of discovery with the EBL31 valve when I set about restoring an Ekco A22.

Having painstakingly restored my A22 - replacing perished wiring, fitting new capacitors, replacing out of spec resistors - when the moment of truth came and I switched the set on, all was well, except that the audio output was very low and it was clear that the EBL31 had run its distance.

It's a great pity that such a useful and versatile valve as the EBL31 – a double diode pentode, which takes care of AGC, detection and amplification all in one envelope, is now so rare.

Several UK valve suppliers do offer EBL31s for sale at about £25.00 each, but those on offer - though appearing to be new old stock - are not original EBL31s, but most likely EBL1s which have been adapted as EBL31s.

The EBL1 valve is electrically identical to the EBL31, but had a side contact base, and I suspect that the 'EBL31s' on offer from valve suppliers have been adapted by replacement of the side contact base with an octal base, as evidenced by the visible join in the valve base where the two are mated.

These apparently modified EBL31s also have a larger diameter top cap. The net effect is that the modified valves are much larger than the original EBL31 valve, as can be seen in the photo, which shows the original sized EBL31 alongside its big brother (or perhaps I should say 'ugly sister'!).

This wouldn't matter in most radios that use the EBL31, where the height of the valve is not an issue, but in the Ekco A22, unusually the valve lies horizontally and the taller adapted valves protrude too far to allow the back of the radio to fit.

Initially, my quest for the smaller valve proved fruitless, so when a member of the UK Vintage Radio Forum suggested that I consider making an adaptor to enable a smaller more modern pentode valve and a couple of germanium diodes to emulate an EBL31, I thought it was worth a try.

This would at least put the set into working order and had the merit of not requiring any alterations to the EBL31 valve-holder or chassis wiring. Hence, when and if a genuine valve turned up – as one later did – the adaptor could simply be unplugged and the EBL31 plugged in.

The characteristics of the ubiquitous EL84 pentode were close enough to those of the EBL31 as to not require any changes in value of any of the components on the A22 chassis, so was a good candidate.

All that was required was to make a bush that would couple an octal valve base culled from a scrap donor valve to a B9A valve holder. The pins from the two would need to be cross-wired as appropriate, and two germanium diodes fitted inside the adaptor. I used OA91 diodes, but any germanium signal diodes should suffice: OA90, OA81, 1N34 etc.

The EBL31 has a top cap - the EL84 doesn't. Hence, it would be necessary for the adaptor to include a 'top cap' to accept the top cap clip. (G1 of the valve).

'Small and large EBL31

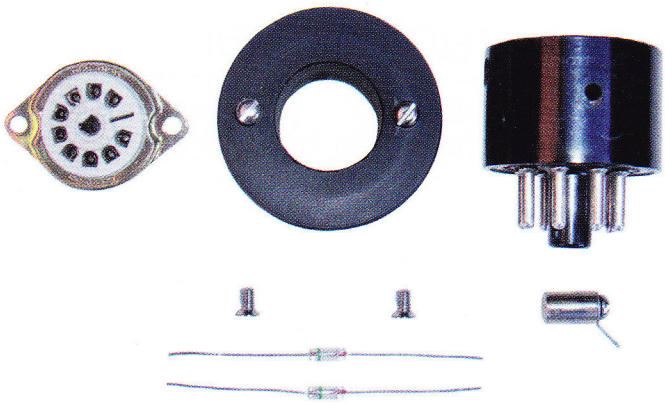
As a woodturner, my first thought was to make the adaptor bush from a close grained hardwood such as yew or box, but I was able to obtain an offcut of 40mm diameter black nylon rod from a local plastics supplier, which turns easily with woodturning tools.

A donor octal valve is needed - wrap it in a an old towel and smash it, taking sensible safety precautions, then unsolder the electrode wires from the valve pins. Octal valve bases appear to come in two sizes. One has an internal diameter of 1.15" (29mm), the other, 1.25" (31.75mm). Either will suffice.

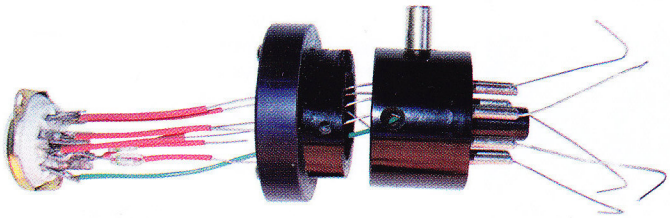
The pictures are self explanatory, but some notes may help.

The nylon rod was mounted in the lathe and drilled out to a depth of 25mm with a 19mm (¾") diameter Forstner bit held in the tailstock, to accept the B9A valve–holder. The rod was then turned down to a diameter to be a push fit into the donor octal valve–base. The bush was then parted off from the lathe, leaving the flange 10mm thick, and the spigot 8mm long.

A 15mm (1/2") length of brass rod from a scrap ¼" (6.4mm) diameter potentiometer shaft was drilled and tapped 6BA and fitted to the side of the valve base beneath the depth of the bush, with a solder tag on the inside. This would serve as the 'top cap' and would be wired inside the adaptor to the B9A valve holder.



EBL31 Adaptor Components



EBL31 Valve Base Adaptor wired up

Wiring up the pins of the octal valve base to the B9A valve holder, not forgetting the two OA91 diodes, is a fiddly task. By far the easiest way is to poke a length of tinned copper wire up the inside of each of the octal valve base pins in turn, bending the wire at the lower end to prevent it being pulled out, then slipping a short length of sleeving over the wire, soldering each wire in turn to the correct B9A valve holder pin.

Pin 3 of the B9A valve holder requires three connections - namely, the cathodes (striped end) of the two OA91 germanium diodes, and to pin 8 of the octal valve base. Twist the diode wires together at the cathode ends, but don't cut them too short before soldering them to pin 3 of the B9A as the lower ends of the diodes need to be long enough to poke down inside pins 4 & 5 of the octal base.

A short flying lead (3" - 75mm) of thin flex from the "top cap" solder tag is then wired inside the octal valve base to pin 2 of the B9A base, then the bush can be lowered into place, ensuring that the anode ends of the OA91 diodes are slid down through pins 4 and 5 of the octal base.

By now, you should have seven wires poking out of the octal valve base pins. (Pin 1 being n/c). It's worth double-checking for continuity to ensure that they all mate with the correct pins of the B9A, and that the diodes are the right way round before soldering the octal pins.

When checking for continuity, do remember that when looking down into the B9A valve-holder that the pins number from 1 - 9 anti-clockwise, but from the underside of the Octal Base, the pins number from 1 - 8 clockwise.

The EBL31 and EL84, connections are:

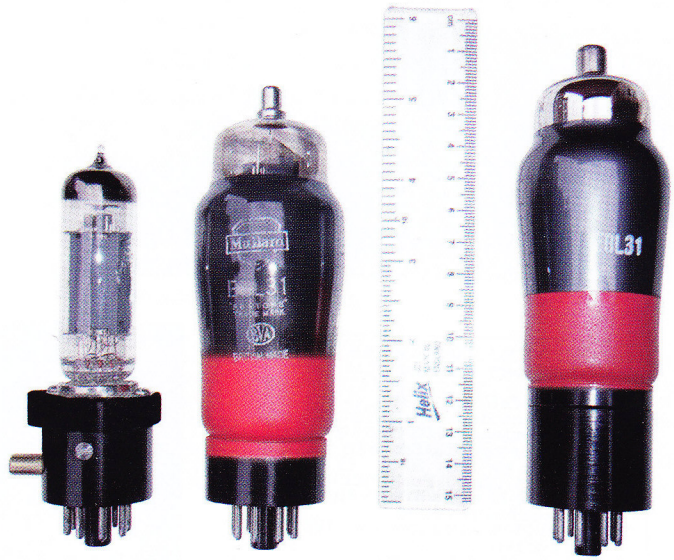
Octal (EBL31) Valve base pins	**B9A (EL84) valve holder tags**
Pin 1 – N/C	-
Pin 2 (Heater)	Pin 5
Pin 3 (Anode	Pin 7
Pin 4 (Diode) OA91 a-[>-k	Pin 3 (Cathode/G3)
Pin 5 (Diode) OA91a-[>-k	Pin 3 (Cathode/G3)
Pin 6 (G2)	Pin 9
Pin 7 (Heater)	Pin 4
Pin 8 (cathode/G3)	Pin 3
Top Cap (G1)	Pin 2

(There are no connections to pins 1, 6 & 8 of the EL84 valve-holder).

It's important to apply the soldering iron to the sides of the valve base pins to ensure that solder is drawn into the pins and a good electrical contact is made. The surplus wire ends can then be snipped off.

It sounds much more daunting and involved that it is – about an hour's work.

Of course, it will look completely out of keeping, but then the integrity and originality of the radio has not been compromised, and the adaptor/EL84 can be unplugged if an EBL31 comes along later.



EBL31 valves and EL84 Adaptor

I claim no credit for the originality of the idea – I'm sure I won't have been the first to do this or something similar. The same concept could apply to many other valves which are scarce or unobtainable – especially output valves and rectifiers.

Similarly, a donor valve base could be used to make a 'solid state' rectifier as a substitute for an unobtainable rectifier valve – for example, using 1N4007 diodes. I know that some restorers resort to soldering diodes across the valve–holder pins beneath the chassis, but by using a donor valve–base to house the rectifier diodes, the unit can simply be plugged into the valve–holder, with no alterations to the wiring of the chassis.

The picture shows the correct sized EBL31 alongside its 'big brother' and the valve-base adaptor with an EL84 fitted into it.

Notes on the photographs:

Small and large EBL31
As can be seen, the original EBL31 valve is about five inches tall – the larger valves currently supplied by at least two UK valve suppliers are probably adapted EBL1s, and are nearer six inches tall. The taller valve base has a neat join, which perhaps provides a clue that the original side contact base has been partly removed and an octal valve base joined to it. These modified valves also have a larger diameter top cap.

EBL31 valves and EL84 Adaptor
Shows both sized EBL31 valves, alongside an EL84 valve in the EBL31/EL84 valve base. adaptor.

EBL31 Adaptor Components
This shows the items needed to make an adaptor, namely:

Octal valve-base removed from a scrap donor valve.
B9A valve-holder.
Plastic bush, turned on the lathe to fit into the octal valve-base, drilled to accept a B9A valve-holder.
Two OA91 diodes.
Brass 'top cap' tapped 6BA, with solder tag and screw.
Two short c/s 6BA screws to secure the plastic bush to the octal base.

EBL31 Valve Base Adaptor wired up
Shows the completed B9A valve-holder wiring including the two OA 91 diodes and internal wire to the 'top cap' solder tag, ready to lower the valve-holder and collar into the octal base for final continuity testing before soldering the wires at the octal valve-base pins, and securing the collar of the adaptor in place with two small 6BA screws through the side of the octal base.