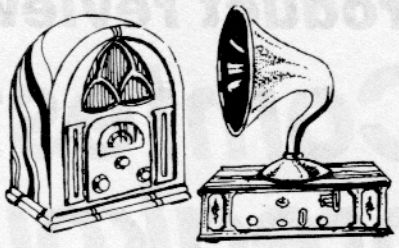
Vintage Radio

by PETER LANKSHEAR



The Methuselah of valves

Many vintage radio enthusiasts find valve collecting and historic research a rewarding aspect of their hobby. Valves were a key component of early electronics and their evolution was closely tied to major advances in receiver design. Improvements and marketing demands meant that the great majority of valves were preferred types for only a few years. Despite the evolution of more efficient successors, one rectifier outlived many later developments and became a sort of "working fossil" amongst valves.

Few if any valves can match the longevity of this popular rectifier, introduced in 1927 and an octal version of which, 60 years later was still being produced in Eastern Europe. I am referring of course, to the UX based 80 and its octal based derivatives, the 5Y3G and 5Y3GT.

When broadcasting began in the early 1920's, receivers were battery powered, with expensive blocks of dry cells providing the high tension and generally, a lead-acid battery supplying filaments. A typical medium duty HT or "B" battery was made up of three 45 volt blocks, each consisting of 30 cells about the size of a modern type D. The heavy duty "superdynes" used even bigger cells.

Little wonder then that mains fed HT power supplies, called "B eliminators", soon appeared. These needed rectifiers, and electrolytic, cold cathode gaseous, and high vacuum types were all used. The latter included the progenitor of the 80, the UX213 – which was the first rectifier to include two anodes in one envelope..

The UX280 arrives

Full AC mains operation of receivers had by 1927 become a reality. No longer was it necessary to restrict output valves to a few milliamperes of anode current. A respectable audio output was possible, which enabled the newly developed moving coil loudspeaker to replace the horn and moving iron types. Intended for the modest current requirements of battery eliminators, the existing rectifiers were unable to meet the increased demands, and Westinghouse engineers had been at work developing for RCA an improved version capable of handling much more current.

Released in May 1927, it had an anode rating of 300 volts and 125mA. In 1929 this was raised, the new maximum anode voltage for a capacitor input filter being 350V. Despite even this voltage being regularly exceeded, this new rectifier proved in operation to be a winner.

Originally, the full name was UX280, and the UX prefix is of interest.

The original receiving valves developed for RCA had a tall base with 4 stubby pins, that fitted into a bayonet socket. These valves were given the UV prefix.

Late in 1925 the familiar 4-pin base with the longer pins became standard, and valves, including the 80, fitted with this base had the prefix UX. Some UX bases from this era have a little peg on the side, enabling them to be used if necessary, in the earlier UV socket.

Other manufacturers and distributors soon started marketing the 80 using type numbers such as 180, 380, 480, G80 and T80. The significant portion was "80" and by 1930, magazines were referring to it as the '80. 1932 saw the introduction of the familiar domed bulb. This construction enabled mica spacers to be used, eliminating the filament tensioning springs, and creating a more rigid assembly as well as a less expensive valve to manufacture. Early in 1933 the Radio Manufacturers Association (RMA) rationalised the US valve numbering system and confirmed the new title of "80".

Unsuccessful rival

A new rectifier, which could well have superseded the 80, appeared in 1934. This was the indirectly heated cathode 83V.

Cathode type rectifiers, essential for vibrator powered and transformerless mains radios, had recently been developed and were more efficient than the widespaced electrode 80. The compact cathode construction permitted close spacing of the anode, resulting in superior voltage regulation. A logical move was to make a similar rectifier for standard receivers. The outcome was the 83V, which was more efficient and had improved ratings compared with those of the sometimes overloaded 80.

It made a lot of sense to use indirectly heated rectifiers. The internal voltage drop of an 83V was typically about 50 volts lower than that of the 80. Consequently, the power transformer could have a smaller HT winding and because the 83V heated up slowly, there was less strain on filter capacitors during warmup.

Why the 83V did not displace the 80 is not clear. Maybe manufacturers were plain conservative and certainly the 80 was cheaper.

Whatever the reason, the 80 remained pre-eminent. Although the 80 underwent little modification during its long life, around this time National Union attempted to increase the power handling ability of the 80 by corrugating the anodes. NU did not perpetuate this idea, but British STC marketed similar rectifiers under the BRIMAR label some time later.

An eventful year

1935 was the year of a major development in the American valve market. This was the introduction of the first of the octal-based metal valves. These

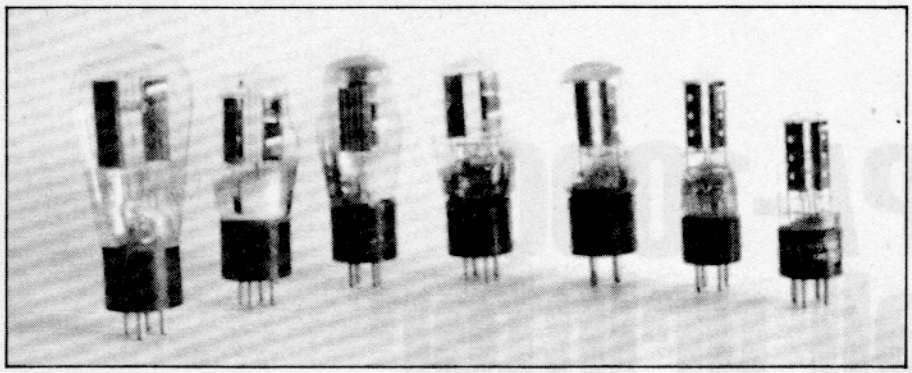


Fig.1: Various versions of the original type 80 (from left) – original S17 bulb; 1933 ST14 bulb; corrugated anode; English Philips; Chinese 1957; Eastern European T9 bulb; English T9 bulb.

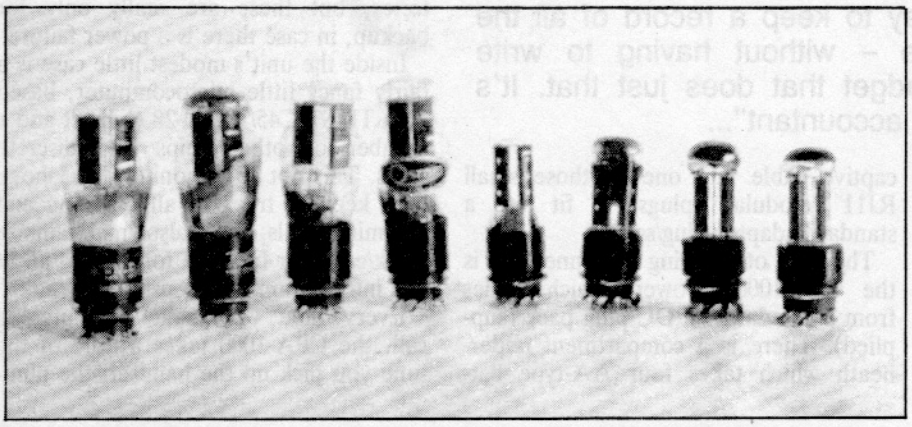


Fig.2: 5Y3 variations (from left) – 1935 ST14 bulb; 5Y4G; 5Y3G corrugated anode; English U50; Brazilian T9 bulb; Japanese 5Y3GT; East European "5Y3GT"; East European 5Z4GT.

were intended to boost General Electric back into the receiver market and along with the octal glass valves, dominated receiver design through the war years until the 1950's.

Their story is worth telling sometime, but it is sufficient to say that, in reality, many of the "first edition" were existing types in metal shells. However, one type, the 5Z4 mains rectifier, was a new design. It had similar maximum ratings to the trusty 80, but with the benefits of indirect heating. In its original form, the 5Z4 had an unusual appearance, with a tall perforated shell surrounding a pair of vacuum tight anodes.

This should have been the end of the 80 in new equipment. In valve terms, it was already old, its contemporaries long obsolete. An odd turn of events however, was to give it immortality.

The new 5Z4 rectifier seems to have been troublesome. When the "bugs" were cured, it became a conventional metal valve in the same envelope as the 6F6, but it was too late. The damage was done, and the reliable old 80 with its glass envelope was brought back into use, given an octal base and called the 5Y3G.

Although the 5Z4 problems were promptly cured, it never in the USA became as popular as the 5Y3G. Oddly though, the 5Z4G glass version of the 5Z4 was quite often used in Britain.

In Australia, AWA stayed with the 5Y3G for general purposes and for an indirectly heated 5-volt rectifier standardised on the 5V4G – which was none other than the 83V with an octal base.

One odd type was made by BRIMAR. This was the 80s, in reality a 5Z4G with a UX 4 pin base. There are times when valve genealogy is as complicated as that of a TV soap opera, but there is more yet!

4 Pin UX Base		8 Pin Octal Base		8 Pin Loktal Base
80	=	5Y3G(GT) 5Y4G U50	=	5AZ4
80s	=	5Z4(G) (GT)		
83V	=	5V4G(GA)		

Table 1: The relationship between the various 80 "family members".

Soon after the introduction of the 5Y3G, Philco, who were at loggerheads with RCA, changed the base connections around and called it the 5Y4G. This was not very clever, and if any reader has a replacement problem, I suggest that the rectifier socket is jumpered to take both a 5Y3G and 5Y4G.

1938 saw a Philco/Sylvania development, the Loktal series of valves. Whilst the preferred rectifier in this group was the isolated cathode 7Y4, a 5 volt directly heated version, the 5AZ4, was eventually included. Any surprise that it was an 80 in a Loktal envelope?

To help clarify the situation, the family tree of the 80 and its associates is shown in Table 1.

It must be emphasised that the 5Y3G was an 80 with an octal base and as such, continues our story. Strictly speaking, there never was a 5Y3, as in the octal numbering system the lack of a suffix would indicate a metal valve. The domed ST14 bulb version was correctly a 5Y3G, whereas the smaller T9 bulb type introduced after 1946 was the 5Y3GT.

During the 1950's, the 5Y3G was used less in new designs, but with so much existing equipment using it, demand has continued until quite recently. The 80 also received a T9 bulb about this time, but as it was not an octal valve, was not given any suffix. The progress of the three different shapes can be seen in the picture of the selection of 80 valves.

Although the 80 must have been made in practically every country that has manufactured valves, to the writer's knowledge, it has never been given an alternative civilian name. This is unusual and can be attributed to its being in common use from such an early date. Even the 5Y3G seems to have had only one redesignation. This was by British General Electric when they introduced their international range, and was called by them the U50.

The rationalisation of replacement valve types has lead recently to a strange twist in the story. At the right of the photograph of the 5Y3 group of valves is a pair of rectifiers of East European manufacture. Although one is labelled 5Y3GT, the other, identical in every way, is labelled 5Z4GT. As the cathodes are indirectly heated they are both correctly type 5Z4GT.

I guess that in a funny way, the wheel has gone full circle with the 5Y3 ending up being substituted by the valve type it was recalled half a century ago to stand in for!