The Ever Ready 5214 pre-War portable radio

by Stef Niewiadomski

Any radio introduced just a few months before the outbreak of the second World War was bound to encounter production problems for the duration, and the Ever Ready 5214 (and other related model numbers, see later) is a good example of such a radio. I bought this radio on eBay in December 2012 and because I thought that the restoration might have some challenges, rather than dive straight in I decided to wait a while and see if I could find another example of the radio to use as a possible donor. In fact I managed to find two more radios, and these, along with the original, showed the interesting story of the radio through at least part of its production lifetime.

On the back page of the Radio Times for 7th July 1939, Ever Ready advertised an 'All-dry Superhet Radio' – clearly the 5214 - being carried by a good-looking woman in a swimming costume and cape, on her way to the beach, see Figure 1. The radio was described as 'the radio that goes anywhere', and its advantages were listed, including that it weighed in at 'only 18½ lbs' – presumably including the battery - and that its 'single dry battery gives at least 240 hours' service'. The 'all-dry' description was novel and significant in that most contemporary portables still needed wet accumulators to be lugged around to supply the current to their filaments. Ominously the advert also states: 'Reception is free from interference in steel and concrete ARP shelters', indicating the commonly-accepted view at the time that war was inevitable. The scan of this advert was kindly supplied by the Radio Times Archive, at Reference 1.

Figure 1: Ever Ready's Radio Times advert for 7th July 1939.

Models and variants

The 5214 has a red/black leatherette finish (see Figure 2 for a view of my restored 5214), and this model was also offered as the Lissen 8514. The knobs on the 5214 were black with a red speckle, to match the cabinet. One of these knobs was missing on the original radio I obtained, which Mike Barker was kindly able to supply, and I also inherited a few more from one of the 'extra' chassis which eventually came my way.

There was also the model 5215 (gold/black leatherette and matching knobs, Lissen 8515 – with an olive green scale, rather than the red Ever Ready scale) and the 5216 (blue/black leatherette, again with matching knobs). With the advent of war, how many of these colours, different from the 5214, were actually manufactured is an interesting question: perhaps readers can indicate if they have seen any of these models?

A 'Forces Entertainment Radio' version of the 5214 was also produced, supplied to RAF canteens between 1940 and 1944. This was finished in RAF blue, and used a hybrid collection of valves, as and when they were available. Finally the 5218 was a 'table model' using a similar chassis to the portables but with a larger cabinet and loudspeaker. The Lissen factory in London was destroyed by bombing in early 1941, and this may well have been the end of Lissen-branded versions of the 5214.

My radio was an early model as indicated by it having six elliptic holes in the back panel, each about 1-inch wide and 1¼-inch high, and the provision to connect an external aerial and earth via sockets mounted in the right-hand hole. The front has a clean finish without visible screw heads, four of which can be seen in later models. The dial pointer rotates in the opposite direction to the tuning knob via a friction drive mechanism, see Figure 3. For later versions this was revised to a dial cord, which allowed the dial pointer to rotate in the same direction as the tuning knob, as might be expected by a user.

The volume control has a red-painted bakelite disk with a narrow white stripe pushed over its shaft, which indicates whether the radio is switched on or off. There is a similar disk, painted white with 'MW' and 'LW' stencilled onto it, on the shaft of the wavechange switch. These disks are visible through holes in the top panel, adjacent to the control knobs.

The first radio I bought (chassis number 2144201) contained a set of Ever Ready-branded first generation D-series 1.4V filament battery valves, apart from the frequency changer which was marked 'Mullard'

(see Figure 4 for the complete valve line-up). Two examples of the DK1 frequency changer valve are shown in Figure 5. The one on the left has golden-coloured metallising and was the original valve from the 5214, and the fact that a non-metallised version was produced - presumably later - seems to indicate that the metallisation was not needed in practice.

Since Mullard produced valves for Ever Ready (apart from some very early valves produced by Ever Ready itself) all the valves were in fact of Mullard origin. These valves were among the first whose filaments were intended to be powered from 'dry' zinc-carbon rather than 'wet' rechargeable batteries. They were also pretty much the last valves designed to use the 8-pin side-contact base format (of Continental origin, and also called 'Ct8' in the Mullard literature), with most later functional equivalents using an octal base. Most other portable radio manufacturers seem to have skipped this generation of 1.4V Ct8-based valves, and persevered with 2V filament valves until adopting the DK32 (introduced in 1945), etc, series of octal-based valves in their immediate post-war designs of 1945-46.

The design

The schematic of the 5214 is shown in Figure 6. The radio is a standard medium/long wave battery portable superhet with an IF of 452kHz. Loop aerials are used for the two bands, and external aerial and earth sockets are provided on the back panel. The radio used an Ever Ready All-Dry No. 3 combined 1.5V LT and 90V HT battery, fitted with a four-pin socket for connection to the radio.

V1 is the DK1 heptode frequency changer stage; V2 is the IF amplifier stage using the DF1 pentode; V3 is the detector/AF preamp stage using the DAC1; and V4 is the audio output stage, a DL2 pentode.

The 5214 entered production in June 1939, at the time the country was about to go to war, and difficulties would soon be experienced in obtaining the originally-specified valves. The Trader service sheet for the 5214 (published in February 1940) gives equivalent octal valves for the side-contact versions, 'where difficulty is experienced in obtaining the specified valves', as: 1A7 (for the DK1), 1N5 (for the DF1), 1H5 (for the DAC1), and 1C5 or 1Q5 (for the DL2). I believe these were US-manufactured (RCA, Sylvania, etc. 'Lucas' which no doubt were being shipped over on convoys at great cost to human life. This was only six months or so after the outbreak of war and it looks like supplies of the original valves were anticipated to dry up very quickly.

Because of the timing of the introduction of the DK1, DF1, DAC1 and DL2, apart from Ever Ready (and the Lissen brand) very few radio manufacturers designed them into their radios. In the UK I believe Ferguson used them in their 906B and 907 models; Pye used them in the 'New Baby Q'; and Beethoven Radio Ltd (a little known company based in London) incorporated them into the 'Little Prodigy' 909 model, all in the 1939-1940 period. In all cases the service sheets were advising a switch to octal equivalent valves as supplies of the original valves dried up. The Trader service sheet for the Pye also advises how a 2V accumulator could be substituted for the dry LT battery, by the addition of a series 2.4Ω resistor.

To help the use of these octal valves without having to replace and re-wire the original valve bases, plug-in adaptors could

Figure 2: The restored Ever Ready 5214 portable radio.

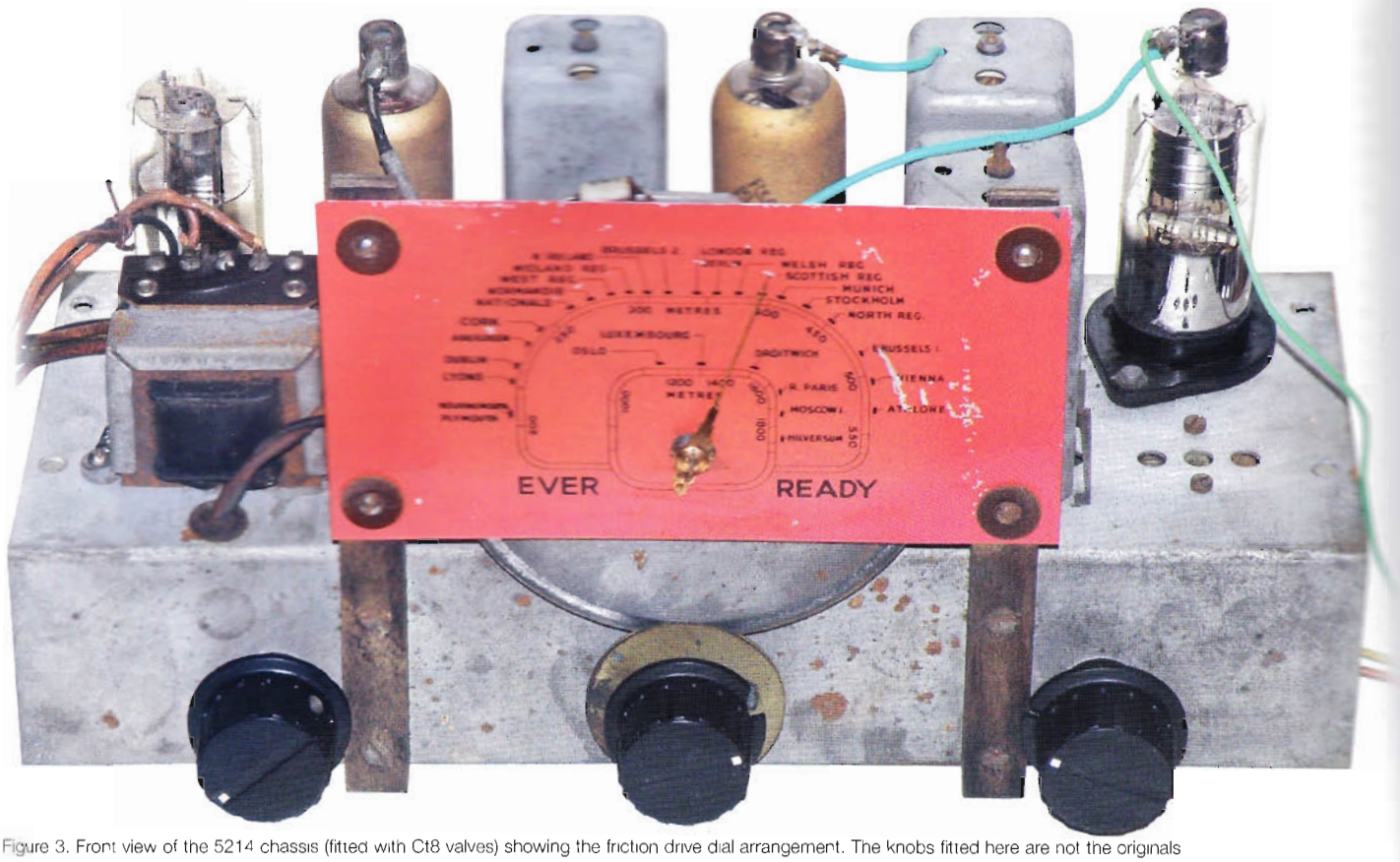


Figure 3. Front view of the 5214 chassis (fitted with Ct8 valves) showing the friction drive dial arrangement. The knobs fitted here are not the originals

be purchased to adapt the side-contact sockets to octal. See Figure 7 for one of these adaptors, manufactured by Ever Ready itself. It may have been necessary to extend the valve's top-cap connection if this wasn't quite long enough to accommodate an octal valve with a longer envelope.

CV equivalents

The DK1, DF1, DAC1, DL2 set of valves had a very short design-in lifetime and data on them has not survived well. The only data I could find was for their CV equivalents. CV service codes are quoted for these valves at Reference 2. The codes given are:

DK1 = CV2910
DF1 = CV2907
DAC1 = CV2887
DL2 = CV2911

Since these valves were given service CV codes, I presume they were used in military radios. It would be good to hear from readers about any military radios known to use these valves. Although I couldn't find any online data for the D-prefix valves I did find brief data for their CV equivalents, and this data is now exhibited at the National Valve Museum (see Reference 3).

Figure 4. An 'identity parade' line-up of the DK1, DF1, DAC1 and DL2 valves from my Ever Ready 5214.

Restoration

The cabinet of my radio wasn't in bad condition, bearing in mind its age of something like 70+ years. A good clean up and replacement of the very yellowed and distorted plastic dial cover made it look much better. The handle, often a very worn part of a portable, was in remarkably good condition.

I removed the knobs and the chassis fixing screws and lifted the chassis from the cabinet, replacing and lengthening the speaker leads which were perished and too short to work conveniently with the chassis out of the cabinet. I also had to connect flying leads to the frame aerials: not ideal as this adds inductance to the connections, but again it made life much easier. The medium wave aerial is mounted on the inside of the back cover, and the long wave aerial is screwed to the inside left hand side of the cabinet.

Figure 8 shows the underneath of the chassis, which is very simple. First of all I checked the values of all the resistors: they all seemed to be pretty close to their nominal values, even the high value ones, and so I left them alone. As I checked each component I looked carefully for dry joints and loose connections, a couple of which I found. The wiper of the volume control seemed to be intermittent in its contact, and some switch cleaner and back-and-forth motions seemed to fix this. I was suspicious of all the paper and electrolytic capacitors, and changed them all for modern components.

The lead from V1 grid (top-cap) to the tuning capacitor, and that from V2 grid to its IF transformer, were perished and so these were replaced with new wire.

I connected up a 90V HT and 1.4V LT supply and switched on. Initially the filament current measured low at about

180mA and I suspected that one valve had a blown filament. I checked around all the valves and I could see that one side of the filament wiring for V1 wasn't grounded. I made the connection and the current came up to the correct value of 250mA.

There was a slight hum from the speaker, but no stations as I tuned around the medium and long wave bands. I injected modulated RF into the grid (top cap) of V3 and could hear the demodulated tone. With my 'scope I checked to see if the frequency changer stage was oscillating, which it wasn't. Checks to its DC potentials looked OK and so I suspected that the DK1 wasn't in the best of health. This stalled progress for a while until I obtained a replacement valve from Mike Barker.

With the new DK1 fitted things improved slightly, but only a very weak Radio 4 on the long wave could be detected - which I could only hear when I plugged in an external aerial - as I tuned around both bands.

Alignment

I concluded at this stage that there was no good reason why the radio shouldn't work, and that it was probably badly mis-aligned. Following the service sheet's procedure I short circuited the oscillator section of the tuning capacitor (C14) and connected a 470kΩ across the tags to the frame aerials. I then injected a modulated AM source at 452kHz to the control grid (top cap) of V1 via a blocking capacitor. The IF transformer cores were then peaked in the correct order, which made a big difference to the volume of the demodulated audio output. Then I removed the short from C14 and the 470kΩ resistor. The service sheet recommends that alignment is carried out with the chassis in the cabinet, and adjustments are made through the holes in the back panel. This looked tricky to me, so I thought I'd give it a try outside the cabinet first.

I followed the recommended medium wave alignment procedure and got several stations on this band. Then switching to the long wave I aligned to get Radio 4 at the correct position on the dial. Switching back to the medium wave, I needed to re-peak to get my stations back at reasonable strength. At the low frequency end of the medium wave band the radio started 'motor-boating' but was OK over the rest of the band. I then re-assembled the chassis into the cabinet: I don't think my results were brilliant, but I was happy enough at this stage to get some stations on both bands. I may come back later and attempt the alignment using 'keyhole surgery' through the back panel holes.

Figure 9 shows the chassis back in the cabinet, with the large space allowed for the combined LT and HT battery.

Figure 5: Two examples of the DK1 frequency changer valve. The one on the left has golden-coloured metallising and was the original valve from the 5214.

The other two Chassis

As I mentioned at the beginning of this article I managed to find two more chassis, which in the end I didn't need to cannibalise, but which showed the interesting history of this radio. I was very lucky to pick up a very wood-worm eaten 5214 from the wall outside the hall at the September 2013 meeting at Harpenden. The cabinet was quickly disposed of but the chassis (number 2257373) is in reasonable condition, see Figure 10. The chassis is equipped with 100% Ct8 bases but V1 is a Mullard DK32 plugged into an octal-Ct8 adaptor. This must have happened sometime after 1945 and it's reasonable to assume that the radio was originally built with a DK1 in this position. Note that the cans of the IF transformers, and the can containing the front-end coils are fabricated from sheet metal with their seams soldered together. Perhaps this was a cost and/or labour saving adaption from the extruded aluminium cans used on my original chassis.

Figure 11 shows the chassis (number 2277553) found at the Dunstable Downs rally in 2013, containing octal-based valves of US origin. Hopefully the dial cord can be seen. which results in the dial pointer rotating in the same direction as the tuning knob. Note that the can containing the aerial and oscillator coils on the Ct8-based chassis is missing. The coils are mounted under the chassis, around the wavechange switch, which begs the question 'is this really from a 5214?' There's the possibility that it's a model 'A', designed for the DK32, etc range of valves (but probably built using stocks of the 1A7GT, etc), and produced between 1946 and about 1950 (see Reference 4). Photos of the 'A' clearly show an above-chassis screening can containing the front end coils, which my chassis doesn't have, where these coils are below the chassis. I'd say therefore that it's maybe 90% certain that chassis number 2277553 is a 5214 with variations on the original build level, as would be expected with any radio, let alone one that was being built under wartime conditions.

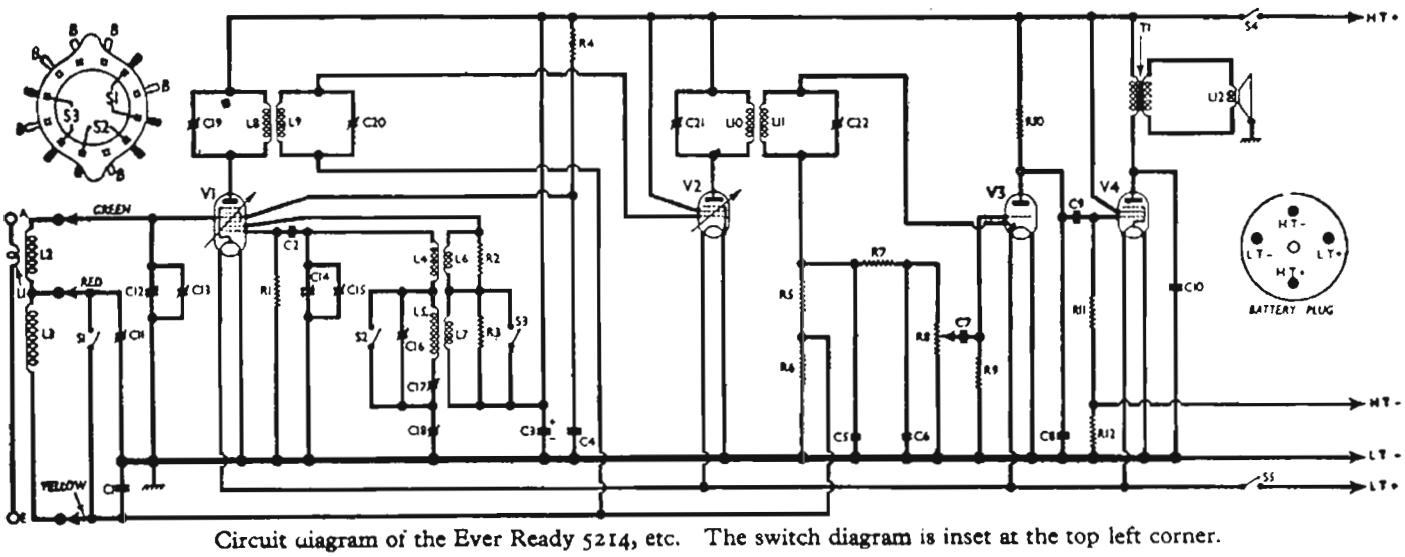
Evolution of the 1.4V Frequency changer valve

Having mentioned the DK1, 1A7GT and DK32, I thought I'd complete the story of the evolution of the frequency changer stage for 1.4V filament valves. Figure 12 shows a complete line-up, with the highly successful B7G-based range consisting of the DK91 (introduced in 1947), DK92 (1951) and DK96 (1953) added in. And that was the end of the line for valves for use in battery-powered radios.

The Sylvania 1A7GT/VT-147 has a shorter glass envelope than the DK32 and presumably was a useful height reduction in the service equipment in which it was used.

The DL2

The DL2 audio output valve is unmetallised and is marked 'Ever Ready' in red ink. I have



Circuit diagram of the Ever Ready 5214, etc. The switch diagram is inset at the top left corner.

Figure 6: Schematic of the Ever Ready 5214, which used Ct8-based valves immediately pre-war. The same chassis also appeared in the 5215, 5216, 5217 and 5218, as well as the Lissen 8514 and 8515, which were of course Ever Ready sets, having acquired the Lissen brand in 1934.

an original box (see Figure 13) for this valve and it shows the Mullard 'Pentone' branding for pentodes, started in the 1920s, continued into the octal era and even used for their B9A valves, such as the EL84. Note also the strict policy on price maintenance: the valve could not be sold to the public for less than 9/- (presumably radio manufacturers and the trade got a discount), and 'No allowance, bonus, rebate, gift, or other consideration shall be given to the purchaser of this valve in connection with its sale'.

Conclusions

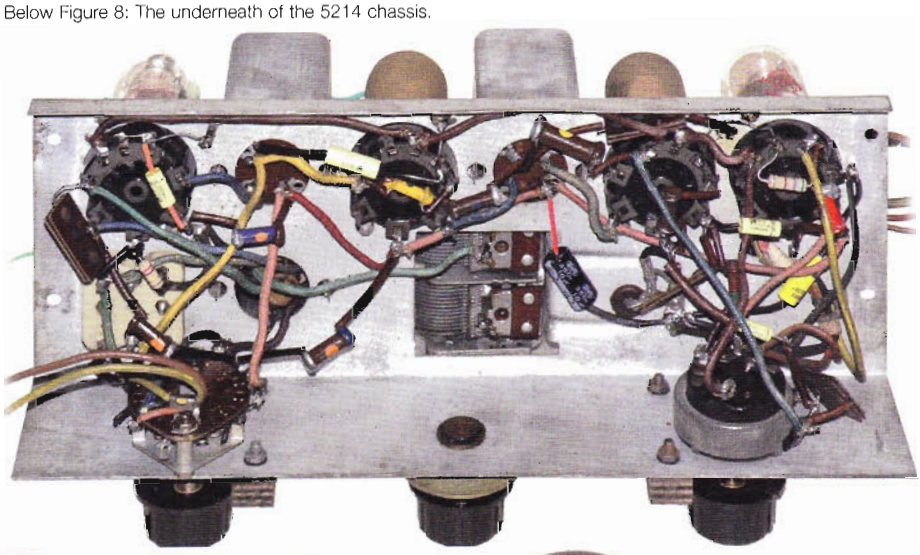
The 5214, and associated Ever Ready and Lissen models, and a handful of radios from other UK manufacturers, gave a very brief design-in window for the side-contact DK1, DF1, DAC1 and DL2 valves. With 1.4V filaments, and intended to be powered from 'dry' rather than 'wet' batteries, these valves were the ancestors of the D90 series of B7G valves (DK91, DF91, etc) which were designed into portable radios in their millions between 1947 and about 1960. The outbreak of war in 1939 caused a rapid migration to octal-based equivalents, many of which were shipped over to the UK from the USA. I must admit I found removing and inserting these side contact valves a nerve-racking experience as it's very difficult to avoid putting considerable pressure where the glass meets the base.

By the end of the war, side-contact valves were obsolete. As new portables were designed post-war, for just a couple of years a typical octal line-up for battery radios - for example in the Ever Ready A, and the Vidor 351 - was: DK32, DF33, DAC32 and DL35. By 1947 the Vidor 353 used the miniature all-glass construction B7G DK91, etc line-up, and this was adopted by most portable radio manufacturers very quickly. There was a DK21 (see Reference section) but as far as I can see this valve did not reach production status in any British portables.

The numbering of the DL2 begs the question 'what happened to the DL1?' So far I've found no data whatsoever on this valve, so for a while I presumed that it was an unsuccessful prototype of what became the DL2. However I did manage to find a Mullard DL1 in its original box on eBay recently and so it looks like it was released to production, though not used by Ever Ready in any of their radios.

Figure 7: The Octal-to-Ct8 adaptor, made by Ever Ready. On the adaptor it says 'Only to replace Ever Ready valves DK1 – DF1 – DAC1 – DL2'

Below Figure 8: The underneath of the 5214 chassis.



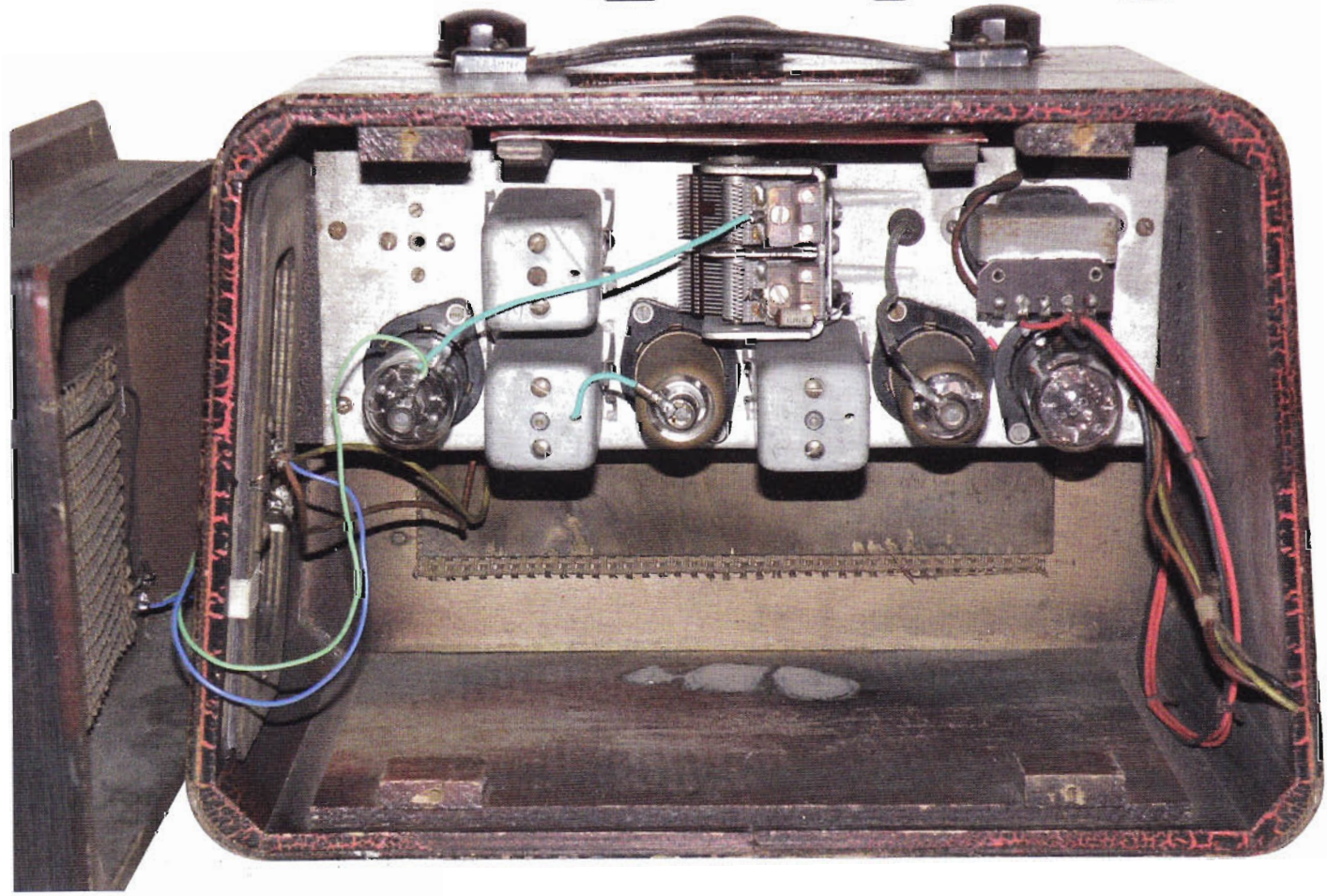


Figure 9. The chassis installed back in the cabinet.

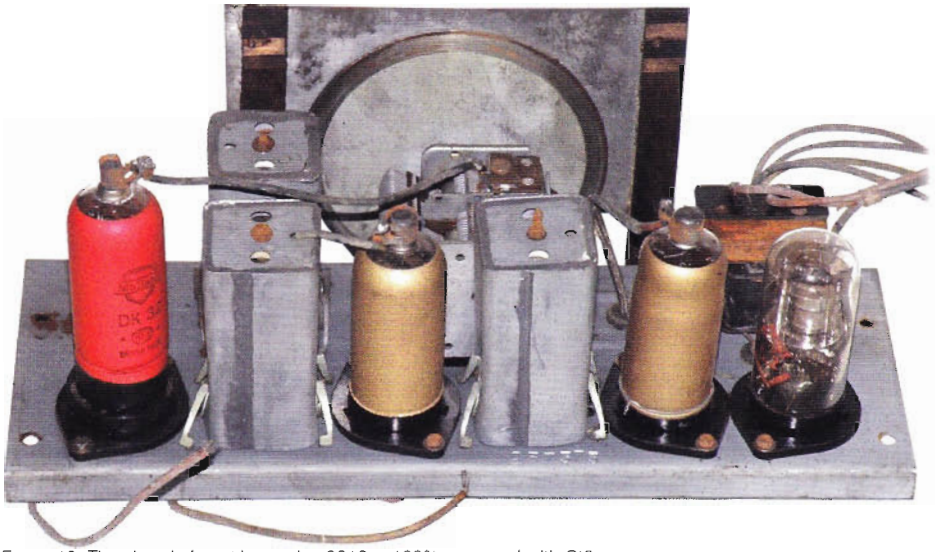


Figure 10: The chassis from Harpenden 2013 is 100% equipped with Ct8 bases. V1 is a DK32 plugged into an octal-Ct8 adaptor.

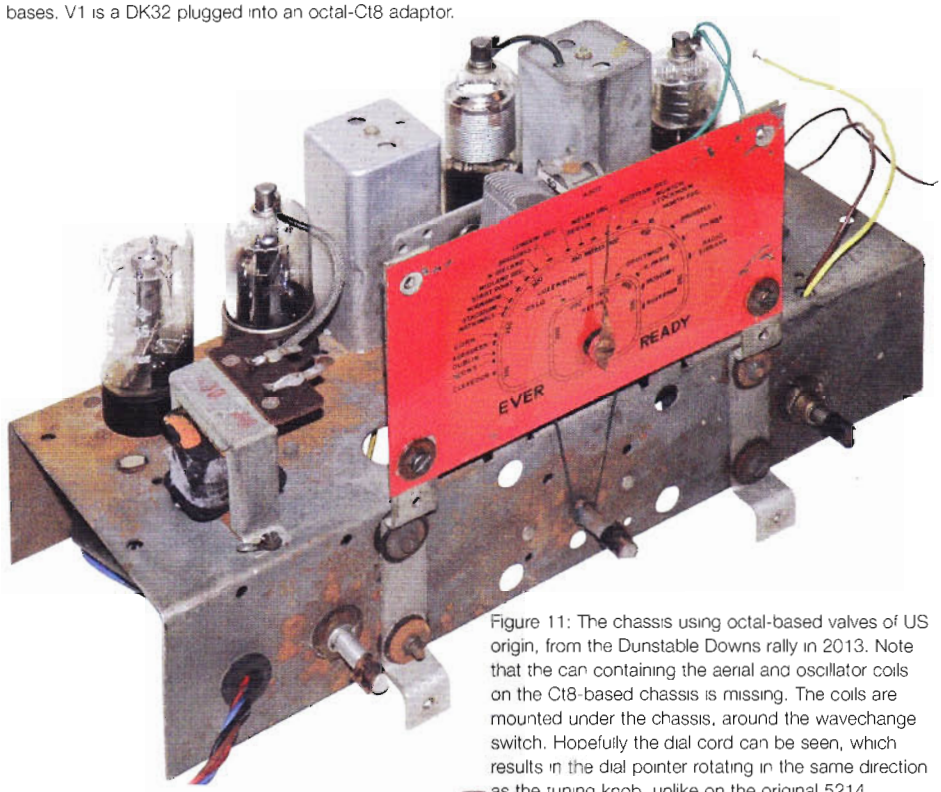
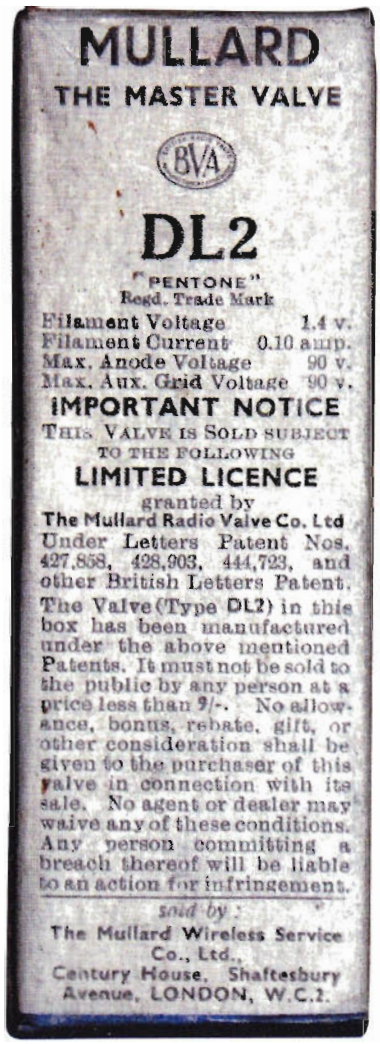


Figure 11: The chassis using octal-based valves of US origin, from the Dunstable Downs rally in 2013. Note that the can containing the aerial and oscillator coils on the Ct8-based chassis is missing. The coils are mounted under the chassis, around the wavechange switch. Hopefully the dial cord can be seen, which results in the dial pointer rotating in the same direction as the tuning knob, unlike on the original 5214.

Figure 12: Line-up of 1.4V frequency changer valves. Left-to-right are: DK1, 1A7GT (VT-147), DK32, DK91, DK92 and DK96. Mullard has supplied the DK91 with a plastic cover for the pins, helping prevent them from being bent during handling. The DK96 is marked 'Ever Ready', but as with earlier Ever Ready valves, this was manufactured by Mullard.

Right - Figure 13: An original box for the DL2 showing Mullard's 'Pentone' branding. Note also the strict policy on price maintenance: the valve could not be sold to the public for less than 9/-, under any circumstances.



References

Reference 1: The Radio Times Archive can be accessed at: http://www.radiotimesarchive.co.uk/

Reference 2: A searchable list of CV valve codes and a full list of CV valve manufacturers' codes can be found at the Virtual Valve Museum at: http://www.tubecollector.org/cv-valves.htm

Reference 3: The National Valve Museum at http://www.r-type.org/index.htm is a valuable source of valve history and data, including many high quality photos of the valves featured. Data for the DK1, DF1, DAC1 and DL2 (mainly derived from their CV equivalents) has now been published on this website.

Reference 4. The Ever Ready model 'A' can be seen at: http://www.radiomuseum.org/r/ever_a.html

The Lucerne, Switzerland-based Radiomuseum contains a wealth of online information on radios, TVs, etc. A good starting point for exploring what they have on Ever Ready sets can be found at: http://www.radiomuseum.org/r/ever_all_dry_battery_portable.html

A fascinating history of valves can be found in 70 Years of Radio Tubes and Valves by John W Stokes. Published by The Vestal Press Ltd, New York, in 1982.

In occupied Europe there was a range of octal-based 1.4V valves produced during the war. Descriptions of the Dx21 series of valves (in undated documents) can be found at:
http://frank.pocnet.net/sheets/046/d/DK21.pdf
http://frank.pocnet.net/sheets/046/d/DF21.pdf
http://frank.pocnet.net/sheets/046/d/DAC21.pdf
http://frank.pocnet.net/sheets/046/d/DL21.pdf