BRITISH VINTAGE WIRELESS SOCIETY

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A selection of Valve boxes

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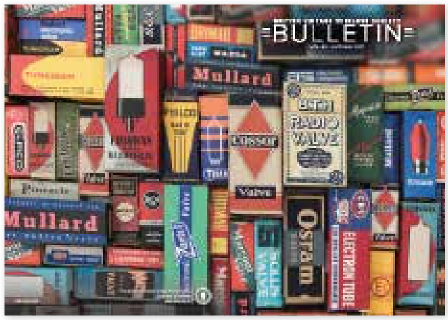

From the Chair...

A couple of weeks before this issue was due to go to print, our editor was in a state of great panic! He still had 8 blank pages to fill. The easy option would be to reproduce even more old advertisements from long gone publications and show more photographs from our recent events but we need to maintain a balance of features. A few frantic phone calls were made to various contributors and thankfully some were forthcoming. So please, **WE NEED YOU TO SEND IN MORE ARTICLES!** Do read the editors request on the last page of this issue. We are grateful to all of you who have sent us articles in the past and particularly those who are regular contributors, you've all helped to make this publication the high quality, varied and informative magazine that it is. For a good while now, both the past and current editors have been in the fortunate position of having material held in reserve but this seems to have dried up. So share your restorations and projects with us. And please don't be put off by some of the extremely high quality restoration articles that get published if you don't feel that you achieve those results, if you just get your set or whatever working and give it a wipe over with a damp cloth (which is about my usual standard!) we'd still be interested to read about it. And it doesn't have to be a restoration, it could be a relevant story, historical article or 'show and tell' of your collection.

Many Clubs and Societies take a break over the summer months but not so the BVWS – the events calendar has been full: The British Vintage Wireless & Television Museum Garden Party and Cinema Museum swap meet both in June, Royal Wootton Bassett swap meet/auction in July and the 4th annual Punnetts Town swap meet in early August with a record attendance this year! I'd just like to thank the folk who put in a great deal of time and hard work to organise all the BVWS events for our enjoyment, it really is appreciated, they're always well attended and great fun. And you just never know what little curios might turn up, a very rare Baird Televisor attracted much attention at Bassett. You'll find many interesting photographs of these events in the following pages.

A few members have spoken with me regarding the word "wireless" as used in our Society name, which some feel is no longer appropriate, especially to anyone who is in their 20's or 30's, to whom it will have a different meaning altogether and so be misleading. Others have said "If it 'ain't broke don't fix it!' So let's have any suggestions, please email them to the editor and we'll publish your views on the letters page in the next few issues.

Over the last 40 years, we've developed a great identity with our title, if we do ultimately decide to change it, we have to come up with the right name to drive the Society forward. If we get it wrong it could be detrimental to our future. The word 'technology' seems to come up regularly but maybe is too general, as essentially our interests cover radio/tv/audio (increasingly) also overlapping slightly in to comms and telecoms, including all the associated spares, test equipment and ephemera, so what words can we come up with to accurately portray this?

Please take note of the announcement in the red box below regarding the BVW&TV Museum events. Nonetheless, it's an exciting time for the Museum as it enters a new chapter. Museum committee chairman John Thompson explains what's happening on page 28.

I don't know about you but I find the longer days of summer seem to keep me out of the workshop. There always seems so much else to do around the house and when not raining, in the garden. And as much as I don't look forward to the long dark and cold nights, it does mean extended play time in the workshop! So let us all get some interesting projects going, write down our findings as we go and take plenty of photographs. Then send them in to our editor and he'll be one very happy chap!

Best regards,

Greg

NOTICE ALL EVENTS AT THE BVW&TV MUSEUM ARE POSTPONED UNTIL FURTHER NOTICE DUE TO RENOVATIONS

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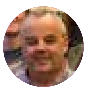
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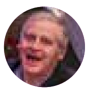
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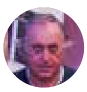
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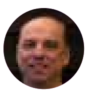
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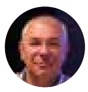
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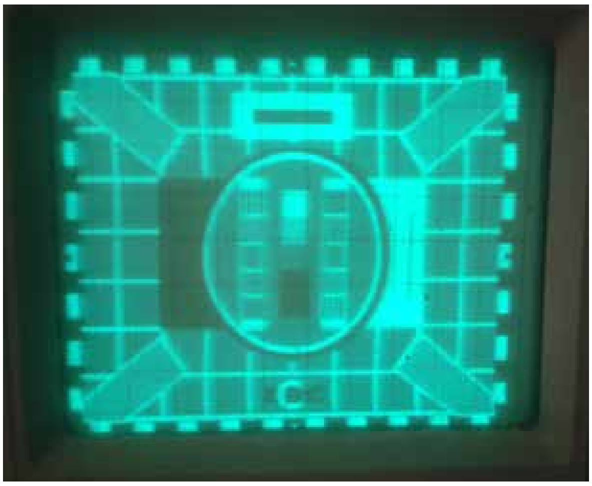

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Philips Aachen Super, D57 AU, MonoKnob from 1938/39 - second cabinet refinish.

Gary Tempest

This article relates back to one in 2015 for which readers kindly voted me a best article award.

The reason for having to refinish the cabinet again was due to tiny cracks appearing later in the bottom black trim, the Monoknob control panel and worse the entire top. It shouldn't have been due to over-spraying Halfords black acrylic paint with cellulose lacquer as I have done this many times before with no problems and the cracking was below the cellulose and actually in the primer used. Of course paint formulations change over time. The cabinet was gently stripped using Coloron Furniture and Antique Wood Stripper washed down with thinners. This didn't work rapidly and I had to do all surfaces twice. A big help was being able to remove the foot and the Monoknob panel. The former was secured by panel pins and glue. As is normally the case, if they are of robust construction, they can be removed by gently knocking in stripping knives. Replacement was by countersunk woodscrews, drilled at this time in the same holes as the panel pins. Four screws were countersunk on the inside and two were in the recesses for the furniture pads so none can be seen now it's finished. The panel was held from the inside with woodscrews and a little glue at the ends. This parted with a light knock from the butt of a hand with a small veneer loss but where it is out of sight.

Firstly, was a light sand down before laborious grain filling of the front and sides with Rustin's Natural thinned with dark stain. This was done twice and it left quite a lot of scum on the surface as it dries so quickly.
A good tip to remove it is to not use too fine an abrasive paper and aluminium oxide 240 seems about right finishing off with silicon carbide 600. The top didn't need much filling as it is birch veneered plywood.

Now a nice part was to apply some mixed and thinned stain (White Spirit) to the body which shows some colour and contrast to the wood and is inspiring for the work ahead. Parts of it, particularly the corners which get damaged, needed touching in with the "artist oil paint method" which I have written about before.

The black top, Monoknob panel and other trim were probably evened up with black stain but I haven't noted this. They were then sprayed with Mohawk Black Tone Toner (M115-2809) which is of the obliterating type. It was over-sprayed with several coats of Mohawk 75% gloss lacquer rubbing down with a very fine paper, where needed, between coats.

After leaving for a few weeks the cabinet was rubbed out using a car body polishing compound before final waxing.

I then put the cabinet away for some months as I wanted to be sure that the finish was now stable before the difficult task of reinstalling the electronics. This was made more so as I didn't want to put a single scratch on the cabinet. I'm happy that the finish was as good as I wanted and the black parts are now flawless. It shows for the best results and the least trouble use all finishes from the same maker. You at least know that they will have been thoroughly tested for compatibility.

Cabinet stripped

Conclusion

Even now when I walk past it I'm thrilled at how perfect it looks. As to performance, having had longer to listen to it, the care that Philips took with detection, AVC and the negative feedback amplifier shines through. Someone on a Forum said his was the best sounding radio in his collection and I might agree with that in mine.

On all wavebands it is sensitive with adequate selectivity even on the short waveband but there are few stations there now.

The controls work smoothly and I have got better at using the Monoknob. However, it's still an odd way to control a radio, although it doesn't seem to have deterred sales judging by how many radios that are still around with it. The trickiest thing is the volume, as the radio has an excess of audio gain. But a lot of the time I don't need to juggle the knob as with the separate side on/off switch that's all

Cabinet re-finished

that's needed with the radio left tuned to R4. When I do tune across the MW band the AVC works very well smoothing out the differences between the weak and powerful stations so no frantic grabbing of the knob is required.

The bandwidth switch is perfect with just enough top cut, letting you know that alignment is correct, when switching to narrow band.

The 'phono' input suits an EMI playing deck for 78 rpm records and performance is powerful and pleasant although I couldn't tell which I preferred, the Philips or an HMV 650 with a similar connected player. This was playing the same disc on one and then immediately on the other.

A long restoration and frustrating at times but my wife summed it up: "It wasn't easy but you don't want easy any more; you've done enough of those".

The "Davenset Type 1 Valve" receiver

Rod Viveash

(Or is it two valve?) This set was bought on an internet auction site, I was the under bidder for a crystal set and it appeared in "Plenty more options for you…" in the customary consolation email. I was drawn to it as the maker was Partridge & Wilson who are famous for their Davenset battery chargers, a 1930s version of which I have on my garage wall.

The illustration the seller had provided clearly showed 2 valves and I thought one may have been added later but when the set arrived it was an original 2 valve set, confirmed by the Marconi royalty plate. The confusion was in the title, they must mean Type 1 receiver using valves.

The seller's late father had worked for Partridge & Wilson for nearly 50 years and the set had been found when he was sorting out his father's belongings.

Clifford Partridge and H.G.A. Ross Wilson formed an engineering business on Loughborough Road, Leicester in 1926, and started manufacturing radio sets.

The previous year the BBC had opened 5XX, their new high power Long Wave transmitter, at Daventry some 35 miles from Leicester. Like many other receiver manufacturers at the time, Partridge & Wilson cashed in on the new station calling their Daventry set the Davenset.

When radio production ceased and battery charger production started is not clear, but they probably realised there was a shortage of places where the L.T. batteries of valve sets could be charged. They must have found a ready market for their chargers at garages, cycle shops, ironmongers and the like. By 1930 they moved to a much larger premises at Evington Valley Road, Leicester and went into volume production of Davenset chargers.

For two years in 1935 and 36 they deviated briefly into manufacturing electric cars, David Burgess Wise in his book "Encyclopaedia of Automobiles" wrote of the Wilson car "About 40 cars were made in the two years of production, making it the top selling British electric car of the inter-war years!" no doubt each car was supplied with a Davenset charger.

Davenset 5 Front view of Davenset Type 1 radio.

In the summer of 1986 Partridge & Wilson Engineering closed down in Leicester and moved to Chippenham, joining Westinghouse Rectifiers, and becoming Westinghouse Davenset Rectifiers Ltd. In 1979 they were taken over by D.D.R. Ltd (Deakin Davenset Rectifiers Ltd) who are still trading today.

This Davenset radio is of the detector + A.F. amplifier type and is the standard simple circuit of the day. I have not done any restoration other than a general clean and a repair to the reaction swinging coil mechanism. The wave band required is selected by changing coils, a couple of sets

Fig 1 Interior of charger showing low voltage "Tungar" rectifier valve.

Fig 2 1930s Davenset battery charger.

were probably supplied with the receiver.

The cabinet is rather crudely made particularly the beading round the front panel that doesn't meet at the corners properly and is fixed with screws that are not flush with the wood. They also have only used four screws instead of six for each lid hinge and the lid is not central with the body. I wondered if it was a later "shed" built job, although with decades of dust ingrained in the crevices it does look contemporary with the chassis, and also has the Marconi valve royalty label fixed inside. I can however forgive these blemishes as it is a rare survivor of the origin of the Davenset trade mark that is still in use today, but what of 5XX transmitter that started it all off?

Fig 3 Interior of radio.

Daventry 5XX the L.W. National transmitter remained in use until the service was transferred to Droitwich in 1934.The transmitter however remained in situ at Daventry and was used during World War 2 to send messages into occupied France. It was finally scrapped in 1949 to make way for the new "Third Programme" Medium Wave transmitter which was installed in its building.

Here at Daventry Museum, we have the few remaining fragments from 5XX, three water cooled Marconi valves, a 2 inch steel ball from under one of the aerial support masts (needed to allow the mast to swing slightly in windy weather), and a toasting fork alleged to have been made from copper from the transmitter. These items including one of the valves form part of a permanent display in a section of the museum that also contains items from the BBC short wave transmitters that were installed at Daventry from 1932 until closure of the station in 1992.

5XX provided mass entertainment covering most of the country and extending into Europe and even reaching the east coast of the USA. It started the home entertainment revolution that we take for granted today, all summed up in this extract from Alfred Noyes poem "The Dane Tree" that was read out on the opening night by John Reith, the first Director General of the BBC :-

"And thoughts that speed the world's desire,
Strike to your heart beside your fire.
And the mind of half the world,
Is in each little house unfurled."

Fig 4 June 1933 BBC Daventry 5XX transmitter on Borough Hill taken in 1933 also showing the Short Wave aerials of the new Empire Service.

The AVO Test Bridge

Ken Brooks

The AVO Test Bridge shares the familiar AVO meter house style and is used to determine the values of capacitors and resistors. This attractive instrument had been languishing in a store and was offered some time back as a project “to get working”. Unable to resist the opportunity of a little clean up and repair I readily accepted, as one does.

How it works

An electrical bridge compares the value of known components with an unknown component, rather like a pair of scales uses a number of weights to find an unknown weight. In the broadest terms a bridge is a circuit in which two branches of a circuit are “bridged” by a third branch, connected to a balance detector. They have been used for many years in electrical engineering and some readers will have seen early wood cased bridges with heavy metal bars and plug-in shorting links.

A very elementary explanation of bridge operation is to consider two equal open high resistance wires, A and B connected in parallel across a source of direct current voltage, say 10V. If we place a high quality volt meter between the positive connection to resistance A and the negative connection to resistance B, our meter reads the energising supply of 10V. But if we transfer one terminal of our voltmeter to half way along resistance A our meter now indicates 5V. This occurs because current flowing through the circuit produces a voltage gradient along each resistance wire. Now consider what happens if we move the other volt meter terminal to the same position on resistance B. Although both points are at a potential of 5V above negative, there is no voltage difference between the two measuring points and the meter reads zero. The bridge circuit we have made is now said to be “balanced” and we can say that the sections of resistances of A and B, as measured “up” from our negative supply, are equal. Similarly, we can also say that the sections of resistances of A and B, as measured “down” from the positive supply are also equal. If resistances A and B are rearranged by being split at the measuring point, we may now substitute an unknown resistance in one side of the circuit and compare its value to the known value of the opposite component. By switching appropriate known components in to the circuit, we may use the comparison principle as the basis of a measuring instrument.

To ensure accuracy the balance, or “null” detector must not introduce parallel resistance paths in to the circuit and to minimise this effect, a high impedance detector like a valve voltmeter may be used. The same basic principle may be applied to the measurement, or more correctly, comparison, of other electrical characteristics like capacitance or inductance. However, alternating current rather than direct current is used as the energising supply.

The version of the Avo Test Bridge to be described was produced during the 1930's and 1940's. The last three digits marked on the scale of my own example are 648, indicating a June 1948 date. A successor version was produced and is illustrated in my 1952 Brown Brothers catalogue, described as a Universal Bridge and cost £26, excluding Purchase Tax. This would have represented a significant investment.

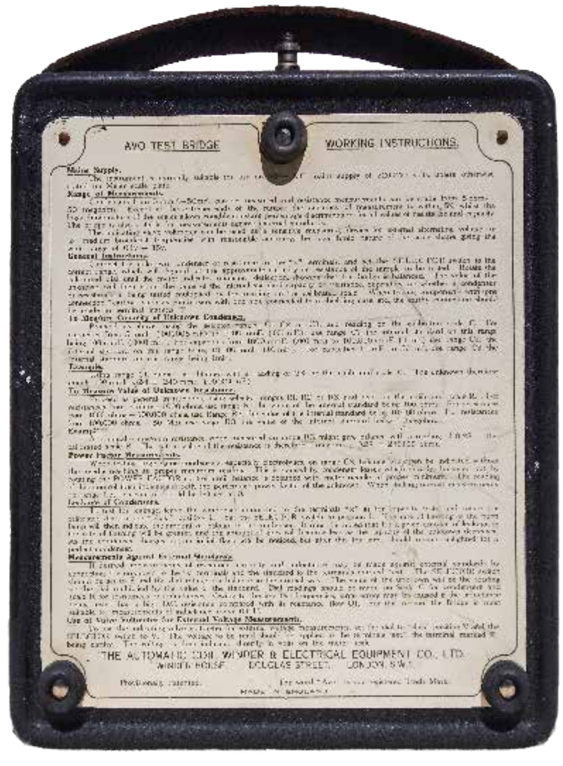
My earlier type covers the ranges for capacitance of 5pF to 50μF, and for resistance 5Ω to 50MΩ. The bridge is also suitable for measurements against external standards and has the ability to measure inductance and power factor. A neon tube is also provided to indicate leakage. The internal valve voltmeter can function as a measuring device for external alternating voltage up to “medium broadcast frequencies with reasonable accuracy, the logarithmic nature of the scale shape giving the wide range of 0.1v – 15v.”

Work begins

I commenced work without a circuit or any technical detail other than instructions printed under the case so initial intuitive work began by looking for obviously suspect or failed components. Visible candidates were some wax encased capacitors, mostly sticky looking, what appeared to be the original high tension (HT) filter capacitor, and a paxolin encased HT rectifier powering an octal base valve.

Starting with the rectifier, I bypassed this with a modern silicon diode and a 150Ω resistor in series. It was assembled inside a length of heat shrink tubing and fitted parallel to the original rectifier, which was disconnected

A. AVO Test Bridge three quarter view



B. AVO Test Bridge rear view - instructions

C. AVO Test Bridge under chassis view

from the rest of the circuit. The waxed paper capacitors were replaced with modern parts.

After a few hours of work the instrument was ready for test, but being supplied with a two core mains cable and having an exposed chassis, power was supplied via a Variac transformer and an isolating transformer to minimise electrical hazards. As the mains input voltage was gradually raised using the Variac, the HT could be seen rising. All looked well so with power off, the instrument was placed in its normal operating orientation, switched on and checked with some sample test components.

With an appropriate range selected the bridge could be balanced showing a strong null at the balance point. On each range the value of sample test components could be read from the calibrated scale which confirmed that the instrument was functioning.

One observation of something needing attention was the meter deflecting to its stop when the instrument was unbalanced. Although this did not affect operation, it was clearly not what the original designers intended, and I resolved to address this when the opportunity arose. After undertaking the immediate electronic repairs, it was given a thorough clean and put aside where it was used from time to time.

A second instrument

Some time later I was asked to take a look at a further non-functioning AVO Test Bridge. Fortunately this one came with technical information including a circuit, but after repeating the obvious component replacements it still failed to work. The only sign of life was a brief flash from the neon leakage indicator as the calibrated balance dial was swung through the leakage test position. In addition, the balance meter remained resolutely at the lower end of the scale, despite the presence of HT. A few simple tests showed that the 50V bridge supply was absent which was traced to its series resistor being open circuit. With it replaced the bridge worked except on one resistance range where a further resistor was also found to be open circuit, which was also replaced. Most of the suspect larger value capacitors had by now been changed and it was interesting to note that those removed were found to be leaking.

An indication of the calibration with stock components produced the following results:

Resistance ranges

R1 range: 100Ω read 0.99; 330Ω read 0.34

R2 range: 10kΩ read 1.0

R3 range: 680kΩ read 0.64

Capacitance ranges

C1 range: 680pF silver mica 1% read 0.67

C2 range: 0.01μF read 0.98

C3 range: 0.22μF read 0.23

These results were considered quite adequate. The other secondary functions were not tested. The mains insulation was found to be 300MΩ at 250V which was considered to be acceptable, and after a thorough clean the instrument was returned to its owner.

Back to an old problem

It will be recalled that I still had an unresolved issue with the meter deflecting beyond full scale on my own instrument when the bridge was unbalanced. This effect was much less pronounced when testing components on the external setting. After an inexcusably long delay I returned to take a look at this, confidence now boosted by possession of a circuit diagram. It could have been due to a combination of factors, one initially considered being increased HT voltage from replacement of the rectifier with a silicon diode. However, the second meter did not suffer from this problem and I concluded that it was most likely due to component ageing. Some types of resistor change their value over time, often increasing. The anode load of 100kΩ +/- 5% read 109k Ω which is outside tolerance, whilst the meter series resistor marked 96kΩ +/- 10% read 89kΩ. Although this is within tolerance, a replacement by 100kΩ would reduce current through the movement whilst still being within the original design tolerance. After testing combinations of correctly measured parts in both positions, a compromise was reached by changing the meter series resistor to 100kΩ. I should perhaps have pursued a better engineered solution based upon finding a definite cause, but admit to hiding behind vague excuses like “tolerance build up”.

Whilst finalising this article I casually checked the internet to see if it turned up anything of interest and was delighted to find a Restoration Manual written by Peter Wotton. This is an excellent document, far more comprehensive than this brief article and is highly recommended as a starting point for others contemplating work on these overlooked classic instruments.

D. AVO Test Bridge close in scale

An Unusual Marconiphone radio … Repurposing in the 1950s?

Stef Niewiadomski

Browsing on eBay I found an intriguing radio which was advertised as ‘manufactured by G Marconi’ and said to be in working condition. It didn’t look anything like any Marconiphone offering I was familiar with, and a photo taken from the back showed a 35Z4GT valve, which made me think of an American design, rather than one originating in the UK. This made me eager to win the auction, which I was pleased to do.

Figure 1: The ‘as received’ condition of the mystery radio.

Once it arrived I could start to investigate exactly what this strange radio was. See Figure 1 for the ‘as received’ condition, as viewed from the front. A ‘G Marconi’ badge is mounted between the two knobs, which is why the previous owner had deduced the manufacturer of the radio to be Marconi.

The radio was fitted with a two-core mains lead in good condition and a 13A plug, and after removing the back panel and doing a quick sanity check, I plugged it in and switched on. All the valves lit up and after ten seconds or so, it came to life. The tuning cord seemed to be slipping and so tuning was a little tricky, but it worked very well from its frame aerial. Connecting my long wire aerial to a wire dangling out of the back improved performance even more, and I could see that the challenge of any restoration I might apply was not to make reception worse!

If it ain’t broke

In my opinion, when it comes to radios, the expression ‘if it ain’t broke, then don’t fix it’, doesn’t apply. To be fair to myself, the cabinet needed treatment to make it presentable, and to untangle the history of the radio, some degree of disassembly was needed. The wooden panel onto which the speaker was mounted had come loose in the post, so leaving things alone was not an option.

Figure 2 shows a rear view of the radio, again in ‘as received’ condition. The frame aerial of the radio chassis can be seen to the left, then what seems to be the audio output transformer, and then a mains dropper resistor. The cabinet definitely looked to be home built, perhaps adapted from some old radio, and the back panel was obviously cut from the rear of an old TV set, as given away by the horizontal slot marked ‘Focus’.

The bottom of the cabinet was fitted with a wooden inspection panel, held in by a couple of brackets and screws. The cut-out seemed to be original, being much neater than I would expect from an amateur. Figure 3 shows a bottom view of the radio, with the inspection panel removed, revealing the underneath of the chassis.

The first job was to remove the chassis from the cabinet. One of the two knobs pulled off easily, but the other was stuck onto its shaft and needed a long hard pull to get it off. Four 4BA screws and washers on the bottom were removed, and after unsoldering the connections to the tag strip on the chassis, it slid out easily along with its dial drive assembly and a bulb holder dangling on its connecting wires. The dial itself was crudely secured to the cabinet by two screws and brackets: I would remove this once I had dealt with the chassis.

The chassis

The chassis looked very much like an American five valve AC/DC radio from just before the war, see Figures 4 and 5. It was fitted with a 12K8GT frequency changer; a 12K7GT IF amplifier; a 12Q7GT AGC/audio detector and triode audio amplifier; and a 35L6GT audio amplifier beam tetrode (all Brimar) line-up, but the rectifier was a Marconi-Osram U76 (more or less like a 35Z4GT, but with a different heater voltage and current rating). The chassis had the serial number 039192 stamped into it, but no indication as to who the manufacturer was. I took a few photos of the chassis and posted them, along with the valve line-up, on the UK Vintage Radio Repair and Restoration forum. I quickly received a couple of helpful replies indicating that the chassis looked very much like that from the Marconiphone T11DA

Figure 2: Rear view of the radio, again in ‘as received’ condition. The 11-way tag strip is stepped away from the chassis by a couple of 1-inch long spacers. The white wire dangling out of the back seems to have been an external aerial connection, but the ‘official’ connection is to the socket in the middle of the paxolin panel in the frame aerial.

Figure 6: Front cover of the November 2, 1946 issue of The Wireless and Electrical Trader, featuring the RG11A.

Figure 3: Through the keyhole - bottom view of the radio, with the inspection panel removed, showing the exposed bottom of the chassis in original condition. All the components seem to be original ex-factory. The cut-out also seems to be original, being much neater than I would expect from an amateur. The exposed, and potentially dangerous, chassis fixing screws can also be seen.

Figure 4: Top rear view of the chassis, showing the large choke at the centre. You should be able to see the small size of the tubular-canned IFTs when compared to the valves, as shown by the one next to the tuning capacitor.

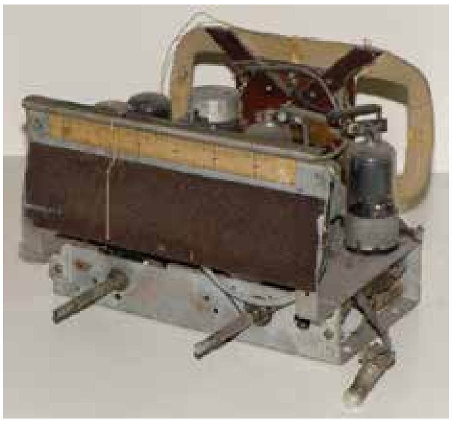


Figure 5: Front view of the chassis. The horizontal ruler scale – calibrated in inches - is used to indicate useful wavelength points when aligning the radio.

'companion' radio from 1946, which was also fitted into the RG11A table radiogram, introduced later in the same year. At the time, Brimar were producing US-coded valves in the UK (and perhaps even re-marking US-manufactured valves) and so the presence of these valves in a British chassis is not evidence that it was manufactured in the US.

Looking at the on-line data for the T11DA and RG11A, I could see that because of the angle at which the dial mechanism and pointer were orientated, my chassis was from the RG11A. The dial on the T11DA is angled backwards at 45°, and so the mechanism on the chassis would reflect this. This also suggested that the cabinet of my radio was a cut-down version of a RG11A radiogram, with the record player mechanism discarded. Figure 6 shows the front cover of the November 2, 1946 issue of the Trader, featuring the RG11A.

Although the T11DA radio was capable of being operated from AC or DC mains, the RG11A was AC-only because of the design of the gramophone motor.

It was interesting that my chassis used these American-coded valves (apart from the U76 rectifier) whereas the data indicated that the Marconi-Osram '70-series' X76M, W76, DH76, KT71 and U76 (all with introduction dates of 1945/46, except the KT71 which is earlier) would have been the original line-up. Most of these Marconi valves were physically a little longer than the Brimar US-coded equivalents, and in the case of the KT71 there was no GT version, so it was considerably longer and wider than the 35L6GT. There was plenty of headroom above the chassis, even in the compact T11DA, to have fitted them in.

All of the valves looked original, and it seems unlikely that all the valves would have been changed since the radio was built, and so I concluded that the four Brimar US-coded valves were fitted when the radio was manufactured.

Medium wave only

The chassis was designed to cover the medium wave only: it seems a shame that no effort was made to fit at least the radiogram version with long wave coverage. I suspect this lack of the long wave would have negatively affected sales, but maybe it was done simply to get the design out into the market as quickly as possible in this difficult period just after the end of the war. One 'luxury' fitted to the radiogram was a tone control.

The manufacturer's service sheet for the T11DA hints at there being three variants of this model: the basic T11DA; the T11DA/B; and the T11DA/G. In the spare parts list, different part numbers are given for the cabinets and scales, for the basic, the /B and the /G models. The three variants have different coloured cabinets and scales, although all the ones I've seen are brown Bakelite with a white grille, handle and knobs. Another request on the UK Vintage Radio Repair and Restoration forum revealed collectors' T11DAs with plain brown Bakelite, dark green and maroon cabinets. I believe there was also an export version of the T11DA, with frequency and wavelength markings on the dial, but no station identifications.

Heater voltages and currents

In some on-line data, the 12K8GT is shown as being equivalent to the X76M; the 12K7GT equivalent to the W76; and the 12Q7GT equivalent to the DH76. From a pin-out point of view, this seems to be the case, but these 12-series valves have 12.6V 150mA heaters, whereas the Marconi-Osram valves have 13V 160mA heaters. When it comes to the KT71, its heater is specified at 48V 160mA, whereas the 35L6GT is 35V 150mA, so in fact the KT71 is closer to a 50L6GT. The KT71, 35L6GT and 50L6GT are all pin-for-pin compatible, and although their optimum load impedances vary to some extent (they tend to be around about 2.5kΩ, and are anode voltage dependent), for practical purposes they can be considered to be interchangeable, as long as the differing heater requirements are taken into account.

The U76's heater is 30V at 160mA, whereasthe 35Z4GT is, of course, 35V 150mA. An 'all-Marconi-Osram' valve line-up adds up to 117V at 160mA, and an all-American line-up would come to 108V at 150mA (or 123V if the 50L6GT were to be used). My somewhat mixed valve line-up comes to 103V, with the U76 being a little under-run if this voltage were to be applied to the heater chain. My intention was to measure the heater voltage and current of my radio to see what the values actually were when the chassis was powered.

Restoring the chassis

The schematic of the T11DA, taken from Marconiphone's own service manual (an original copy of which I found on eBay) is shown in Figure 7. This schematic is of a higher standard than the Trader version: for example it shows the component values on the schematic, rather than having to refer to a separate table. An external mains line cord is indicated on the schematic, which was the case for the T11DA, but the chassis in the RG11A used an internally mounted tapped dropper resistor, allowed by the extra space inside the radiogram. The manual also gives alignment data, and a components list. It also shows high quality drawings of the top and bottom of the chassis, which are shown in Figure 8, and are very helpful when finding your way around the chassis.

Note that the 12Q7GT detector valve, V3, is at the 'bottom' of the heater chain; this is normal practice and minimises the hum picked up by the audio path.

Since it seemed to work very well, I resisted the temptation to do too much to the chassis. Audio quality was very good and so C14, the usual suspect audio coupling capacitor didn't seem to be leaky. C14 was a brown Hunts capacitor, usually a good candidate for changing, but the one fitted was larger than the small ones you often encounter - which are often falling apart - and seemed to be in good mechanical order. The lack of hum indicated that the smoothing capacitors were still doing their jobs. Figure 9 shows an underneath view of the chassis.

I removed all the valves so that I could clean the chassis. There were some areas of rust, which I gave a light rubbing down as they weren't too extensive. I noticed that the lead from the top of the second IF transformer to the detector valve's top cap was 'wobbly', caused by a half-broken tag coming out of the case of the transformer. I adjusted the tag so that it was upright and applied a blob of rapid-setting Araldite to secure it in place. This avoided my having to unsolder the lead from the tag and remove the IFT's case to make a better repair, and once the glue was set, the tag was mechanically rigid.

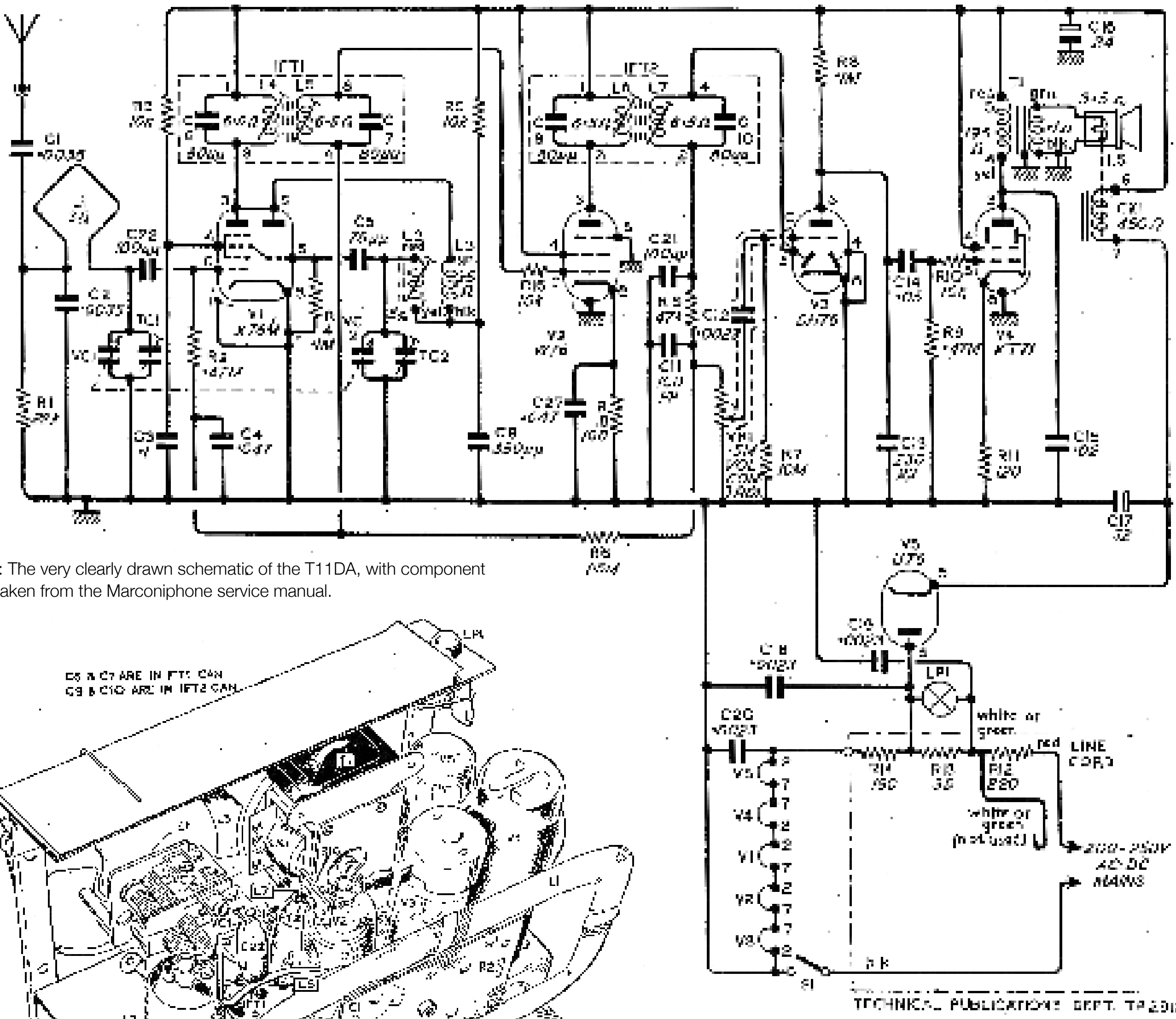


Figure 7: The very clearly drawn schematic of the T11DA, with component values, taken from the Marconiphone service manual.

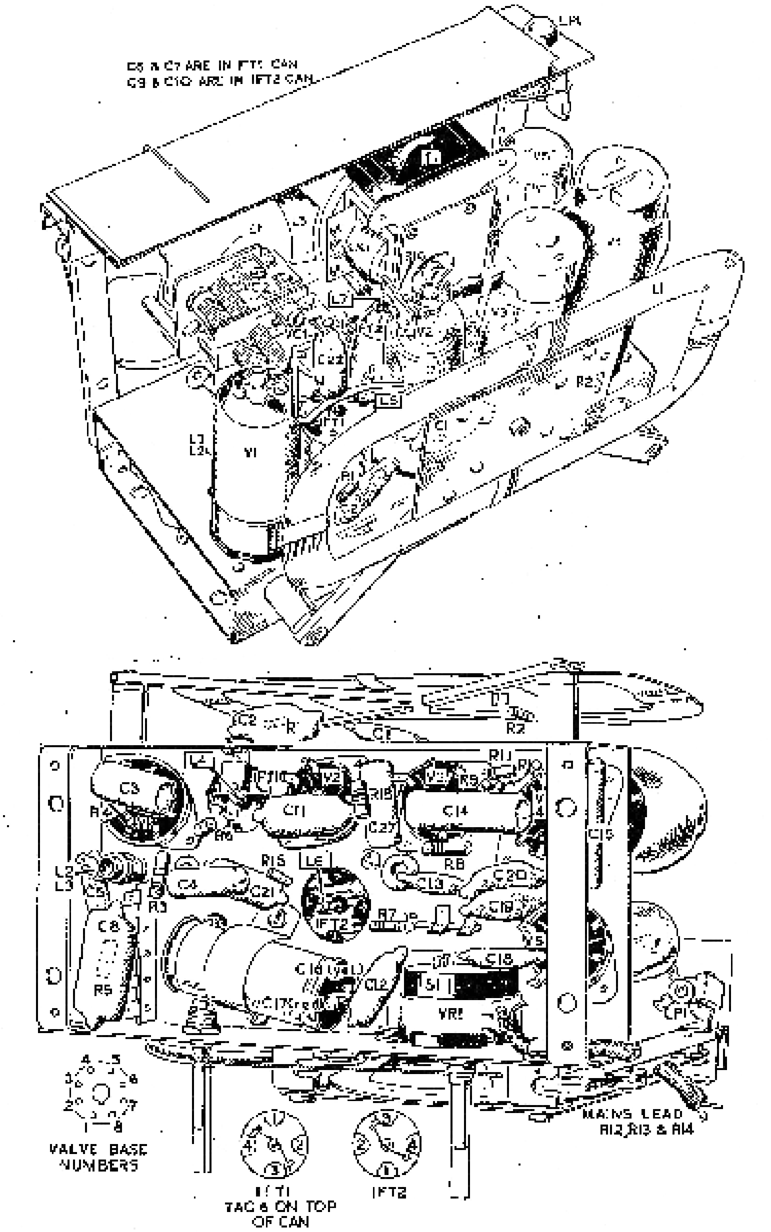


Figure 8: The clear and helpful top and bottom drawings of the chassis, taken from the Marconiphone service manual. The large size of V4, a KT71 audio beam tetrode, can be seen. In my radio the rather more compact Brimar 35L6GT was fitted in this position.

The next thing to fix was what seemed to be a slipping dial cord, as mentioned earlier. A closer look showed that the slide on which the pointer rode was sticky with a grease/oil residue, which was causing the pointer to jam intermittently. The pointer was tensioned on to the dial cord with a short 6BA screw and once this was unscrewed, I removed the pointer and cleaned the slide and the pointer itself with white spirit. I applied a very light coating of oil to the slide, being very careful not to get this onto the cord, and refitted the pointer. It now moved much more easily and the tuning was very smooth.

The paint on the pointer was flaking off and so I gently rubbed it down and applied a coat of white paint.

Frame aerial

A few of the outer turns of the frame aerial were loose, and so I secured them back in place with some lengths of dial cord. The 3.5V 300mA bulb that was fitted – specified as 5V at 150mA in the service data - was blown, and I replaced it with a 6V 150mA bulb that I had handy.

The schematic of the radio shows an energised speaker, with the energising winding being part of the power supply smoothing circuit. The speaker actually fitted was a permanent magnet type and so I would have expected a resistor somewhere on the chassis acting in this smoothing role. However, perched in the middle of the chassis was a tar-covered choke. The T11DA radio is very compact and this position is occupied by the coil assembly of the speaker, with the output transformer mounted on the top of its frame. I assumed, therefore, that the choke is a feature of the radiogram version of


Figure 9: Underneath view of the chassis, after restoration, showing the replacement capacitors, including the two new HT smoothing electrolytics.


Figure 10: Left hand side of the chassis, showing the frame aerial, and the audio output valve (with a 50L6GT fitted instead of the original 35L6GT) and the original U76 rectifier.

the chassis. I did a search on the Restoration forum for the RG11A and a restoration project was described, along with a few photos. I could just make out that the chassis did indeed have a choke mounted on it, and the output transformer and a dropper resistor were mounted on the inside bottom of the cabinet.

I then removed the output transformer, the dropper resistor and the 5-inch Elac speaker so that I could restore the cabinet. The primary winding of the output transformer measured 442Ω, which seemed a little high, but at least it was intact.

My original plan was to replace the dropper resistor with an autotransformer, but the resistance of its sections checked out OK. From the live mains input 'inwards' the sections measured 235Ω (R12 on the schematic), 35Ω (R13) and 196Ω (R14), so they were not too far away from their nominal values, and I decided to retain it. The cabinet is big enough and well ventilated so that the heat generated by the dropper has plenty of space to dissipate into, and plenty of air flow passing over it, so that heat will not be a problem.

Cabinet

To finish dismantling the cabinet I removed the speaker, and the wooden blocks supporting the output transformer and the dropper resistor, and unscrewed the brackets holding in the dial. After gently cleaning the dial, I put it away somewhere safe so that I didn't break it. Now I could get at the fixing screws of the plastic escutcheon around the dial and speaker aperture. I could see now that this had been modified by having a couple of bars removed, and that it had originally come from the radiogram.

I could see a few woodworm holes in the base of the cabinet and so I treated the whole cabinet with woodworm killer. The top panel of the cabinet was loose towards the back, and it was a simple job to re-glue it to the sides. The cabinet rocked back-to-front and so I applied four stick-on feet which cured the problem.

I wanted to preserve the 'G Marconi' badge mounted between the two knobs and so I masked it off before starting to rub down and paint the cabinet. I rubbed the cabinet down using P150 sandpaper, cleaned off the dust and primed the wood. I rubbed down the primer to a smooth finish and applied an undercoat, and again gently rubbed this down once it had thoroughly dried. I bought a can of spray-on fast drying project paint, applying it in several thin coats. I went for a shade of blue, which turned out to be a little brighter than I intended, but which matches the ocean on the globe on the badge.

Measurements

I wanted to make some measurements on the heater voltages and currents while the chassis was accessible on my bench, to see if they looked reasonable. I re-fitted the valves, substituting a 50L6GT for the 35L6GT, which I hoped would give a heater current closer to what was ideal for all the valves in the chain. The valves' heater voltages now added up to about 118V.

I connected the chassis to the output transformer, dropper resistor, and the mains (after removing the old 13A fuse and replacing it with one rated at 1A), and switched on. This time the dial bulb lit up, and to my relief the radio still sounded good as I tuned around the medium wave.

Before working on the chassis with power applied, I checked that the mains was connected the right way round, that is with the neutral side of the mains connected to the chassis. In fact, this was not the case, and so I swapped over the mains connections where they were soldered to the tag strip at the rear of the chassis. Note that this is NOT a guarantee that the live side of the mains will not become connected to the chassis metalwork, see later.

When measuring the voltage across, or the current through, the heaters in a radio fitted with a half wave rectifier, care should be taken to use a 'true RMS' meter. This is because the voltage and current waveforms are not sine waves: the half wave rectifier only conducts on the positive half cycles (with respect to the chassis) of the mains input, and during these periods the voltage at the junction of R13 and R14 is reduced by a voltage drop across R12 caused by current flowing into the rectifier and thence into the HT smoothing circuit. During the negative half cycles, the rectifier does not conduct and therefore no voltage is dropped across R12 due to rectifier current. This effect results in the top half of the mains sine wave being somewhat flattened, and the bottom half being the shape of a normal sine wave. Because of the live chassis of the radio, this is not an easy waveform to monitor on an oscilloscope, but simulation (I use LTSpice – available free of charge from Linear Technology) shows the effect clearly. A 'normal' meter will not measure the RMS value of this waveform correctly, because it assumes that it is perfectly sinusoidal. I made my measurements with a UNI-T UT50A true RMS meter (other meters are available).

I measured the voltage across the heaters at 137V RMS, measured from the 'bottom' of R14 to chassis, and the current flowing was 166mA, again measured with the UT50A. This seemed on the high side, and so I added some resistance in series with R14. I tried a few values and a 5W 150Ω resistor finally gave me a current of 153mA at 119V, when the radio was fully warmed up – which were very close to the ideal values. I mounted this resistor on a small tag strip alongside the dropper resistor.

Capacitor problems

Having not changed the audio coupling capacitor (C14) previously, I decided to measure the voltages at either end of it. I measured 61V at the V3 anode side, and about 5.6V at the other side (both with respect to the chassis). This 5.6V was adjacent to the control grid of V4, and I would have expected a reading much closer to 0V, so I suspected that C14 was a little leaky, and changed it for a modern 0.047μF capacitor. Making the voltage measurements again, I got 68V and 0.1V, confirming that the original capacitor was leaky to some extent, and may well have got worse in the future.

C3 (nominally 0.1μF) and C4 (0.047μF) were the only other paper capacitors in the chassis, and so to be on the safe side, I changed them both. C18 and C19 (both marked as 0.0023μF on the schematic) are both connected between the mains supply and the chassis, albeit at tapped-down points. Both seemed to be some sort of a wax covered mica type and seemed to be in good condition, and so were left alone.

I was now satisfied that the chassis was working well and so my intention was to leave it powered for a few hours as a soak test. After half an hour or so, I heard a combination of a hissing and bubbling sound. Turning the chassis over I could see liquid bubbling out of the Hunts smoothing electrolytic can, C16 and C17. Interestingly, the capacitors still seemed to be doing their job, as evidenced by the absence of hum on the audio output. Touching the can showed it to be rather hot, and so I did a rapid turn-off. The electrolytic was rated at 150V, which seems rather marginal for this application, and was dated Jan 1947, so it had probably been in the radio from new. The capacitor was clearly past its best: at least it hadn't exploded on me! I removed it and fitted a couple of new 33µF 450V (over rated I know) electrolytics.

The brightness of the dial bulb was remarkably constant from switch on to the radio been fully warmed up, so the positioning of it across a low resistance section of the dropper resistor seems to be effective.

The radio was very lively on its internal frame aerial, and even better with an external aerial connected, and so there was no need to attempt a re-alignment. What I did have to do, however, was to set the correct position of the pointer on the dial cord as I had disturbed it when I cleaned the slide on which it ran. Referring to the alignment data for the radio in the Marconiphone service sheet gives the position of the pointer as one and one-sixteenth of an inch for an input wavelength of 210m (1428kHz) – now I could see the reason for the stuck on ruler scale at the top of the dial mechanism. I duly applied this frequency from my signal generator, loosened the pointer from the cord, slid the pointer along until it corresponded to this position on the ruler, and tightened up the clamping screw. It was quicker to do than to write about it.

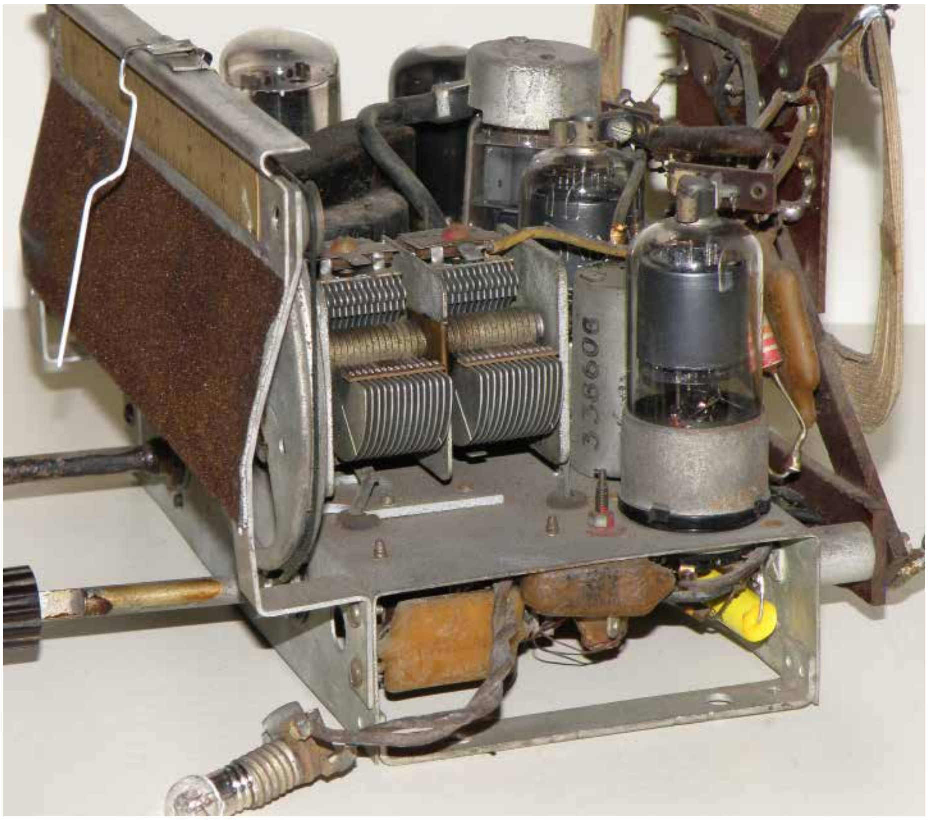


Figure 11: Right hand side of the chassis, showing the 12K8GT frequency changer and the tuning capacitor.

Having completed the restoration, I fitted the chassis and bits and pieces back into the cabinet. As received, the mains lead was attached to the chassis only via two soldered connections, and so I added a plastic clip screwed into the wooden cabinet to take any potential strain from the cable. I also took the opportunity to cut a small hole in the back panel to allow the cable to pass through neatly. I refitted the bulb holder back into its original position to the right of the dial. I must admit it's not very effective at lighting up the dial, despite its reasonable brightness when it was out of the cabinet. I'll have to take the radio apart at some point and try to find a better position for it.

I applied a 'Live chassis' label to the back panel and made a small hole to allow an external aerial to be plugged into the hole in the middle of the frame aerial.

Figure 12 shows the restored radio, in its new coat of blue paint. As you can see, I left the 'G Marconi' badge in the position it was mounted when I received the radio.

Live chassis

As assembled, the radio clearly still has a live chassis, with the live side of the mains potentially (no pun intended) being connected to the metalwork. Even if the live and neutral sides of the mains are connected the right way round, that is with the neutral side connected to chassis, when the radio is switched off, the chassis becomes live via the heater chain, because the on/off switch is only single pole.

The push-on knobs help with isolation and safety (they have no grub screws), as does the wooden cabinet fitted with a back panel. The chassis is secured to the cabinet with four screws, which are exposed to prying fingers. After re-fitting the chassis, I covered these screws with several layers of insulation tape, though of course there is no guarantee that a future owner might not remove the tape and compromise the isolation.

Summary and conclusions

Repurposing is now a trendy response to our throw-away lifestyle, but in the past it was a much more common practise. It looks to me that an unwanted Marconiphone RG11A radiogram has been 'butchered' to produce a useful radio (though only covering the medium wave band), maybe sometime in the 1950s or 60s. To me this is preferable to throwing the whole radiogram away, and I was pleased to give the radio another extension to its working life.

Restoration of the mainly Brimar-valved chassis was relatively simple, and I spent more time on the cabinet, rubbing down the old dark stained and varnished coating, treating it for woodworm, and painting it a bright blue colour. I preserved the 'G Marconi' badge, which had come from inside the lid of the donor radiogram, and was now mounted between the two control knobs, so that any future owner could immediately identify the original manufacturer.

Figure 12: Front view of the restored radio, in its bright new coat of blue paint. The original 'G Marconi' badge has been left in place.

Cinema Museum Swapmeet

Photos by Greg Hewitt & Carl Glover

Jon Weller at his table

The BVWS tables

Frightfully orange Fidelity portable

The Bush TR102 – a rather interesting set

Scott Elliot

This set once belonged to a family member, but after many years lying dormant in his garage, it came into my possession. My first glimpse of it made me rather curious; is this really a radio I thought? It had no knobs or dial, and nowhere obvious where they might have once been!

Only the word 'transistor' across the lower front of the case gave credence to its radio status. Looking at the back, two wires protruded from under what I presumed was the battery cover terminating at a 'mains plug type' power supply. Crudely scratched on the battery cover were the letters 'PP9'. As PP9 batteries are still readily available today, I presume that the power supply had been added on the grounds of economics! Further inspection revealed that the top part of the case is in fact a swivelling cover, which in the closed position completely hides the dial. Two plastic studs, which look like retainers for the carrying handle, are actually the volume and tuning controls. Very cunning! A metal label underneath declared it to be a Bush TR 102.

As I hadn't seen or heard of a Bush TR102 before, I tried researching it on the Internet and found some interesting facts. Released in January 1962 it was designed by David Ogle, the industrial and car designer who also designed the iconic Bush TR82 a few years earlier. Ogle previously worked for Murphy and had also distinguished himself as a Fleet Air Arm pilot receiving the DSC and MBE. His car designs included the Reliant Scimitar and the Ogle SX1000 based on the BMC Mini. Ogle was tragically killed while driving one of his own Minis on 25th May 1962 aged forty. I guess the Bush TR102 must have been one of his final creations. Regarding the radio itself, it operates on Long and Medium wave bands, selected by two push buttons on the front. A third push button is a tone control and I also found out that the hinged lid operates the on/off switch and when the tuning knob is pressed, the dial pointer should light up.

The chassis

Several months passed before I eventually started working on the TR102. I removed the battery cover by loosening the two large 'coin operated' screws, and powered it up using my bench power supply connected to the battery leads. To facilitate this, the set was lying face down on the bench with its 'lid' open. It responded to the tuning control and a quick check showed it was receiving all the usual stations on both wavebands at good volume and quality. When it was stood upright though, it stopped working altogether! Laying it flat again restored the status quo. I noted that when upright, no current was being drawn from the power supply, so suspected that the fault probably lay with the on/off mechanism.

With the battery cover off, instructions on how to remove the rear cover become visible. The words 'TO OPEN – REMOVE SCREWS AND PUSH TOWARDS LID' is actually engraved and ink-filled on the bottom lip of the cover! Also engraved on the rear cover is 'EARPHONE' and 'AERIAL' adjacent to the holes to facilitate the external connections.

After removing the rear cover, I caught my first view of the chassis. My immediate concern was the problem with the on/off switch, and to my horror I realised that this one was well and truly a 'one-off' design, no doubt specially made for the TR102 – and probably nothing else on earth! I would hate to have to find a replacement for that! The leaf spring contacts of the switch are operated by a lever, which is pivoted at its lower end, the upper end being used as a cam follower. The cam is part of the plastic lid hinge. See figure 1 (top left). To my utmost relief, the problem was simply that the chassis retaining screws were loose! With the cam effectively part of the lid and the cam follower part of the chassis, the loose screws meant that not enough force was being exerted on the cam follower to operate the switch. However, with the set lying face down, the weight of the chassis acting in the right direction was just enough to operate the switch. Phew!

The way the volume control operates is intriguing. Presumably because there was insufficient space (and maybe complications due to the lid hinge) to fit the potentiometer at the top of the case, it was fitted lower down where the case is deeper. It is connected to the volume knob at the top via three gear wheels. These gears are robustly made from a hard nylon type of material, closely meshed and cause no 'backlash' when operated. See figure 2. The potentiometer caused a bit of crackling when in use, but some switch cleaner sorted that out.

I tried pressing the tuning knob and sure enough, the dial pointer lit up. This is a good thing, because the pointer can hardly be seen at all when the knob isn't pressed! At a medium volume level I noticed that the current drawn from the power supply was 14mA but went up to 67mA with the light on – a PP9 wouldn't like that for long. The pointer lamp switch contacts, which 'make' when the tuning knob is pressed, can be seen in figure 1. (Red wire near pushbutton cap).

Another obvious oddity was that the ganged tuning capacitor was not fitted 'square' with reference to the other components. It looked very out of place and I couldn't see any reason why it should be fitted like that. I had seen an image of a 'restored' TR102 chassis on the Internet, and its gang was similarly misaligned, so I assumed this to be normal – but it kept bugging me. On closer inspection, I noticed that the dial cord wasn't approaching the gang drum straight either, due to the odd angle of the gang. This finally convinced me that something was wrong. Then the penny dropped! The gang's three rubber mounting grommets had become perished and over the years, the relentless pull of the tensioned drive cord had compressed the weakened grommets, pulling the gang out of mechanical alignment. These would have to be replaced.

Whilst on the subject of the ganged tuning capacitor, another interesting point is worth mentioning. Due to the restricted depth of the case, the gang's drive drum has a much smaller diameter than would normally be found in most receivers; this means there would be a lack of 'slow motion tuning' due to the ratio of the tuning knob spindle diameter to that of the drum diameter being relatively small. However, this is addressed by introducing two intermeshed metal gear wheels with a reduction ratio of about 3:1. The smaller gear wheel is on the same spindle as the drum and the larger one on the gang's spindle. To make sure there is no 'backlash' between the gears' teeth (and therefore when tuning) the larger gear wheel is in fact two wheels face to face on the gang's spindle. An adjoining tension spring tries to make the larger gears contra-rotate, thereby keeping its teeth tightly meshed with the small gear wheel. Hopefully figure 3 and figure 4 explains this better than I can!

The set beforehand from diffrent angles.

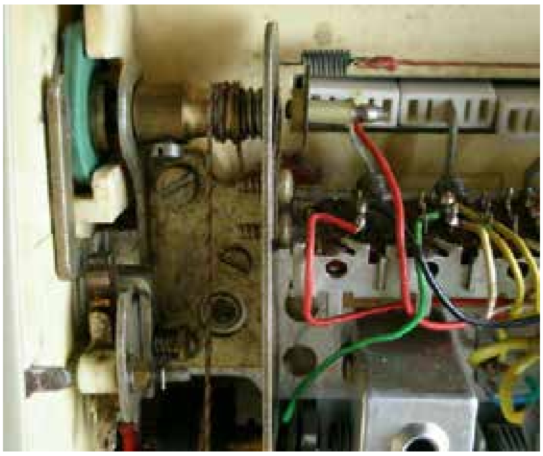


Fig 1

Fig 2

With the rear covers removed, the chassis can be extracted from the case. The tuning and volume control spindles are released by loosening their grub screws; these are accessible from within the case after turning the knobs to make the grub screws face rearward. The knobs with spindles attached then pull out. Four screws attach the chassis to the case, so with these removed and the loudspeaker leads de-soldered, the chassis is free to lift out.

With the case put to one side, replacement of the gang capacitor mounting grommets began. I didn't fancy having to re-string the drive cord after replacing the grommets; but fortunately I didn't have to. The fixing screws were loosened first, then the old grommets were removed and replaced one at a time, so that the gang was never actually detached from the chassis, thus reducing the risk of the drive cord becoming undone. The new grommets are slightly thinner than the old ones, so I had to add additional washers to allow the fixing screws to tighten up sufficiently. The gang and drive cord were now nicely lined up as they should be. With the chassis being in good condition and the set working well, I oiled the moving parts of the tuning mechanism and gave the push-button switches a squirt of switch cleaner for good measure.

The case

The plastic case was dirty, scratched and some of the corners had minor cracks, but it did at least seem complete – with the exception of part of its 'feet'. These are part of the main moulding, just two thin strips running from front to rear, one at each end. So with part of these broken off, the set was very wobbly. The component parts making up the case are the main body/grille, hinged lid, two side panels and the handle. The loudspeaker is a six-inch by four-inch elliptical and held in place by four screws. The glass dial is secured with two aluminium strips and felt spacers, retained by two screws each. The dial is quite robust with heavily painted lettering on the inside so was safely cleaned with a damp cloth. With the 'speaker and dial put in a safe place the handle and lid were removed next. These are held at each end by a brass ferrule and circlip. Felt and fibre washers are used between the case, lid and handle, so a sketch was made to assist in re-assembly. That only left the two end panels, which were removed by extracting two screws each. With all the component parts now separated, some serious restoration of the case could begin.

The difference in colour between the inside and outside of the case was stark, which led me to believe that it had spent most of its working life in a smokey environment. The inside was cream whereas the outside was distinctly brown. It would be nice to get it back to somewhere close to its original colour. I had previously restored a couple of Bush TR82C's, which were seriously impregnated with nicotine (or maybe tar) and found that their cases responded well to sanding. As long as the contamination hasn't penetrated too deep, there is a good chance of revitalising the case to an acceptable standard. The TR102 was very badly contaminated and therefore took many hours of tedious sanding, even when using medium grade sandpaper. Using a coarse grade paper removes the contamination quicker but then more time has to be spent removing the deeper scratches that are inevitably created. Care has to be taken to sand evenly; otherwise the surface will end up with a blotchy appearance. If this does happen however, it's easily sorted as the colours tell you which parts needs more sanding.

When the colour reached a point I thought acceptable, sanding was continued using finer and finer paper, finishing with 1200 grade wet and dry (used wet) to eliminate all induced scratches. Finally, a good polishing with Brasso then car polish brought the surface back to a good lustre. Due to the depth of contamination and the necessary amount of plastic removed, all the original scratches in the case parts had now disappeared. Unfortunately, the engraved Aerial and Earphone lettering was also long gone. I didn't sand the part of the rear cover bearing its removal instructions, as this is very thin and isn't seen when the battery cover is fitted. I intended having the Aerial and Earphone lettering re-engraved later.

The louvers which in part form the 'speaker grille had been painted a metallic bronze colour; I wondered if this was original. My initial research on the Internet only revealed cream louvers – in other words unpainted. However, a more diligent search did find a TR102 the same colour as mine so I was happy to keep the bronze. I found that Humbrol Enamel paint number 171 metallic to be a near perfect match. After a light rub down with fine sandpaper, the louvers were given two coats of paint, which smartened them up no end. This was applied by brush and took some time with all the nooks and crannies to contend with.

The lower corners of the case body were

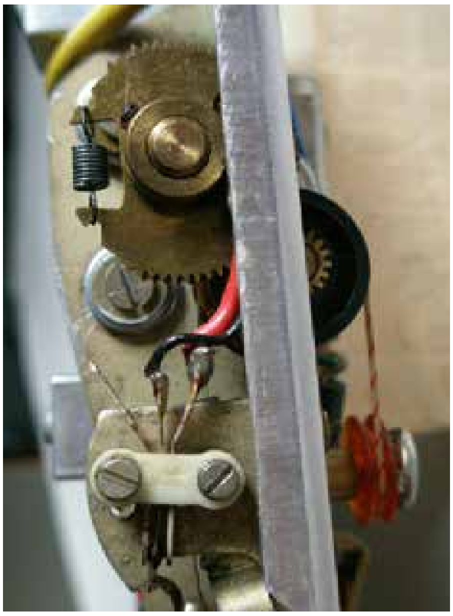


Fig 3

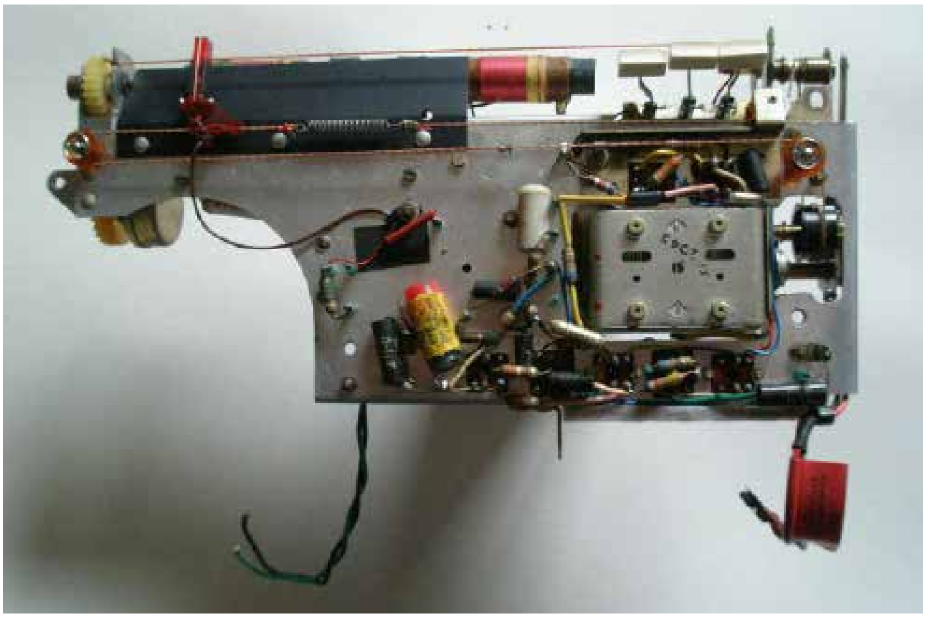


Fig 4

Fig 6

cracked and needed attention. I ran superglue into the cracks then reinforced the joints with epoxy putty on the inside. I also used epoxy putty to build up the damaged feet. When set, I shaped the putty to give more pronounced feet than original, which helped the radio to stand much steadier. See figure 5. With its chassis at the top, it is inherently top-heavy but at least a PP9 in the bottom should help.

The 'BUSH' name appears on the front of the hinged lid. The lettering seems to be embedded in the plastic – like the name in a stick of rock. Even after a severe sanding, the lettering remained visible. Can't imagine how that was manufactured! After the parts repaired with epoxy putty were given a couple of coats of matching cream paint, the case was re-assembled. That only left the back cover to be re-engraving with 'aerial' and 'earphone'.

Knobs & Spindles

I must have contacted every engraving company in the area but not a single one was interested; I contemplated using Letraset but couldn't find a source anywhere. Then, by chance I passed a Timpson's key cutting booth where the man was engraving some nametags. He had some very sophisticated looking computer controlled engraving kit and invited me to bring in my back cover. This I did and was delighted when he took the job on. I returned an hour later and the job was done. He even in-filled the lettering with black wax – and all for a tenner. Marvellous.

Re-assembly

The TR102 uses three AF117's (Mixer and IF's). As these are prone to the dreaded 'tin whisker' affliction, I thought I would try to determine if they had contracted the disease. With the set switched on and its current monitored, I snipped each screened lead in turn but saw no change in current consumption. No resistance was measurable between the screen lead and the other terminals either. So as far as I can tell, they have not yet succumbed. Their screen leads were re-soldered to their chassis pins.

When refitting the chassis back in the case, care has to be taken to ensure the

Fig 5

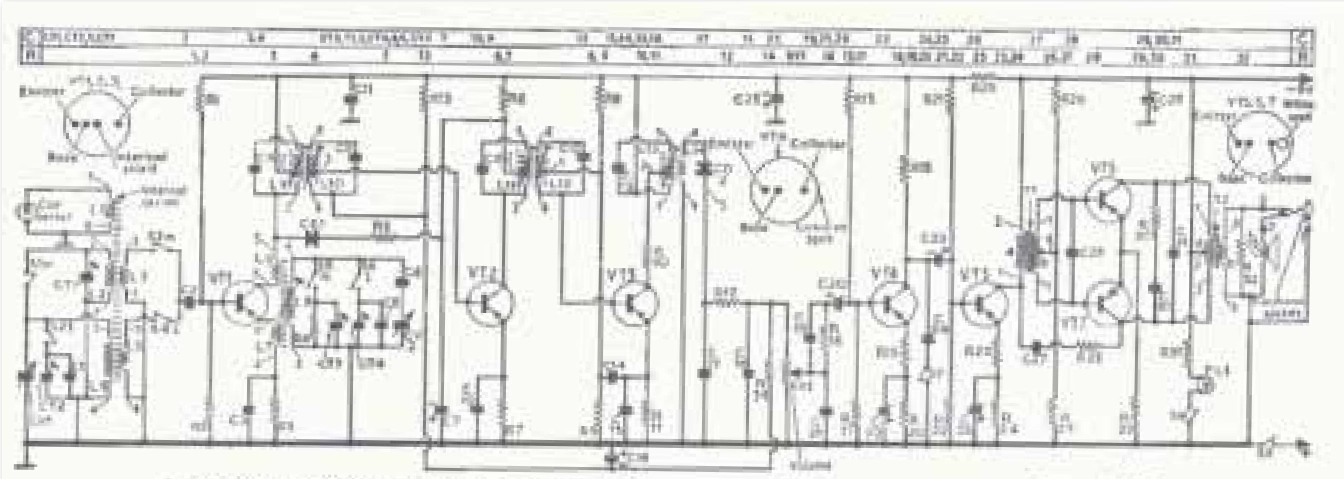
cam follower is sitting on top of the cam; otherwise the on/off switch won't operate when opening the lid. Also, when refitting the tuning knob, the spindle needs to be positioned carefully to ensure correct operation of the dial pointer lamp switch.

I now ran the set from a PP9 for the first time. All was well until I pressed the Tone button – then came the sting in the tail! A horrible, loud, low frequency noise was being emitted. Switching the tone button off silenced it, as did running it from the bench supply again. It seemed that with the tone 'top-cut' capacitor in circuit, it was causing something to self-oscillate – and why only on battery? I wondered if the internal resistance of the battery (which was new) had something to do with it. I tried bridging the battery with various values of capacitor in case the decoupling capacitors were faulty, but to no avail.

Experience has taught me that when the inexplicable happens check all the earth connections! This set only has four solder tags, so using a lead with a croc clip on each end, I clipped one end to the chassis and used the other end to touch each of the earth tags in turn. Sure enough, as the lead touched one of the tags, the fault cleared. Unlike the other three solder tags, which are firmly bolted directly to the chassis, the one causing the problem is bolted to the top of a metal pillar used to support a bank of trimmer capacitors. The bottom of the pillar is secured to the chassis from the other side. I thought that all I needed to do was tighten up the pillar screw, which wasn't very tight. It didn't seem to be tightening, and then as I was turning the screw I noticed that the gang capacitor vanes were moving! I immediately stopped tightening the screw but when I tried turning the tuning knob, I found it was jammed solid. What on earth could be happening? (No pun intended).

So it was out with the chassis again to see what was going on. I found it's not a conventional screw on the other side of the chassis that is used to secure the pillar. It has a threaded shank which screws into the pillar but its head has a wire loop attached, the latter being used as a guide for the dial cord, which

Figs 7a, b, c



Bush TR.102 circuit diagram. On later receivers: C24 is connected between S7 and the junction of C19 and C20

Figure 8

passes through the loop. As I had turned the screw from the other side, the pillar and the loop had also been turning, thus winding the cord round the loop! No wonder it jammed – I was just grateful I hadn't wrecked the cord. The loop with the cord running through it was carefully 'unwound' and can be seen in figure 4 (Below the end of the ferrite rod). Due to the nature of the above arrangement, I wasn't convinced that a satisfactory earth connection could be reliably made, so I opted for the easier solution of soldering a stout wire from the troublesome earth tag to a good one. The wire can be seen in figure 6; it's the black one running horizontally just above the bank of four trimming capacitors.

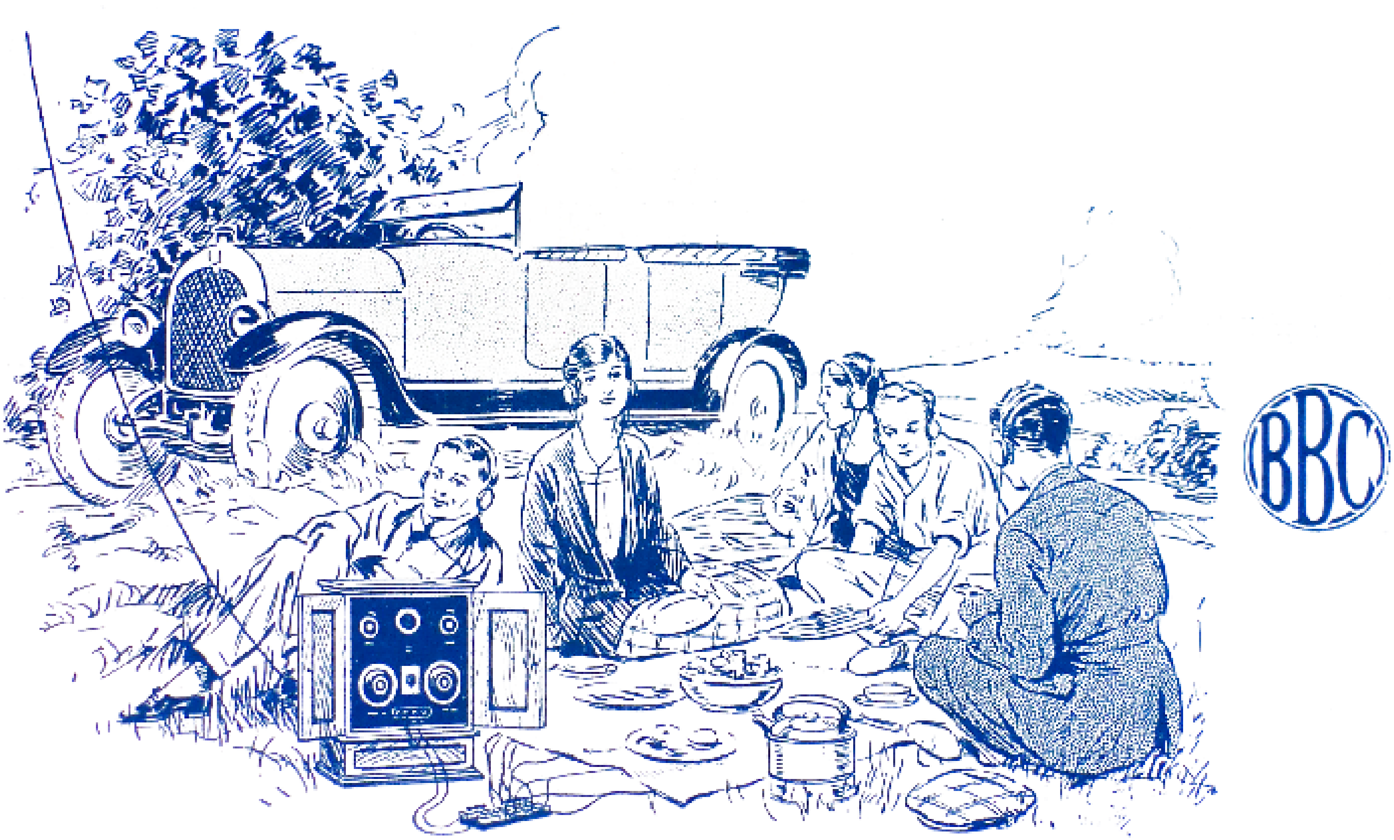
The restored radio is shown in figures 7A, 7B and 7C.

Conclusion

I consider the Bush TR102 to be a bit different from the run of the mill 1960's transistor radios. With its unusual case and control configurations, it engenders interest at first sight; when the back cover is removed one cannot help but marvel at the mechanical ingenuity. From the electronic viewpoint I suspect it is run of the mill – but nothing wrong with that. The circuit diagram from Trader Sheet 1561 is shown in figure 8.

I can't make up my mind whether David Ogle was an inspired artist ahead of his time or the bane of the Bush design engineers' life. (And who am I to judge). The design of the case is certainly inspirational and as far as I know, pretty unique. At twelve inches by nine, yet only two and a half inches deep at its base, it is very unsteady on all but a hard flat surface. The lack of internal depth, especially at the top obviously presented considerable mechanical challenges for the engineers. Maybe they relished that.

One cannot overlook the fact however, that had the case been an inch or so deeper, the complications of driving the volume control and particularly the tuning mechanism, could have been eliminated. It would also have been much steadier on its feet – but that would have deprived us of a rather interesting set.



High Voltage Stabilized Power Supply

Steve Richards

Have you ever wanted a stable high voltage DC? One option is to use a cold cathode stabilizer valve such as the VR150. Here is an alternative approach that you may wish to try.

A couple of years ago I restored a 1942 HRO receiver. Knowing the HRO local oscillator to be susceptible to drift on the higher frequency bands, I experimented with a stabilized power supply for the B+ supply.

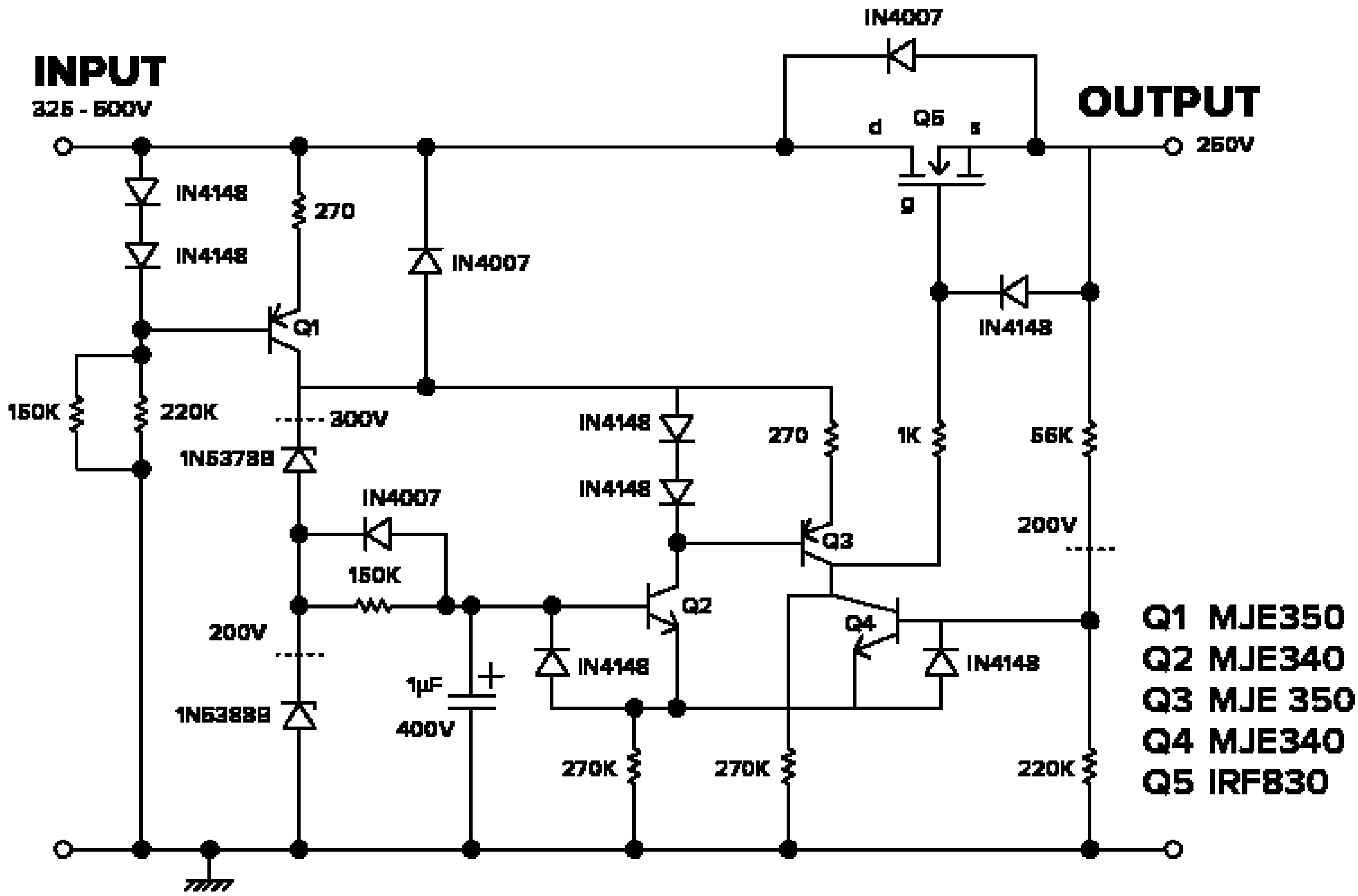
I found a circuit design whilst searching the internet on “Duncan’s Amps” web pages at (http://www.duncanamps.com/technical/mosfet.html). These are well worth a look especially for valve audio enthusiasts.

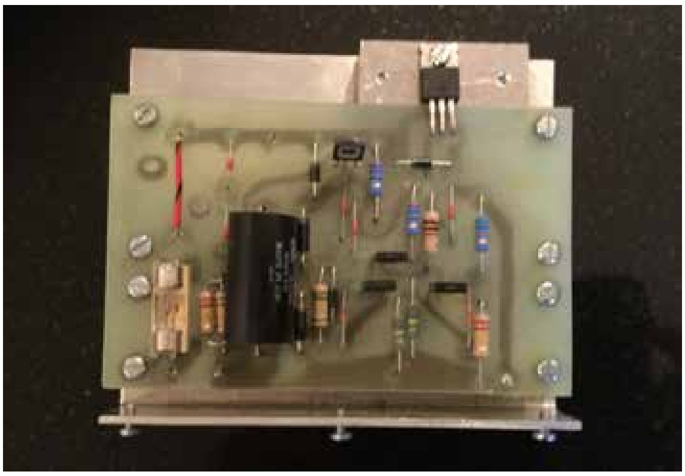
In many respects, the circuit is similar to the internal circuitry of the popular three terminal regulators such as the 7805 and 7812.

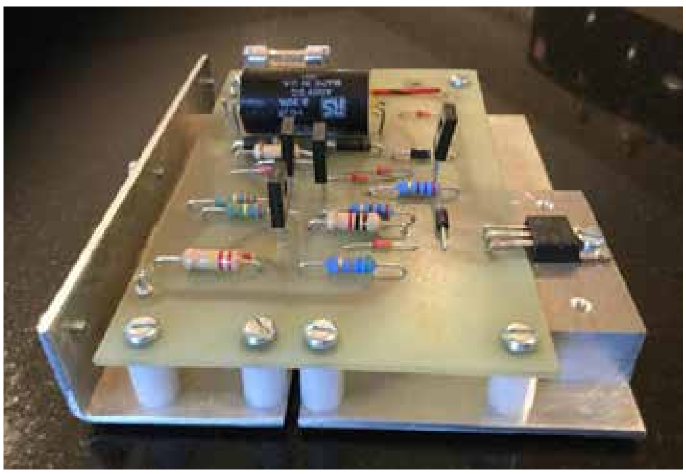
I use a slightly modified version of the published circuit mainly because I couldn’t get my hands on the transistors that Duncan specified. My version of the circuit is shown here and uses transistors that I sourced from Farnell Electronics:

The circuit requires an input voltage in the range 325 to 500V rectified and smoothed dc to produce a stabilized 250V dc output. The circuit itself draws a small amount of current in operation in addition to the current supplied to the load so this should be taken into account when choosing a mains transformer.

I used a printed circuit construction drawn by hand with Dalo pen and etched in ferric chloride solution.
Here is the assembled circuit:







Royal Wootton Bassett Auction & Swapmeet, July 2017

Photos by Greg Hewitt








Philips 930C DC mains version

Sold for £8000

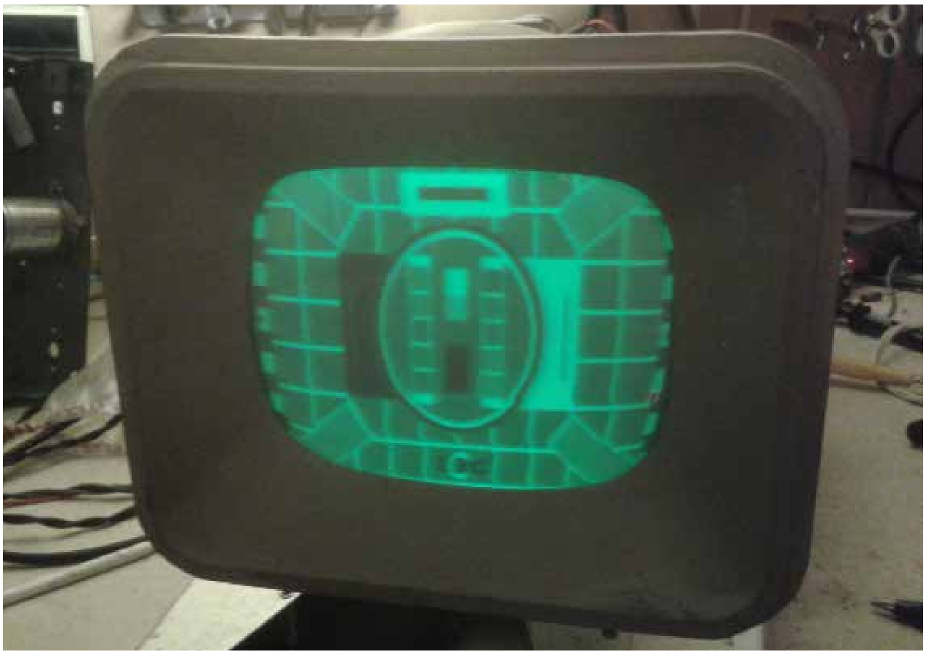
Rare BTH VR2 with type D horn speaker

Getting a picture *(before Aurora)*

Roger Grant

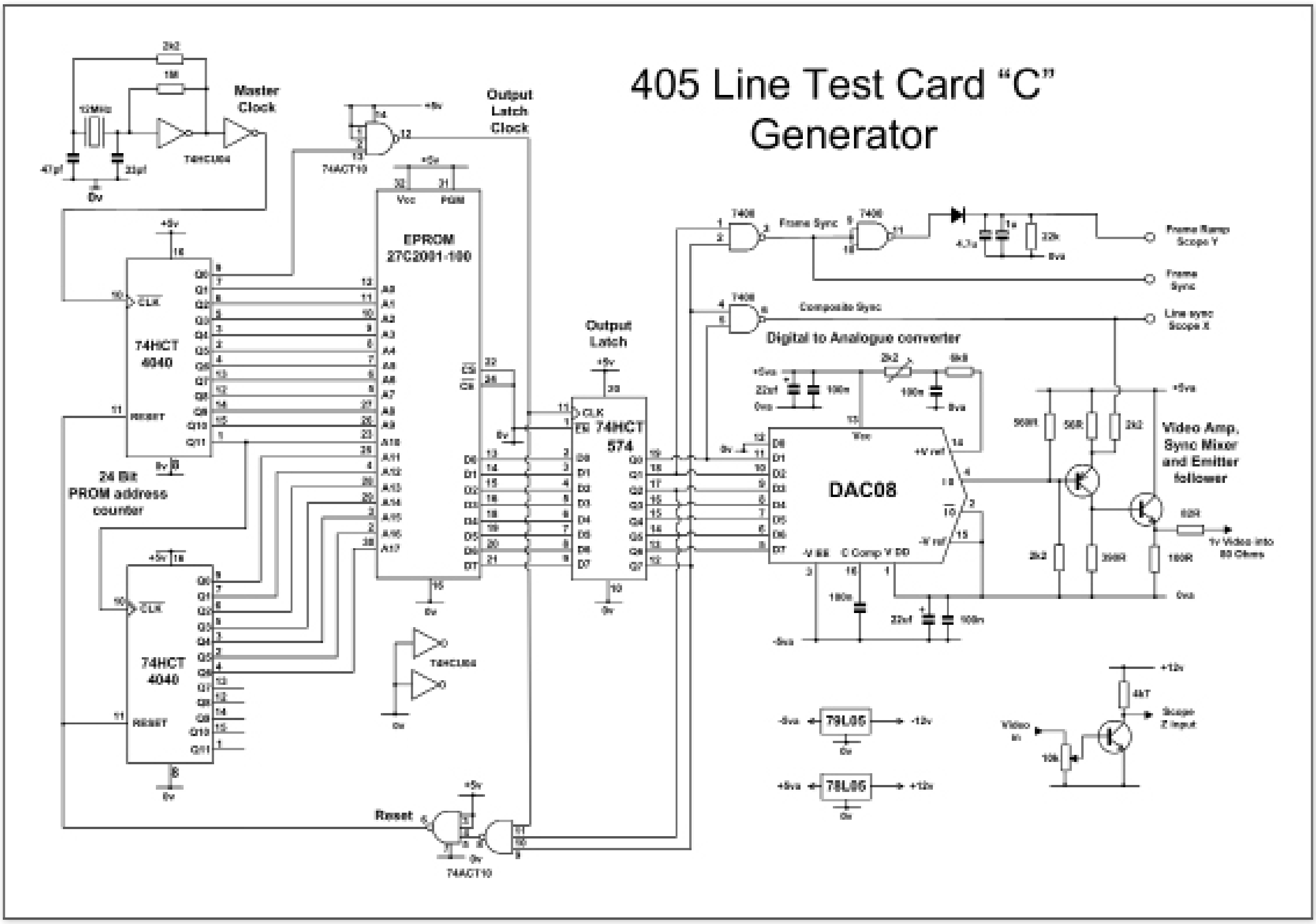
Having read several articles in the bulletins on television test pattern generators, I thought I might follow them with another device that solved the problem for me a short while ago. I found the circuit of this one on the internet and it works very well.

This project started in recent times when I took on the restoration of a Home built "Inexpensive TV" with war surplus components, (The article in the Spring 2016 issue of the bulletin) this was for a fellow BVWS member and came with a Domino standards converter, this converted the audio and video outputs from my spare Freeview box to the 405 line format on band 1 at 45 Mc/s very nicely and reminded me I still needed a signal source for the TV's in my collection. These had become much neglected after the ending of 405 line TV transmissions and back then standards converters were almost non-existent and or very expensive and way beyond my pocket I considered building a standards converter myself, a bit of a major project, the more I looked into it the more difficult it became and after several attempts to cobble together a circuit, the project never got off the drawing board and was filed in the "a bit difficult box". The whole project then put on a back burner for when I had a bit more time and had done a bit more research. With plenty of radio projects to keep me busy it eventually was completely forgotten about.

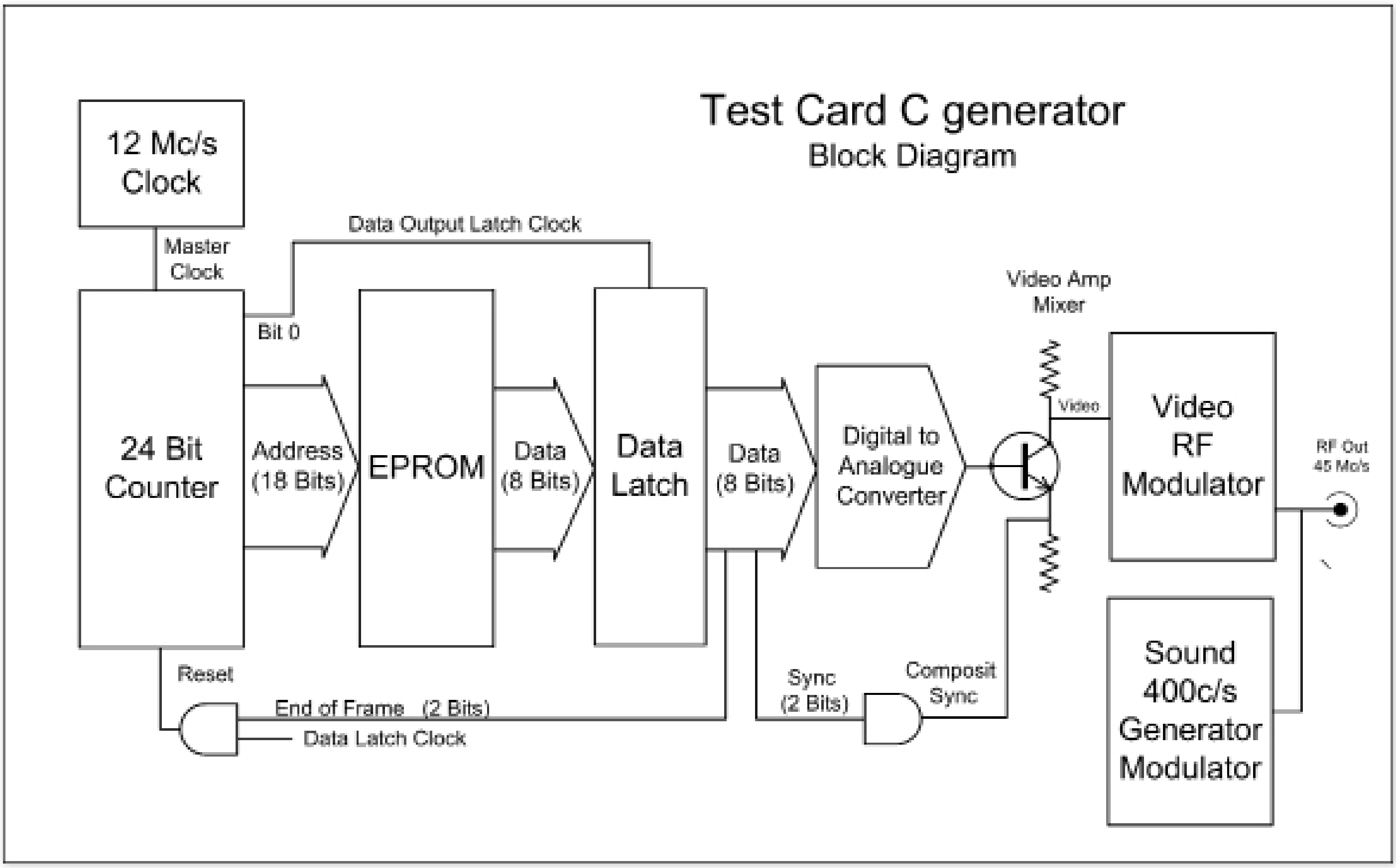


Test card C on the Inexpensive TV

After reading Jeffrey Borinsky's review on the Aurora standards converter in the Summer 2006 bulletin, one of these being affordable, I decided to purchase one but the website said they were now sold out and I left it at that for the time being leaving the problem unsolved.



Redrawn circuit diagram test card generator



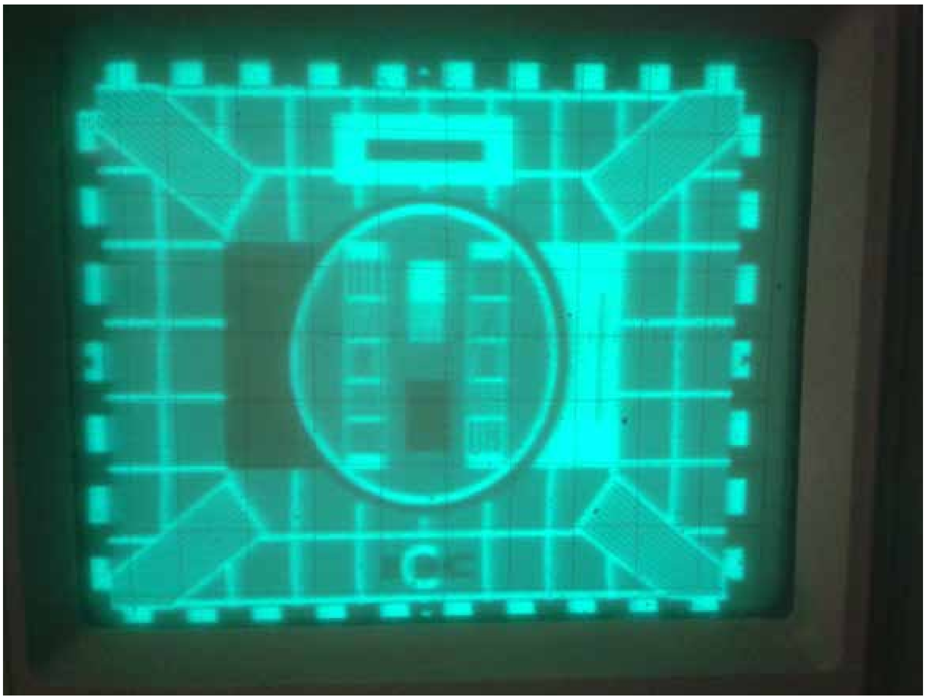
The Test card gen PCB

While fault finding on this "Inexpensive TV" project I found that a test card would be very handy as fault finding and setting up on an off air moving picture was somewhat difficult.

Looking for the easiest way of obtaining a test card signal, I re-read all the articles in the bulletins on standards converters and test card generators and searched on line for an easy solution, no point in re-inventing the wheel and I needed one now and not a long term project. There was an article on the internet describing a "Test Card C generator" by Jon Evans, just the job, an easily build-able circuit using a handful of chips that I was familiar with, I had worked with these chips some twenty to thirty years ago, I just Googled "405 line test card generator" and the whole project popped into view. (ref 1).

The circuit consists of a 12 Mc/s clock driving a 24 bit counter, the count represents an address in an EPROM,

(Erasable Programmable Read Only Memory) the EPROM address contains the digital data representing the test card video level or sync level. The output from this is clocked into and held in an 8 bit latch driving a digital to analogue converter generating the analogue video signal and sync's, these then mixed in the video amp, (there's a full circuit description with timing diagrams in the project notes also at ref 1).



Test card C on the scope

While sourcing the components to build this project I came across a complete chip set with the EPROM already programmed at one of the Wooten Bassett swap meets, this really speeded up the project and saved me the problem of finding someone with a PROM blower, I no longer have access to one myself and didn't want to go to the expense of purchasing one just for one job.

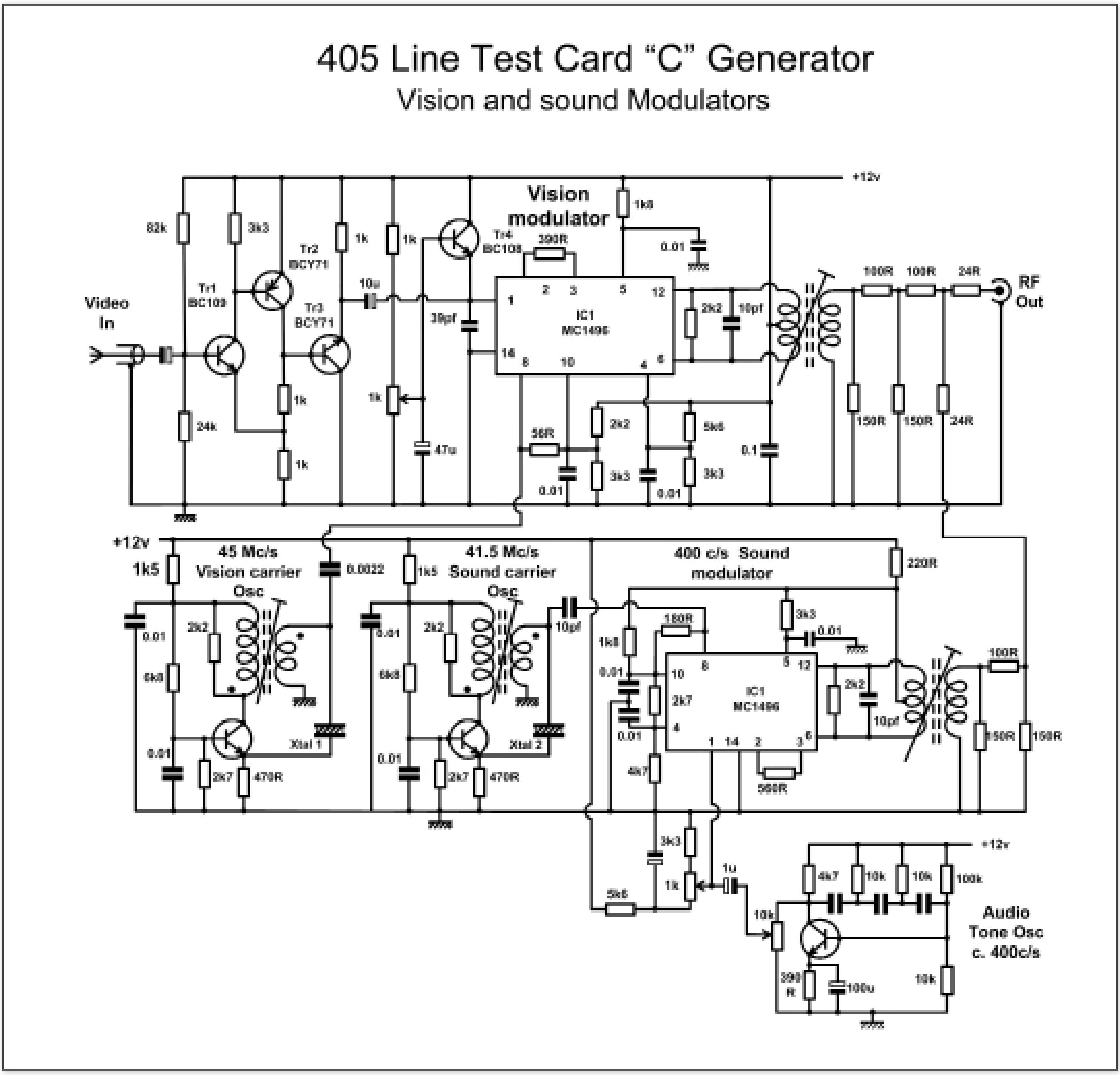
I don't think this would have been an insurmountable problem as I'm sure there are several BVWS members with this capability and know-how that would happily help.

The rest of the circuit just needed the R's, C's, a few transistors and a power supply and building on a piece of stripped Vero-board (the copper stripped off and point to point wired to avoid the excessive stray capacity associated with Vero-board), this made the assembly of this test box quite rapid and the test card video generator was up and running in a couple of evenings.

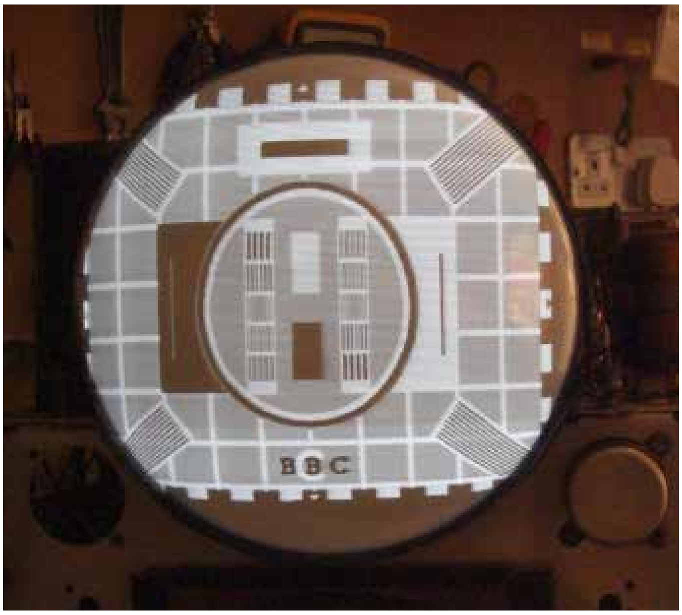
I built the test card generator first, this just producing a video signal and sync's, I decided to get this working before I built the RF modulators.

I had a few teething problems getting it working, the first problem was that this digital generator was running permanently in reset, this proved to be due to an error in the circuit diagram, at the end of the frame the EPROM address counter "reset" was constantly repeated as the reset logic was clocked by the master clock and not the output latch clock, so the master clock re-clocked reset before the PROM address counter could increment, hence it stayed permanently (looped) in reset, easily remedied by moving just one connection.

The second problem was that only half the

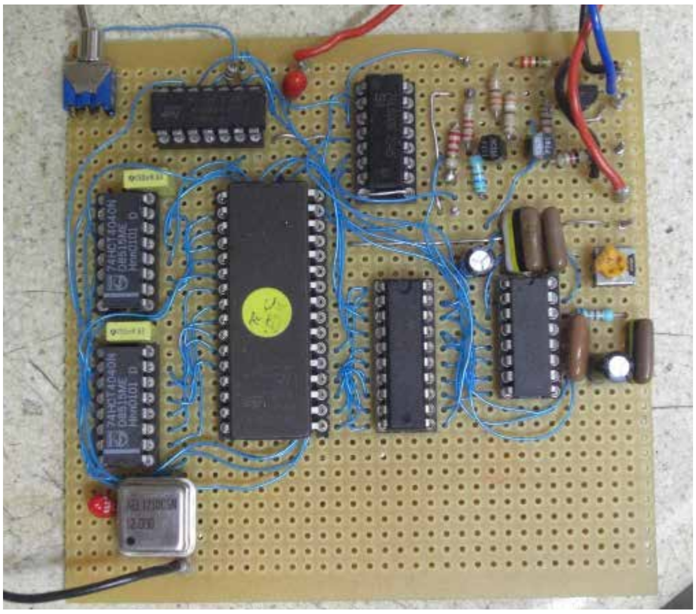


Circuit diagram of the modulators



Test card on my Bush TV22

The finished Test card C generator


The video generator board


Inside the test card generator box

output latches were working, this proved to be due to the wrong output latch chip, the one supplied in the chip set was a 74HCT374, the pin-out of the chip in the circuit diagram was for an 74HCT574, either of these chips will work but they're not the same pin-out and once I obtained a 74HCT574, at the same time as I sourced the modulator chips, the problem was solved, in this case fitting chip sockets had paid off and is highly recommended.

The chips for this circuit are still available (see ref:- 2) and the program for the EPROM down loadable from the afore mentioned project website ref 1.

The waveform on the oscilloscope looked good but a picture would be better, I achieved this by using my oscilloscope as a monitor, the X time base of the scope triggered by the comp sync signal and I built the simple R/C ramp generator from the frame sync test point to drive the Y, the R/C values quoted in the circuit gave reasonable linearity on the X10 probe, the video signal fed into the Z input on the back of the scope, the beam modulator. (for my Farnell DTV60 scope this needed amplifying and inverting). I have built these test points into the front panel of my test card C generator so I can monitor that the test card generator is working on my scope when a TV is not to hand or just not working yet.

Being quite impressed with the test card picture on my scope, I then built the vision modulator, I didn't have a 45 Mc/s quartz crystal so the RF oscillator was left free running and tuned into the set rather than the other way round, I found this made setting up the modulator a bit difficult to get right, a bit of a balancing act but it was achievable.

This done I found that the test card generator made all the difference to the setting up and fault diagnosis of the Home built Inexpensive TV set.

I later acquired the crystals for vision and sound and added a 400c/s tone generator and modulator for the sound channel.

A few weeks later I had heard at one of the swap meets that the Aurora was again available and decided to purchase one as I couldn't find a reason not to, especially as they're multi channel, have a built in test card and at £200 reasonably affordable and finally I now quite liked the idea of demonstrating my TV's re-showing 1950's TV programmes from a DVD player.

As previous reviews have stated, the Aurora standards converter does everything one would need to run 405 line VHF TV's very well and needs nothing else to get a test card and sound tone to keep your 405 line sets working and automatically switches to the video and sound inputs when applied. Although Aurora surpasses any of the previous designs, I very much enjoyed building the Jon Evans test card C generator. It was a very interesting side project now old technology in itself and not too difficult for a home constructor to build. It also has the added advantage of being easily repaired if you do inadvertently have a mis-hap while working on a set and damage it.

This home built box proved to be quite robust and has come in very handy as my permanent bench test card signal generator for restorations and repairs and the aurora used for the second channel and set to Channel 9, the old London ITV channel, for showing 1950's TV programmes fully utilising the multi-channel tuner of the set on demonstration.

ref 1:- www.thevalvepage.com/projects/testcard/testcard.htm

ref 2:- RS components or Farnell components.

What’s the diagnosis?

Mike Barker

A Bush TV62, restored over ten years ago and working perfectly on a very regular basis developed a strange fault.

The whole picture would shrink both vertically and horizontally in from the sides, top and bottom of the mask by about 1.5 inches. The picture would then remain completely stable and bright in this form with very good linearity all over.

The fault was always the same and was triggered by the same actions each time.

The fault only happened when the TV had been allowed to fully heat up internally.

The fault was triggered by the picture blanking out or very dark scenes where there was barely any illumination of the screen. The fault was also triggered by removing the aerial plug and then replacing it straight away (best seen with a test card signal).

You could watch the picture shrink over a period of about four seconds.

I found that turning the brightness up to maximum made the picture ‘grow’ again to its full size where it would then remain perfectly normal until the next time it was triggered.

Various voltages were taken, and all of them changed in the same manner in the fault mode.

The main HT line would drop by about 50 volts and remain perfectly stable. The HT current would also increase each time the fault occurred.

WHAT WAS THE SOLUTION?

A crisp new £20 note will be given to the person who gives the correct answer to me at the Royal Wootton Bassett meeting on December 3rd.

Updates at the British Vintage Wireless & Television Museum

John Thompson

Many members will be aware of the developments that are taking place at the Museum. Following on from my update in the summer 2016 Bulletin I can report on our progress. Our targets are ambitious and it has been a very challenging time. It has been agreed in principle that the Museum lease can be extended on the outbuildings and this really is very good news. For this to happen Gerry's estate with its liabilities needs to be finalised. Eileen, the freeholder, has taken advice, and has been successful in obtaining planning permission to develop the upper part of the house into self-contained flats. This quite clearly involves major structural changes to satisfy the stringent legal requirements of building regulations.

For the work to start on the house it was clearly necessary to remove the collection. Although only two rooms, this was a big task. Large heavy radiograms and pre-war televisions needed to be moved as well as all the Ekco collection and shelves of 1920's radios. The sets were moved carefully and efficiently to the end of the garden buildings.

The main works on the house have now started and good progress is being made. The work is due to be completed by early December. There will then be two flats to be sold. Any radio collectors would be more than welcome to express an interest!!

Our new log cabin

To utilise our outbuildings space to the absolute maximum there has been a project underway to install a new gallery on the 'Quadrangle' area. This involved the removal of the transmitter hut, valve lab and transformer stores. Our working party of Eileen, Richard and Dave did a brilliant job in undertaking this from the initial planning through to the installation of the cabin assisted by the wider team of Phil, Chris, Lucien, Peter and Jeffrey. There were many others and I can't thank them enough. The pictures show the demolition, site clearance, groundwork and concrete base, installation of the cabin and the finished building. The finished cabin was coated with fire retardant paint to meet building regulations, work is carrying on carpeting and sorting out shelving. This all needed to be completed before the work started on the house and because of the team's commitment and hard work this was achieved!

It became clear once the building started on the house that the museum would need to be closed for the duration of the work. Unfortunately this meant cancelling the previously advertised Afternoon of Music, Table Top Sale and the 50 years of Colour Television Event. Apologies if this has caused any inconvenience. We will publish next year's events and opening plans as soon as we can.

At this time we appreciate more than ever the support of our Museum Friends Group and BVWS members. With your support we will do our absolute best, to make sure the museum has a secure, spacious home in the outbuildings at Rosendale Rd long into the future.



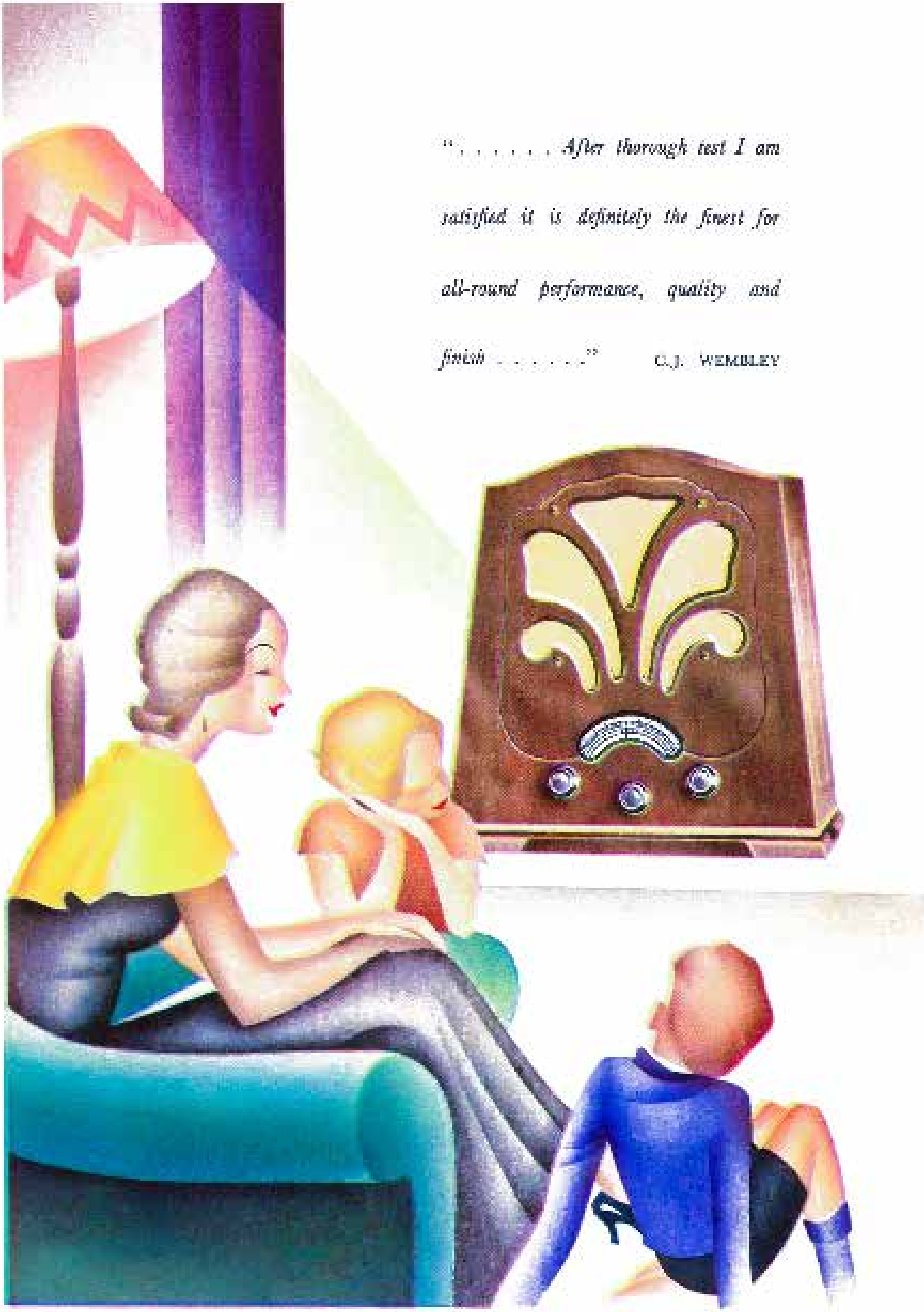





Images by Richard Stow

". . . . . . . After thorough test I am satisfied it is definitely the finest for all-round performance, quality and finish . . . ."

C. J. WEMBLEY



BVWTVM Garden Party

Photos by Alex Hewitt & Carl Glover

The Packard car of the late Alan Carter

A 1950s TRF bought For Its knobs

Stef Niewiadomski

I bought this receiver for the princely sum of £1 because having peered into its back. I decided that it was beyond restoration and I'd simply salvage its three good, matching knobs – always useful when a radio has one or more of its set of knobs missing - and scrap the rest.

It lay unloved in my workshop for a few months and when I came to harvest the knobs I thought I'd take the chassis out of the cabinet and take a look at what else was saveable. The design was obviously a TRF, and as long as the coils are present and intact, these radios usually don't take too much effort to bring back to life. One valve was missing, another had shed most of its Mullard red coating, and the other was housed in a very rusty screening can. There was a metal rectifier mounted on the chassis, but no dropper resistor or mains transformer.

The chassis was made of thin aluminium which of course had not rusted, which was not true of the rear section of the tuning capacitor. The tuning mechanism seemed to work, and the output transformer was still there. A quick check with a meter showed that its windings were of the right resistance, as was the coil on the 5-inch loudspeaker. The Bakelite cabinet had a crack in its top, and although the dual-band dial glass (with no manufacturer's markings) was rattling around and loose, it was intact. The blue-painted dial plate was rusty, but promised an attractive backing to the dial when cleaned up and painted. Overall, the radio was a mess, but restorable, and I decided to save it from the scrapheap. In the end the effort was worth it, see Figure 1 for a photo of the restored radio.

Figure 1: The radio in its restored state. Its intact set of three knobs was what attracted me to the radio, and it barely escaped scrapping to harvest them.

Origin of the radio

It's always interesting to know who manufactured a particular radio, and especially when it's not obvious and a little detective work is needed. Figure 2 shows a Concord Electronics (of Brighton) advert for the 'Ocean Hopper' from the May 1959 issue of Practical Wireless. The cabinet looks identical to mine, and looks very much like the 1940, and immediately post-war, Pilot Little Maestro. The text describes the radio as a TRF, and having two bands, rather than the one that mine has. In fact this type of radio was very common at the time and was sold by several mail order companies, based in London and elsewhere. According to Jonathan Hill's Radio! Radio! this Little Maestro cabinet was used by over a dozen TRF and superhet radio kit manufacturers from 1948 until the early 1960s.

Figure 2: Concord Electronics (of Brighton) advert for the 'Ocean Hopper' from the May 1959 issue of Practical Wireless.

The design

There was no back panel on the radio, so after removing a couple of screws from the bottom of the Bakelite cabinet and removing the prized knobs, the chassis slid out easily. The chassis contained two identifiable valves: the RF amplifier was a Mullard EF39, with most of its red coating having crumbled away, but luckily the area with its markings (including Mullard's 'Pentone' branding) was still just about intact. The good-looking valve – obviously the detector stage - inside the rusty screening can was marked Sylvania 6F5G, a high-μ triode, first introduced in 1937. There was an octal socket to accommodate the missing third valve, which I suspected was probably a 6V6, which was much used post-war in this sort of radio. All these valves have 6.3V heaters with different current ratings, and they were all wired in parallel. There was no sign of a heater transformer but surely that was the only sensible way of supplying the valves' heater current, plus the current to the dial lamp.

I had recently come across Denco's design for a TRF, published as an advert in the February 1955 issue of Practical Wireless, see Figure 3. The coils used were of course Denco's own - coded C2 (blue - aerial) and C3 (green - detector coupling, plus reaction) - and the EF39 / 6F5 valve line-up (plus the 6V6, assuming my initial hunch was correct) was identical to my radio, so it made a useful reference point as I was tracing my circuit. Several coil manufacturers sold coils suitable for use in TRFs, which would have used similar circuits.

Figure 4 shows a rear view of the chassis as it came to me. Under the chassis things were in reasonable condition (see Figure 5), and all the soldered joints looked good. I traced the circuit of the radio, checking the integrity of the coils in particular, and the resulting schematic is shown in Figure 6. The wiring and components around the third valve's socket made it obvious that a 6V6 had originally been fitted, as I suspected. Some of the braid-covered rubber insulated wiring had crumbling insulation, and this was replaced.

To my relief the coils around the RF amplifier were in good condition, with no obvious damage or breaks in their windings. The coil mounted above the chassis was marked PA2, and the coil below the chassis was marked PHF2, both Wearite codes for medium wave only coils, and there was no wavechange switch fitted. Although the radio's dial included the long wave, clearly the radio itself only covered the medium wave.

The method of controlling the volume of the radio was used fairly often in TRFs of the period. To reduce the volume, the wiper of the potentiometer is rotated anti-clockwise, increasing the resistance in the cathode circuit of the RF amplifier valve and simultaneously decreasing the resistance across the aerial coil, and hence shunting more of the RF input to ground. To increase the volume, the opposite effect is produced by rotating the potentiometer clockwise, shunting less of the RF input to ground. The arrangement was also claimed to provide some 'reaction' via the feedback path from the cathode of the RF amplifier to the aerial coil, increasing sensitivity for weaker signals. The volume potentiometer measured about 60kΩ end-to-end, so I presume it was a 50kΩ component originally.

The detector stage revealed itself as a grid-leak detector, with the parallel-connected resistor and capacitor mounted close to the 6F5G's top cap grid connection. There was a feedback path from the anode of the detector valve to the anode of the RF amplifier, via a fixed capacitor and a variable resistor, labelled C5 and VR2 on the schematic. This looked quite strange to me, and I presume it was meant to be some sort of a regeneration control: I was looking forward to checking whether this worked or not.

Unusually, the mains on/off switch (mounted on the volume control) was double pole, which makes a live chassis design marginally safer to use, and both poles of the switch were in working order.

Restoring the chassis

Figure 7 shows the chassis after I'd stripped off most of the top chassis components to give me more access for cleaning. As found, the 5-inch speaker was accommodated in a cloth bag to keep out dust, but this bag had pretty much disintegrated and so was discarded. The speaker had a large – about 3-inches square - magnet/coil assembly, which I think probably dated it as pre-war, and a rusty frame which I cleaned up and treated with rust inhibitor.

The screen around the detector valve was removed, de-rusted and sprayed with a chrome paint, which I had left over from another project, and which made it look much better. The glass envelope of the 6F5G was a little loose on its Bakelite base, so I gave it a couple of dabs of epoxy resin to secure it.

The HT smoothing capacitor was a large 16μF + 24μF TCC electrolytic can, showing signs of bulging and measured very low on the capacitance range of my DMM, and so it had to go. It had Jan 49 printed on it, and I guess that was the earliest that the radio could have been built. I had a salvaged, rather compact, 24μF + 24μF electrolytic can, dated March 1954, which was in good condition, and I fitted it onto the chassis, below the deck.

I checked the heaters of the EF39 and the 6F5G, and both checked OK for continuity. In case these valves were not in good condition (the EF39 certainly looked the worse for wear) I obtained NOS replacements for both valves, sourcing a Marconi H63 for the 6F5G, which is listed as its equivalent (the CV1073 is also given as an equivalent of the H63). I already had a good 6V6GT, so I had a set of valves to try.

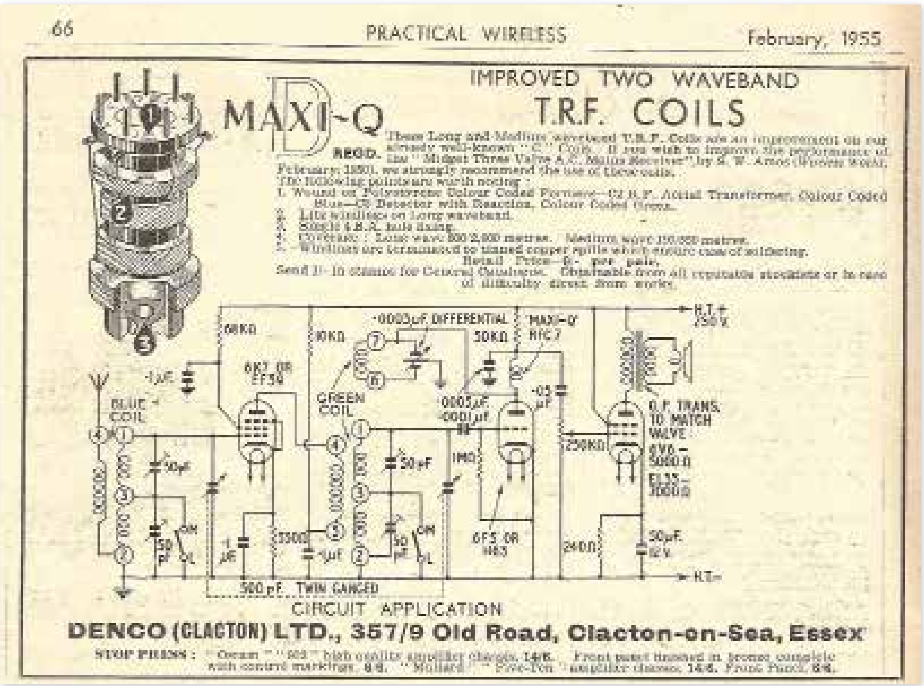


Figure 3: Denco's TRF design in an advert in the February 1955 issue of Practical Wireless.


Figure 4: Rear view of the chassis as it came to me. The EF39 on the left has lost most of its screen coating, and the 6F5G detector valve is lurking inside the rusty screening can.

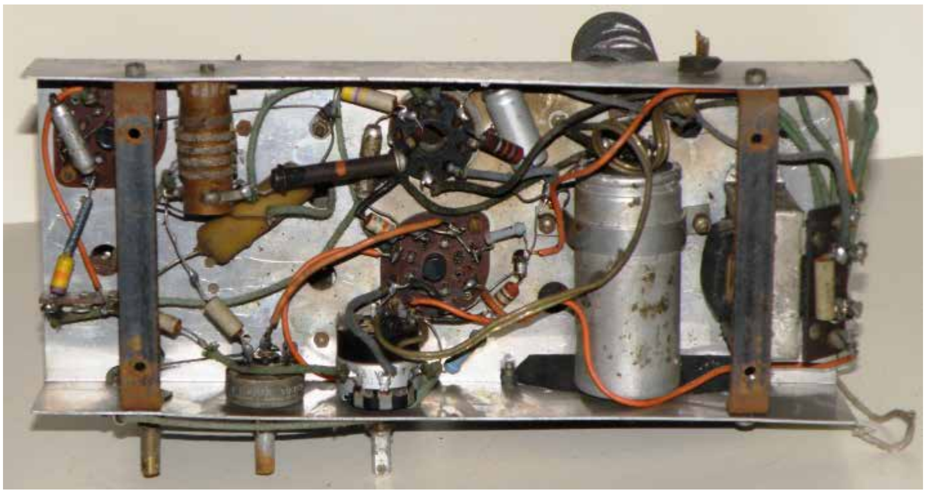


Figure 5: Under chassis view before restoration.

The dial lamp was intact and marked 6V 0.25A, and was connected in parallel with the

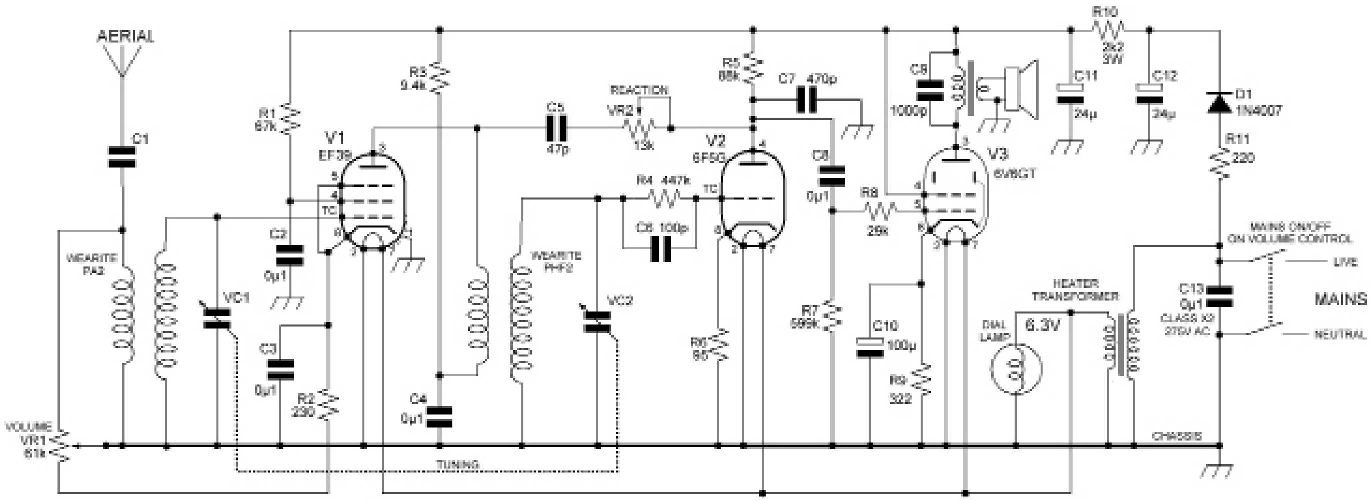


Figure 6: My schematic of the radio.

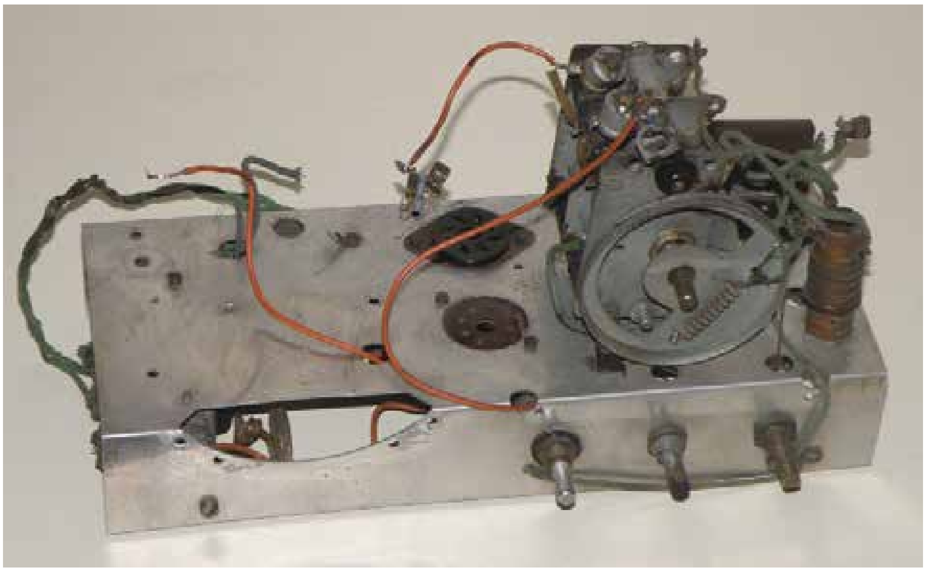


Figure 7: The chassis after I'd stripped off most of the top chassis components to give me more access for cleaning. As you can see, I don't believe in stripping everything, such as the tuning capacitor and the valve sockets, from a chassis, unless they definitely need replacing. Once the radio was working, the two beehive trimmers mounted on the tuning capacitor seemed to make things worse, and in the end I removed them completely.

Figure 8: Rear view of the chassis after restoration. I hadn't replaced the screening can around the detector valve at this stage, and it didn't seem to suffer any instability. The new tag strip accommodating the new diode and series resistor, and the class X2 capacitor can be seen next to the new heater transformer. The original EF39, still without most of its red coating, works well enough to be left in the radio.

valves' heaters. Adding up the heater currents of the valves: the EF39 at 200mA; the 6F5G at 300mA; and the 6V6GT at 450mA, plus the dial lamp, meant that I needed a transformer capable of supplying at least 1.2A. A search through my transformers box brought up a 6.3V 1.5A heater transformer – perfect for the job. Try as I might I couldn't find a way of accommodating the new transformer and a tag strip on which to mount the silicon diode which I was going to use to replace the metal rectifier - the magnet on the speaker was just too big. So rather reluctantly I replaced the speaker with a GEC speaker that I had in my stock, of the same diameter and which had a much smaller magnet, and I also removed the original metal rectifier. Now there was room for the new components on the top of the chassis.

Above the chassis I could also see a paper capacitor, marked 0.1μF and rated at 500V, wired directly across the mains, which had dripped wax. When I examined it more closely I could see that its top end had been blown off, presumably with a bang, at some point. I changed it for a new 0.1μF class X2 275V AC metallised polyester capacitor, marked C13 on the schematic.

Below the chassis, one large 0.1μF wax paper capacitor was replaced, as were two metal cased 0.1μF decoupling capacitors, and the 1000pF capacitor across the output transformer's primary. All the resistors were close enough to their marked nominal values to be left alone.

Figure 8 shows a rear view of the chassis after restoration, and Figure 9 shows the restored under chassis view.

Switch on

With the chassis still out of its cabinet, I inserted the new EF39 and H63 valves, and a new 6V6GT, connected my long wire aerial to the aerial isolating capacitor, plugged the radio into the mains, and switched on. The dial lamp came on and after a few seconds I could see that all the valves' heaters were glowing: the heater voltage measured 6.2V, so the new heater transformer was doing its job. I checked the voltage between the chassis and mains earth, and this showed 2V indicating that I had correctly connected mains neutral to the chassis, rather than live.

The HT voltage was about 260V, so the new rectifier arrangement was working. I turned the radio to full volume and tuning around I could just about hear a couple of broadcasts, including BBC 5 Live, which is usually very strong in my area. Adjusting the control that I suspected was an attempt at anode-to-anode regeneration had no effect, so I cut one of the wires to its potentiometer, and the volume came up slightly in level. A beehive trimmer was connected across each section of the tuning capacitor, and adjusting these trimmers made things worse and so I removed both of their outers completely. In my experience the tuning of these TRFs is rather broad, especially if regeneration is not incorporated, and trimming of the aerial and RF-to-detector coupling tuning circuits is generally not needed.

I removed the beehive trimmers completely, and I could now hear a reasonable number of stations on the medium wave, but the radio wasn't as lively as I would have expected. Looking at the Denco circuit, there is a 0.1μF capacitor from the bottom of the 10kΩ anode resistor feeding the EF39, which wasn't present in my radio. So I fitted one to my radio, and the volume level came up, and was now at a level that was just acceptable. I'm not sure that I could detect any reaction effect from the volume control arrangement.

I replaced the EF39 and H63 valves with the original EF39 and 6F5G, and the performance wasn't noticeably worse, so I concluded that the old valves were still in reasonable condition.

The last job on the chassis was to paint the dial plate with a mid-blue spray paint, which gave an attractive backing to the dial, and to re-attach it to the chassis, and re-fit the pointer. I had to tighten up the fixing screws for the tuning capacitor, which was rather sloppy, and open up the dial plate's central hole to prevent it from fouling the pointer as it rotated.

The cabinet

I gave the cabinet a wash in hot soapy water to get rid of the accumulation of dirt, dust and cobwebs. There was a crack in the top of the cabinet, which I fixed with Araldite from inside, but didn't attempt to repair the outside, leaving it in its 'honest' state. The cabinet was then given a good polish with Polishing Paste No 5.

The dial glass was very dirty and I gave it a clean, being careful not to remove any of the dial markings. The fixing screws and brackets that held the dial glass in the cabinet were nowhere to be seen, and so I fixed the glass into the cabinet with bath sealant. This gives a strong fixing which is easily removed if needed in the future. Finally I slid the chassis back into the cabinet, re-fitted the fixing screws and the three knobs.

I gave the radio a soak test for a couple of hours, which it passed with no problems.

Summary and conclusions

The radio escaped my original intentions of scrapping it for its three intact knobs, and survives to play another day. Most of its original components were still there, and the simplicity of its design made it relatively easy to guess what went where, even when the original schematic was unknown. The most significant task was to rebuild its power supply, and I used a modern semiconductor diode to replace the original metal rectifier, which had to go to make room for a heater transformer.

My radio had an interesting capacitor / variable resistor arrangement from the anode of the RF amplifier to the anode of the detector stage, which I suspect was an attempt at regeneration. This seemed to be ineffective: if any readers have encountered this elsewhere and can comment on what it was meant to achieve, I'd be very interested to hear.

I suspect there are still many of these simple TRFs around. From the front there is nothing to distinguish them from superhets: their performance is good enough at least for local broadcast reception, and I think they are well worth the effort of saving and restoring.

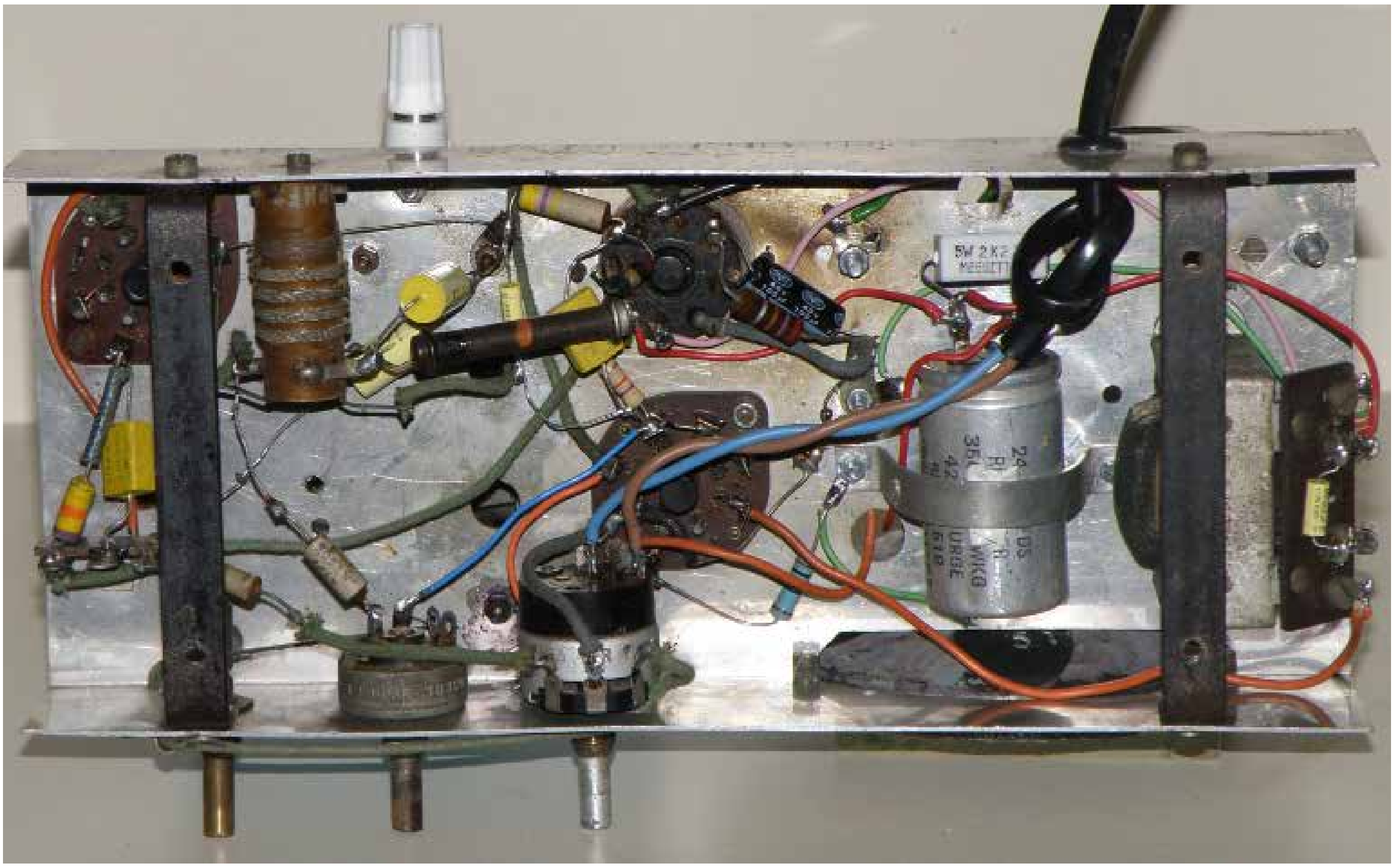


Figure 9: Under chassis view of the chassis after restoration. There's some evidence of burning – or maybe an exploding capacitor – by the socket of the 6V6GT.

The resurrection of an Ekco A22

Richard Shanahan

This tale involves two good friends of mine. One wanted a vintage radio, especially one in or near the art-deco era. The other had a modest collection of such radios. An Ekco A22 was chosen, however few things in this world are simple and the A22 has proved it!

I knew from frequent visits to the friend supplying the A22 that although on display, the dial, knobs and the friction drive had been dismantled. On closer inspection the case and chassis were in good condition, the case near perfect, the back fair.

My friend had obtained some years ago a replacement dial. Many will know the originals often loose their markings or become damaged. In this case the markings, station names, etc., were almost non-existent! My friend had done some work on it, he had replaced most of the coupling and decoupling capacitors. At this point I assumed that the dial components excluding the knobs (my friend had said he had mislaid them) were at hand.

A modest sum of £50 was agreed and a few days later I collected the radio. My friend had put the A22 in a large, strong bag. The dial components were in a second bag. Everything was in there he said. On the bench I opened the bags. In the second bag the new and old dial were there plus a photocopy of the new dial but no centre bezel/speaker cloth or friction drive and pulleys!

I pondered over the situation during the weekend. Five major items were missing. I told my 'buying' friend the situation, we had all agreed that I could find three suitable knobs, my 'selling' friend was making a search. If in the future I got the originals I would simply exchange them. The other items were not going to be so easy!

Figure 7

Figure 2

My proposed solution was two-fold. I would look into making the missing items if successful my buying friend would have the radio. If otherwise I would do the best I could with the replacements and keep it. At the modest price I was pretty sure the case alone was worth it. At this point I had not fired-up the A22. As my buying friend was interested in the testing procedure he came along to witness it. See figures 1 and 2 for the A22 as found.

The first step was to check the 13 amp plug. The fuse was rated at 2 amps, a good omen! The next test was L-N continuity to check the primary winding of the mains transformer. The set has an isolating transformer in a standard circuit. This also tests the on-off switch, which was working. The primary winding measurement was approximately 50Ω, the trader sheets says 50Ω, so far so good! Tests for insulation, using my megger, gave infinity between L/N and earth. And I checked for continuity to the chassis/plug earth lead.

Time to apply AC mains

I have an adjustable AC supply, it was made by Advance many years ago, it isolates the load from the supply and allows an applied voltage from near zero to about 300V. The dial lamp arm was moved out of harms way. I've never had second thoughts about the pros and cons of adjustable applied voltages. It can quickly show up a problem which otherwise could be damaging or dangerous.

We plugged in my long-wire aerial from the garden, the radio to my AC rig, switched on and observed the AC volts level. As my 'selling' friend had said that the set worked I did not bother to check the valves. At around 60 volts the dial lamp began to glow, at about 150 volts some crackles as the wave change switch was operated. Then at 200 volts after operating the tuning shaft stations were received. We did all this over a reasonable length of time. With the fully supply volts there was good quality sound, no hum and no apparent faults. I've subsequently run the set for longer periods.

So, at this point I was contemplating making the centre bezel and speaker cloth holder. As far as the friction drive, and pulleys were concerned, I was pretty sure I could find suitable replacements.

During the next couple of days I found possible drive-cord pulleys and a friction drive. The bezel I could machine out of a 1/4" thick sheet of brown plastic on my lathes faceplate. This would be a 6 1/2" diameter ring, something I've done before. I spoke to Mike Barker at a recent Harpenden, he was very helpful as I'm not familiar with this model. He confirmed my observations from the BVWS CD Trader sheet No 768 concerning the dial assembly fixing. As previously mentioned, I found a number of pulleys and a friction drive to possibly use.

I am aware that the tuning capacitor swing of 180° must be increased to a dial swing of 270°. This is where the photocopy of the new dial was useful, I was able to measure its swing with a protractor and using the illustrations from the trader sheet, I was able to predict the sizes of the pulleys. I calculated an increase of rotation of 0.375%, two of my pulleys gave 0.436, a 4% difference. I experimented with the two pulleys, see figures 3 and 4, by coupling them by a rubber band. A plastic rod acting as a pointer and the pulleys freely turning on the shafts.

I found that the friction drive pulley doesn't go back far enough on the shaft, the outer edge fouls the two mounts of the tuning capacitor front bracket! However, I quickly realised I could reduce the length of the anti-vibration mounts.

Just before my thoughts were becoming set towards making a bezel, my 'selling' friend found the bezel and loudspeaker cloth mounting as expected, the mounting had a 'spider' construction which will locate on the centre fixed shaft in front of the loudspeaker.

Deep Joy! See figure 5.

The speaker cloth was in good condition, and taut. The bezel had some surface staining, I cleaned it later. The bezel has five inserts threaded with 8 BA thread. The five threads match five holes in the loudspeaker cloth mounting and dial holes.

I decided to continue with my plan of using the two dial cord pulleys and the friction drive. My 'selling' friend is still searching for the originals. I can replace them without too much trouble, if found in time.

Figure 1

Time to remove the chassis

This is relatively easy. It is held in by four screws, one was missing, to the front of the case. The loudspeaker is bolted to the back of the vertical part of the chassis. Also missing was the bulb access hatch cover. As mentioned, my friend had replaced the waxed paper capacitors leaving them in place by one connection. Putting new ones inside the rim of the circular chassis, I removed them. The wiring was in fair condition, a couple of lengths will be replaced. The loudspeaker frame has some surface rust, I'll treat this with Jenolite and paint.

Time to assemble the new dial and bezel mount and install the cord drive/ cursor arm. Without these things tuning checks would be well nigh impossible.

Dial/Speaker Cloth/Bezel Unit

These were easy to assemble, the new dial needed careful trimming around the centre hole. The bezel is a ring of brown coloured pressed metal with the five short lengths of brass rod, wedged into the channel formed. One side of the channel is higher than the other, this centred the dial. The five holes were not punched through on the dial, I did these with a GK multi-punch. Five 8BA cheese-head screws completed the assembly. The three holes for tuning, wave change and volume controls were cut.

Cord Drive/Cursor assembly

As mentioned earlier, I knew I had the makings of a successful assembly. However, it was not easy! Aligning the drive wheel pulleys simply by eye showed that the friction drive pulley had to be as far back as possible on the tuning shaft.

The sharp-eyed will notice that in figures 3 and 4 there are no locking screws visible, they are on the other side, virtually impossible to get at! Also in the finally installed assembly, the cursor wheel pulley had to be reversed to match the lower wheel. My solution was to cut back the anti-vibration capacitor mounts and make a new centre piece for the friction drive pulley. See figure 6.

To make sure the new centrepiece of the drive wheel ran true, I used a short length of 1/4" shaft clamped by original screws and protruding about an inch on the plain side. I turned a short length of 5/8" diameter brass on the lathe with a small internal recess to accommodate the pressed-over end of the original centre. After careful cleaning and tinning of the pulley, it soldered well, as did the new piece. I clamped the other end of the 1/4" shaft between two pieces of wood and dropped the new centre on. Prior to this, I had drilled and tapped two 4BA holes in the new centre.

Using my large one-inch bit soldering iron, £1.50 from a local Scout club sale about thirty years ago, I sweated the assembly together. In use, the cursor wheel pulley must be free to turn on the 3/8" section of the fixed shaft, protruding from a bracket in front of the loudspeaker. This shaft also has a 1/4" section with a flat to locate the dial/bezel assembly. Figures 3 and 4 show the pulley turning on the ¼" section for the early test. The pulley had to be reversed for the proper operation of the cursor arm.

The ¼ inch hole in the pulley had to be bored out to 3/8". Measuring the amount of

Figures 3 and 4

metal, brass, surrounding the hole showed that I would almost certainly break through the tin 'wall', allowed for the original press fixing. I had to reinforce the centre.

To do this I turned up a 3/8" length of 5/8" diameter brass to act as a collar around the centre. The hole in the collar was carefully matched to the centre. I then sweated the two together. Two short fixing screws were fitted onto the pulley, see figure 6, to locate the cursor arm. As the cursor arm had to fit flat against the pulley, I soldered the heads of the screws onto the inner face of the pulley.

The trader sheet gave details of the dial cord, 30 3/8" length and the assembling details. I had to mount the friction drive shaft assembly, with the two new fixing holes, below the tuning shaft. The original would have been fixed by two screws above the shaft. After unscrewing these two screws the whole assembly would have come away. You were then instructed to fit the cord with both pulleys on the bench. This would have been nearly impossible with my non-standard items, I would have to hold everything together, the friction drive/pulley had to be fitted together, before re-stringing.

My sequence of assembly meant that I fitted the cursor pulley, checked alignment, added washers behind the pulley to take up the space, then made a collar board to 1/4" to hold the pulley in place. Figure number 6 shows the collar with a 4BA locking screw onto the flat of the 1/4" section.

My first try with the dial cord showed that it needed to be a bit longer. I re-fitted it with success. The stringing was straight forward but very fiddley, especially the springs. I then fixed the cursor arm. I now had a successful dial/cursor arm drive assembly. I pushed on the dial/speaker cloth/bezel unit, the screw on the centre spider is accessed via a cut-out in the chassis outer ring. Checking rotation showed that I had forgotten to fully tighten one of the 8BA fixing screws!

I found three knobs which didn't look out of place. I made the missing cursor lamp inspection hatch, polished the case with a Bakelite paste, trimmed the IF's and aligned the circuit. The two elongated holes on the cursor arm allowed a small adjustment to the rotation. The IF filter core was partly broken, I left it alone.

The chassis was returned to the cabinet and a final polish of deep tan boot polish applied. I find boot polish gives a lasting shine, and also fills any small surface marks. See figure 7 for the finished result.

I found this a very enjoyable refurbish. Two good friends were happy and I had achieved a good result to an otherwise sad looking radio.

Figure 5

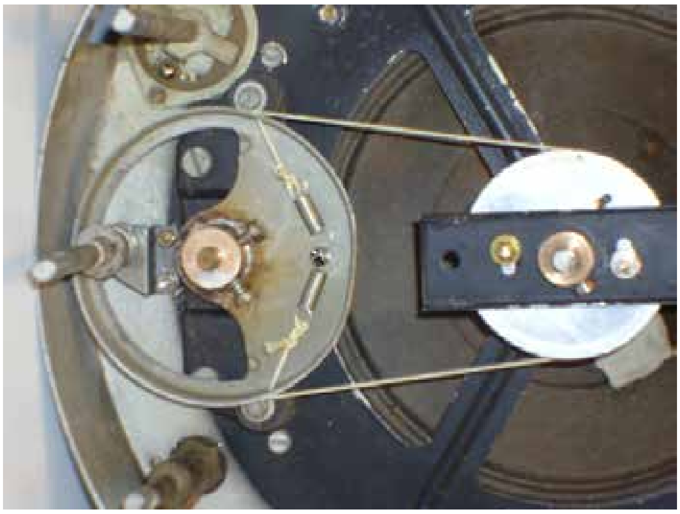


Figure 6

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AK 308 back on the bench

Gary Tempest

The restoration of this radio was described in an article back in Spring 2015. It was a pleasing outcome and the radio has worked well since. However, at the time, as well as adding metal clad dropper resistors to reduce the high mains input voltage, I also reduced the output tube currents. This was in order to prevent the mains transformer running at a high temperature. The old maxim applied: if you can't hold onto it, it's 50 C or more and too hot; for me anyway. The downside of doing that was although there was adequate volume it required the control being turned a long way up. This was going to seem odd to someone in the future and had come to irritate me as well.

Another reason for getting the chassis on the bench again was that the dial pilot lamp had blown and I couldn't see how to change it.

What causes transformer heating with or without secondary load?

A good read is given in Reference 1 for the no load case. Basically, it says for a practical transformer the losses will be the input current passing through the primary winding resistance, the iron losses and that from leakage flux. The iron losses are from the magnetizing flux causing eddy currents to flow in the transformer laminations. This of course is why they are treated with an insulating coating on one side to reduce this. The leakage flux is that flux , that doesn't aid the main flux linking the primary and secondary windings, effectively a loss of efficiency, which causes the input current to be greater than if there were none.

It set me thinking how many watts did the transformer consume on no load and how did it compare to a transformer on a 7 tube Zenith chassis that barely gets warm.

AK and Zenith Transformers on no load

The easiest way for measurements was to remove all the tubes (although I did leave the pilot lamps in place) and use a bench plug In Energy Monitor. In measurements against my True RMS meter I have found it to be reasonably accurate and certainly good enough for comparison purpose.

The AK gave 9W (17VA) against 3W (7VA) for the Zenith. This has a transformer that is about 50% bigger so it is likely to be wound with more turns per volt, so greater inductance, and have a larger wire gauge reducing loss due to primary current.

I asked Peter Lankshear what he thought of this result and here with some editing is what he said:

"I was surprised to note the no load readings of the A-K; definitely a lack of inductance there. The transformer hasn't a shorted turn. A shorted turn soon shorts another turn and within minutes you have a runaway situation.

When I first retired I had a steady stream of radios to service and got to see quite a number of American sets. Most ran hotter than I would have felt comfortable with but although there was (or had previously been) an occasional transformer burn out most seemed to have survived. I quite regularly rewound transformers. Wherever possible I squeezed in an extra turn per volt on the rewind that invariably gave cooler running.

I think there are several factors here; possibly the most important being that the designers assumed that export sets would have to operate at 220 volts, not 230-240. It was easy just to double the turns and reduce the wire gauge of the 110 primaries they were used to.

Then they probably wouldn't be too worried about the lower mains frequency either. In the expected working life of the set there was a fair chance the transformer would survive.

The long term operation / heating of transformers is complex. Thermal delay means that final operating temperature is reached only after some time. But the internal winding temperature can rise more rapidly. This means that the transformer is stressed long before the outside temperature reaches its equilibrium. I recall reading somewhere that enamel insulation is satisfactory up to 100 degrees C. Modern enamels are even better. It's a given that the winding temperature will be warmer than the core".

I have noticed when looking at German radios of this era, some quote 110 / 220 V. As to transformer heating, and measuring the case, it's noticeable that it just continues to rise the longer the radio is left on. I suppose it must flatten off eventually but I wasn't prepared to wait for that. For me half an hour's playing time is enough and I will add a tie on label to the set that it shouldn't be played for longer

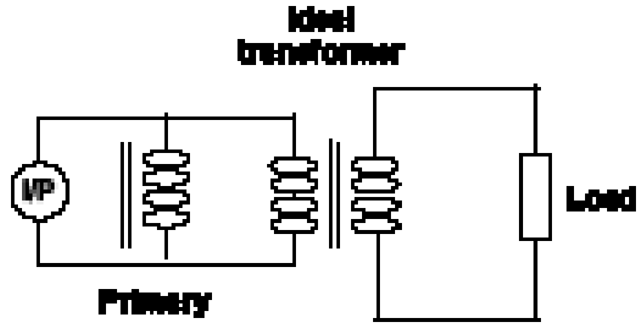

Fig 1. Simple transformer model

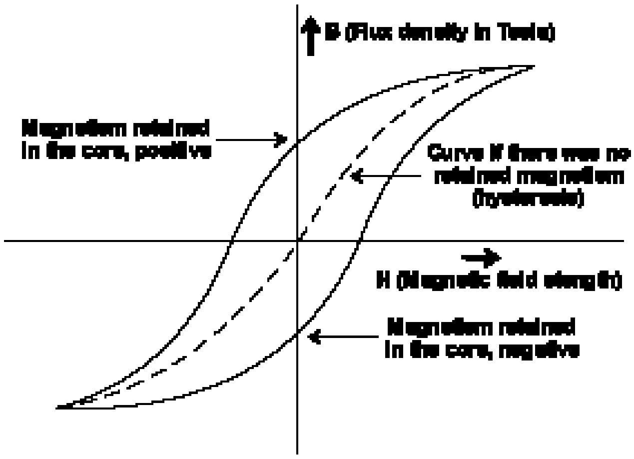

Fig 2. Simplified BH curve for the transformer

than one hour as the mains transformer could be in jeopardy. It can be seen that a lot of heat is stored as it takes several hours for the transformer case to return to ambient.

Transformer on load and at a different supply frequency

Another excellent read is given in Reference 2. This article shows the useful idea of the transformer being considered as a shunt inductor for the primary magnetizing current, followed by an 'ideal transformer' for the actual secondary loads, see Fig. 1.

For this, the secondary load currents flow in the primary and secondary, of the ideal transformer, but in opposite sense so do not add to the excitation current of the transformer.

The current that provides the flux to make the transformer function is that taken by the shunt inductor and is proportional to the supply voltage and inversely proportional to the frequency due to the changing reactance. Accordingly, a transformer designed for 60 Hz should ideally only be supplied with 50/60 times the voltage according to Ref. 2. Here the author is citing the worst case of the transformer core being so saturated with flux that its inductance collapses to that it would have with an air core. This of course would be catastrophic causing a destructive primary current to flow. Obviously the designer of the AK transformer couldn't allow this to happen even if the design and materials used were less than ideal.

Why does the transformer saturate?

There are two more References, 3 and 4, that are worth looking at.

These show that graphs can be made of Flux Density B (in units of Teslas) against Magnetic Field Strength H. This latter is the summation of the number of primary turns, the current flowing through them and the material used for the core laminations. Change any one of them and B, the lines of flux flowing in the core will also change. For plotting a particular curve the easiest thing to increase is the current.

The so called B H curves are interesting as they show the effect of hysteresis or lag caused by some magnetism being retained by the core. If it wasn't for this effect the graph would be a straight line with the flux density increasing to its maximum before going horizontal when no more magnetic domains in the core material can be aligned. Then with the reversal of current all the domains would be arranged back to a random state before being aligned in the opposite direction. I have this mental picture of millions of tiny bar magnets all turning to and fro. It is the fact that not all the 'magnets' go back to random that causes the shape of the B H curve, see Fig 2.

Work done

The first thing was to put the output tubes cathode resistors back to the original values but what to do to try to make the transformer run cooler? Three solutions: raise the mains dropping resistors; replace the 80 rectifier with a solid state one using semiconductor diodes or both. These all save on power drawn which unfortunately, when we think back to our student days, does not work out to power dissipated in the transformer. With these being greater than 90% efficient the 10W saved from not having the 80 tube heater (5V at 2A) could be only 1W of internal heating of the transformer but maybe every little helps? Anyway, I made a neat solid state rectifier using an old tube base and a scrap IF can. Going to this trouble, rather than patching in with crocodile clips, did make comparison temperature measurements easier.

Solid state rectifier replacement

There are lot of entries for this on the internet if a search is made. Many use just diodes with the 1N4007 being popular but it's best to include dropper resistors otherwise the HT will be too high.

This radio is full wave with a centre tapped transformer as usual. In each anode feed I used 470 Ohm resistors and two diodes in series as apparently the failure mode of the diodes is usually short circuit. Two would stand a better chance of a disastrous condition occurring, although of course you wouldn't know about the one that failed! Actually, two are needed as the diode PIV (Peak Inverse Voltage) doesn't give a lot of head room when some simple calculations are made. Each half of the transformer supplies about 300V and it will charge, at first switch on, the electrolytic capacitors to almost the peak voltage of 1.41 times which equals 423V. So on opposite phases of the supply the diodes will get a PIV of 846V. They are rated at 1000V at 1A which is impressive for such a tiny device. For interest the 80 rectifier has a PIV of 1400V.

It's worth noting the plural when mentioning the electrolytics as the diodes will supply full voltage instantly and with no load, until the rest of the tubes warm up, that includes the smoothing capacitor often chosen with a lower

SS rectifier components

SS rectifier, prepared can

SS rectiifer glued and screwed

voltage specification. Fortunately I had used BVWS capacitors rated at 500V for both.

The 470 Ohm resistors were chosen to give the same HT voltage as when using the 80 tube.

Many on the internet advised balancing resistors across the series diodes but it was pointed out suitable sized resistors wouldn't have a high enough voltage rating. Another poster said they weren't necessary as when one diode started to avalanche (effectively breaking down) the other would do so immediately as well. But if you look up Avalanche Diodes this is what can be found:

"An avalanche diode is a diode that is designed to break down and conduct at a specified reverse bias voltage. This is somewhat similar, but not identical to Zener breakdown. When avalanche occurs in a typical diode or other semiconductor, it generally causes catastrophic failure."

So to me it seems best to forget the resistors and use two diodes of high PIV. Do their ratings actually add? A Forum view was that probably not and a sensible rating would be 1.5 times that of one.

Another common thinking was that capacitors (probably ceramic) should be used across each diode. But to work best they should have a series resistor (again what about voltage rating) and so become a "snubber network". This was said to damp out transient ringing with the transformer secondary inductance when the diodes rapidly turn off. It would be difficult in most situations to fit all these components inside a dummy tube, made as a plug in replacement and more components could just mean more to fail.

Lowering the transformer input voltage further

This was an easy thing to do as I had used 47 Ohm resistors in each supply leg giving an input of 216V from the typical supply of 245V. It was no problem to obtain 68 Ohm of the same make and mounting and this reduced the input to 205V but still left the tube heaters only 4% low.

Measurements (from 23 C)

Radio with 47 Ohms in each mains input leg (83W)

Temperature of the transformer case in 30 mins: 42 C and after 60 mins 51 C.

Radio with 68 Ohms in each mains input leg (78W)

Temperature of the transformer case in 30 mins: 39 C and after 60 mins 48 C.

Radio with 68 Ohms in each mains input leg and Solid State Rectifier (74W)

Temperature of the transformer case in 30 mins: 36 C and after 60 mins 45 C.

Conclusions

An interesting exercise and the best option, for me, was to fit the 68 Ohm resistors, and leave the radio original with the 80 rectifier, but suggest a maximum limit on playing time of 1 hour.

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Simple Amplitude Modulator

Andy Palmer

An article in the Summer 2017 issue of the BVWS Bulletin ('FM to AM Radio Converter') inspired me to look again at building a simple amplitude modulator for use with vintage AM radios. I hastily lashed up the modulator section of the converter circuit in the article. However, my (brief!) tests indicated that it had similar idiosyncrasies to those which had frustrated my own attempts several years ago to build a simple 'modulated oscillator' device. Perhaps the time had come to have another go at it myself as I was older and supposedly wiser, well definitely older anyway!

Background

As a schoolboy in the late 1960s I had built my first transmitter (well it was only 'first' if you exclude the spurious signals radiated a year or two earlier by a single valve receiver based upon a DF91 / 1T4 / W17 valve with the reaction adjusted so that it would oscillate and resolve Amateur SSB transmissions on 160m and 80m!). The word 'transmitter' sounds rather grand but in this case it wasn't grand at all because it simply consisted of my one and only precious OC44 germanium 'RF' transistor (Colpitts oscillator configuration) modulated by an OC71 'AF' transistor.

That simple AM transmitter taught me quite a bit about FM! When the oscillator was modulated (by shouting into the Acos crystal mic.) it produced just as much FM as AM, possibly more. It's feeble transmission was best resolved by 'slope detection', i.e. by tuning off centre and using one or other of the two sides of the IF filter response of an AM receiver to create amplitude variations from the FM signal.

Over the years I built a couple of similar devices but, unsurprisingly, with similar problems. Modulating an oscillator is bound to cause some FM and most oscillators don't take kindly to having their bias voltages hurled up and down as is necessary to achieve undistorted 100% modulation. I found similar characteristics with the modulator in the Converter article, i.e. it showed several kHz of FM and oscillation would cease abruptly when driven over 50% modulation. To be fair I had taken liberties with my test lash up on an ancient component plug-in development board which is donkey's years old and I know the socket contacts have seen better days. It's not really the sort of thing to use for RF circuits but I was impatient!

So, I thought I might have another go at something similar. I wasn't going to bother with the clever bit of the converter, i.e. the PIC talking to the digitally controlled FM receiver module – I'll leave that to those wicked sorcerers who understand the mysteries of PIC microcontrollers. I was just interested in building a simple modulated oscillator with decent modulation quality that could be connected to the 'A' and 'E' sockets of a vintage radio and fed from whatever audio source was available, e.g. FM / DAB radio, MP3 player etc. It had to exhibit minimal FM and maintain reasonably low distortion up to around 80% mod.

Design

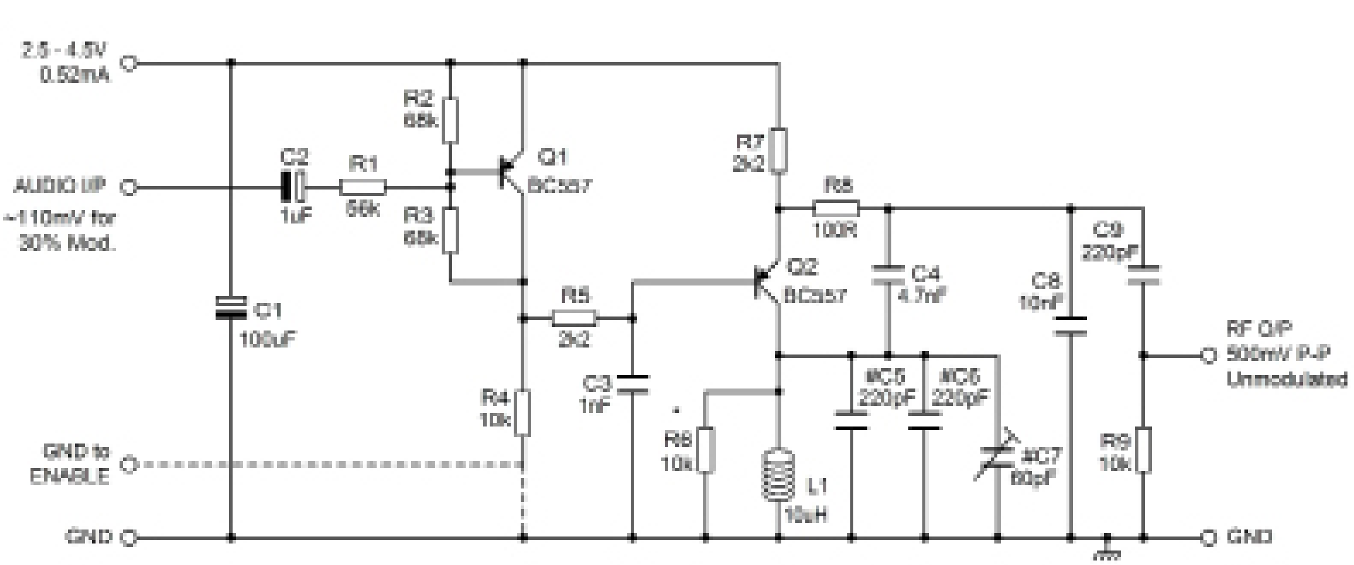
Where to start with the design? Well, as a Radio Amateur I have bought several radio reference books over the years and one of my favourites is 'Experimental Methods in RF Design' published by the ARRL (American Radio Relay League). Chapter 4 discusses oscillators and the circuit of a 7MHz (40m Amateur band) Colpitts oscillator caught my eye (Figure 4.10 in my copy). The design employed a 'low L, high C' strategy to keep the influence of the active device, a bipolar transistor, as small as possible on the tuned circuit. It also employed an 'emitter degeneration' resistor to further isolate the resonant circuit from the transistor. The text makes the point that the transistor needs to be kept out of saturation when the collector-emitter voltage is at its lowest point of each cycle so it must be operated at a fairly low current. The circuit definitely looked worth a try.

The next port of call was the junk box to see what I might have in the way of 'L' and 'C' to produce similar reactances to those in the 7MHz oscillator but scaled to operate somewhere in the MW band. A rather nice little green-bodied 10uH inductor looked like it might be a good starting point. It would have been scavenged many years ago from the rotting corpse of a dead VCR or telly so the

Sht. 1 of 1

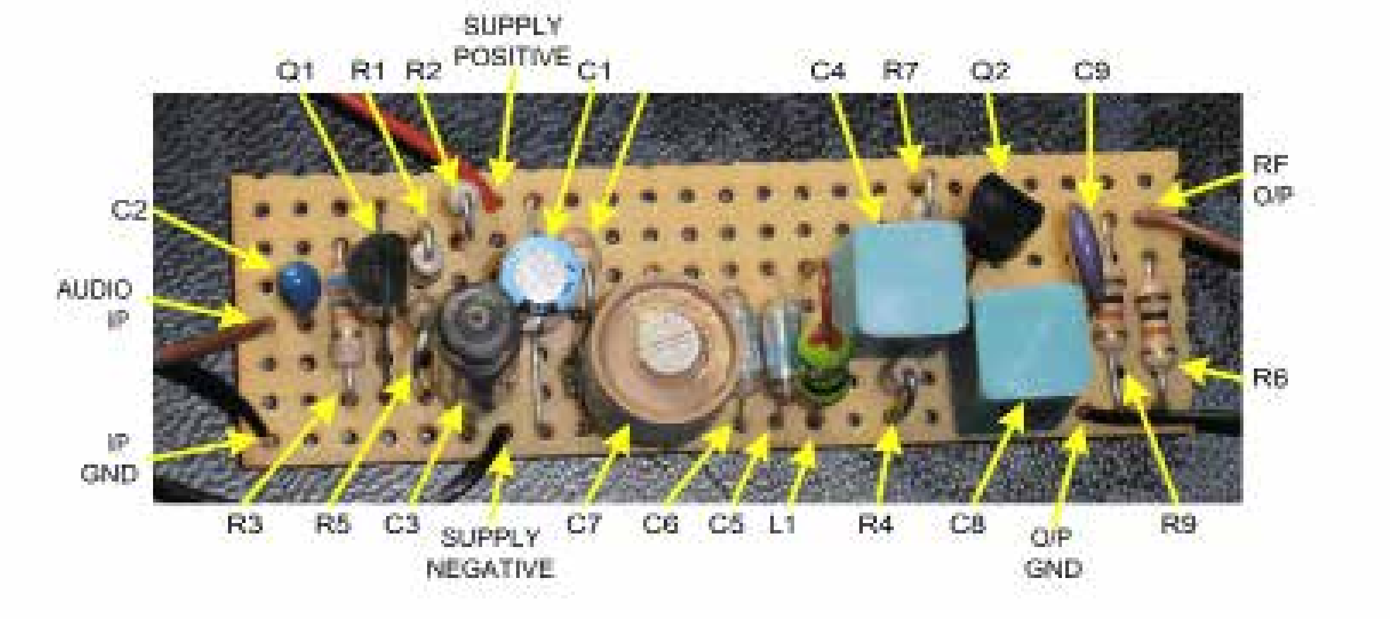
AM MODULATOR

AMP 31/07/17
Rev. 3



*R6: Select on test for 500mV P-P O/P unmodulated (depends on 'Q' of L1)
#C5, C6 and C7 are selected to trim the frequency. The values shown are for 846kHz.
Ideally L1, C4 and C8 should be high 'Q' / low loss components.

L1: Murata 22R103C, 10uH +/-10%, Q 65 at 1MHz, DC Resistance 0.05R
(some suppliers; Rapid Electronics Ltd, code 85-1600, RS code 633-0616, Farnell code 1077049)



Tracks run lengthwise. Remember to cut tracks as necessary!

exact make and type is unknown. A quick test on my trusty Advance T1 Q Meter indicated that it had a healthy Q despite its small size. The Q meter also confirmed that it's inductance was indeed around 10uH as marked, i.e. brown, black, black and silver (10% tolerance?) bands on its shiny green body.

There were three identical 10uH inductors in the junk box so I checked all of them to establish their inductance and Q. I don't trust the ancient Q meter's 'Q' readings as I suspect it under reads Q a bit although it's still pretty good as regards its frequency calibration. I therefore set up a separate Q test. The idea was to directly measure the amplitude changes (i.e. -3dB points) as the frequency was varied either side of resonance.

I used the Q meter as the signal source but monitored the voltage across the coil under test with a scope via a 10M, 15pF probe. Tests were carried out at two frequencies; 2.3MHz and 1MHz. The reason for this is that the Q meter's inbuilt variable capacitor could just about resonate with 10uH near full capacity (550pF max.) at 2.3MHz so it would give a feel for the Q, but this wasn't ideal as I really needed to know the coil's Q somewhere in the middle of the MW band, say 1MHz. For the 1MHz tests I added a low loss 2200pF polystyrene Suflex capacitor to the Q meter to achieve resonance. Frequencies were measured with a nearby synthesised receiver operating in SSB mode and tuning in 100Hz steps to obtain 'zero beat'.

Out of curiosity I also experimented with a larger home made coil wound on every Radio Amateur's default coil former, i.e. a cardboard loo roll! This coil consisted of 13 turns of 16 x 0.2 PVC insulated equipment wire close wound on a 50mm diameter tube. I calculated its inductance to be 9.944uH and when it was actually built and measured I obtained a reading of 9.6uH at 1MHz which, as they say, was "close enough for Government work" (wherever did that expression come from?!).

The test results are shown in Table 1

I also have a few large-ish value polystyrene capacitors with good RF characteristics. A few minutes with a calculator indicated that some combination in the 5000 to 10000pF range would get me in the region of 846kHz which is where I proposed to end up. That frequency is fairly clear in my neck of the woods (north Hampshire) apart from the inevitable wandering sprogs from poorly filtered switch mode power supplies.

After quite a bit of experimentation and learning how important it is to keep contact resistance as low as possible in a high Q circuit, and finding out just how poor my grotty old plug-in development board is in that respect, I finally ended up with something that seemed to be worth committing to Vero board (generically known as 'strip board').

Circuit Description

I wanted to keep the RF ground at the negative rail so that no supply decoupling capacitors needed to be connected in series with resonant circuit components. This meant opting for the PNP transistor configuration of Fig. 4.10 in the ARRL book. I have two bags each containing 500 BC557 PNP transistors so guess what type of transistor I chose to use! However just to reassure myself that the BC557 didn't possess any magical properties I have tested the circuit with several similar low power silicon PNP devices from the junk box, viz. BC558, BC307, BC251, BC214L, BC154, BC257, 2N4403, BC212, 2N4058. I even persuaded an ancient OC202 to oscillate but it wasn't particularly enthusiastic after being roused from its 50 year slumber so I quietly put it back to bed in the junk box. Maybe its day will come eventually...

From the circuit it will be seen that Q2 is configured as a Colpitts oscillator with feedback provided by a capacitive tap (C4 and C8) on the tuned circuit. The 100R resistor from the emitter of Q2 to the junction of C4 and C8 limits the current pulses from Q2 into the tuned circuit and so helps to maintain a decent looking RF sine wave. Capacitors C5, C6 and C7 allow fine tuning so that the signal lands on 846kHz. The signal is tapped off to the outside world via C9 which provides DC isolation. The value of C9 is small in comparison to C4 and C8 so external loading has minimal effect on the frequency of operation.

The purpose of R6 is to slightly damp the inductor so that the level of oscillation is more predictable. With higher Q examples of L1, R6 may have to be reduced in value to maintain the 500mV peak to peak unmodulated output level. Vice versa, R6

Inductor	2.3MHz Tests			1MHz Tests		
	-3dB LF (MHz)	-3dB HF (MHz)	Q	-3dB LF (MHz)	-3dB HF (MHz)	Q
1	2.289400	2.315000	90	0.993700	1.008700	66.7
2	2.287500	2.316000	80	0.993600	1.008600	66.7
3	2.288100	2.316000	82	0.994100	1.009300	65.8
13 Turn 'Loo Roll'	N/A	N/A	N/A	0.995300	1.005000	103

Table 1

Computer Predicted Characteristics of Some 10uH Square Loops Wound with 16 x 0.2mm PVC Insulated Equipment Wire			
Length of Each Side	Turns	Q	Efficiency Rel. to ¼ Wave Vertical
1660mm	1	77	-47dB
540mm	2	88	-60dB
294mm	3	97	-66dB
195mm	4	103	-71dB
144mm	5	107	-74dB

Table 2

will need to increase if L1 is lower in Q of course. For example, with the 50mm 13 turn Loo Roll coil I found that R6 needed to be reduced to 6.8k. If the unmodulated RF output level changes too much the level of audio and DC bias required to produce a certain percentage of modulation also changes. I used a 50MHz scope with x10 probe (10M, 15pF) to measure the RF output across R9 but a 10MHz scope with a similar probe should give acceptable results. I'm sure I don't need to tell you that the frequency response compensation capacitor of the x10 probe must be carefully adjusted with the scope's calibration square wave so that it matches the input capacitance of the scope before doing any high frequency measurements, do I!

C3 provides an RF ground for base of Q2 so that it can 'see' a base-emitter input signal when its emitter is waggled up and down by the tap on the tuned circuit. Am I being too technical?!

Q1 is an audio amplifier but it also has a second and more important role as it's directly connected to the base of Q2 via R5. With only a nominal 3V DC supply available the biasing of Q2 is quite critical if non-symmetrical clipping at high modulation levels is to be avoided. Q1 is connected as a 'Vbe multiplier' such that the voltage from collector to emitter is determined by the ratio of R2 and R3 and its base-emitter junction voltage. With R2 and R3 equal value the collector to emitter voltage is twice the base-emitter voltage. The exact potential varies with temperature and current through the transistor but at around 20 degrees C a collector-emitter voltage of about 1.25V, and hence negative bias to Q2, is to be expected.

C2 simply provides DC blocking and AF coupling for the audio input signal. The value of R1 has been chosen to provide an input sensitivity of 110mV RMS for 30% modulation. This value has been selected as a general purpose compromise and also to match the nominal output level of the RDA5870P FM radio receiver chip (as used in the BVWS 'FM to AM Radio Converter') when presented with an FM signal at 30% of the peak deviation, i.e. 22.5kHz which is 30% of 75kHz. The value of R1 can be altered to suit other applications as necessary.

If the modulator is to be used 'stand alone' then the bottom end of R4 should simply be connected to the negative rail. However, if this unit is used in conjunction with the BVWS 'FM to AM Radio Converter' then the bottom end of R4 can be connected to the 'AM_DISABLE' line, pin 5 of U1.

Construction:

The modulator was built on a scrap of strip board that happened to be laying around. The tracks run lengthwise along the board. A larger bit of board would have made the job less fiddly so don't bother slavishly copying my layout unless you enjoy a challenge!

Layout is not particularly critical but ideally the ground connections of the tuned circuit (L1, C4, C5 , C6, C7 and C8) should be short and grouped together.

The tolerance of the inductor and the larger capacitors (C4 and C8) will probably be about 10% so you will need to experiment with the values required for the 'trimming' capacitors (C5, C6 and C7) if you are aiming for a particular frequency. I suggest building the unit without C5 and C6 initially and then selecting values for them which put you on a clear frequency in your location.

Testing:

To test the modulator first check the voltage at the collector of Q1 (base bias for Q2). At a supply of 3V you should find about 1.25V between the collector of Q1 and the Positive supply rail. It will vary with temperature and different examples of Q1 but should be within around +/-50mV or so of 1.25V at room temperature. The supply current should be about 0.5mA (I measured 0.52mA).

Use a MW transistor radio (or valve portable!) placed within a foot or so of the unit to check that the modulator is producing a carrier. Select the values of C5 and C6 to tune roughly to your desired frequency and then fine tune with C7.

Use a scope with a x10 probe (frequency compensation capacitor correctly adjusted of course!) to check the unmodulated RF output level across R9. If necessary adjust the value of R6 to achieve 500mV peak to peak. This is not super critical so don't worry if you can't get it spot on. Wind up the speed of the scope timebase to 1us per division or faster and check that there is a clean looking RF sine wave.

Next apply a 1kHz test tone to the audio input and monitor the modulated RF output waveform with the scope. At 50% modulation (about 183mV RMS audio input and 750mV peak to peak RF output) the modulation 'envelope' should look undistorted and sinusoidal. As the audio level is increased to give around 80 or 90% modulation, distortion will start to appear but check that the peaks and troughs are similarly affected.

What, I hear you say “it's all very well him glibly going on about simply applying a test tone from a signal generator, but I don't actually have one”! Well an alternative source of test audio could be taken from a computer (or even a mobile phone) by using one of the free programs that employ the computer's sound card to act as a signal generator. However, you don't even need to download and install an 'app' because there is a Web site that will do it for you called onlinetonegenerator.com , and no doubt there are several other sites with similar generators.

Operation:

Most of the audio signal sources that will be used to drive the modulator will probably be stereo or at least have 'right' and 'left' channel outputs. It's a simple matter to sum these together via a pair of 10k resistors before connecting them to the audio input of the modulator, i.e. C2.

Connect the RF output of the modulator directly to the 'A' and 'E' terminals of your radio and tune the radio to its signal.

Adjust the audio input level from your audio source for a nominal modulation depth of around 30% (about 110mV RMS input with R1 at 56k). When modulation is present there should be only one tuning point at the centre of the carrier on the receiving radio. With such a simple device there's bound to be some residual FM but it should not be significant.

If the signal sounds distorted either it's over modulated or it is possible that the radio's AGC cannot cope with the relatively high RF signal level from the modulator. Try reducing the RF coupling by connecting a small value capacitor, say 50pF, in series with the aerial socket. Another way is to create a 'gimmick' capacitor by wrapping a few turns of wire from the modulator output around the radio's aerial lead over a length of about six inches. Some experimentation is required.

If you are using this unit in conjunction with a radio having an internal ferrite rod or frame antenna then you may find that sufficient stray signal will be available within about a foot. The modulator is not intended as a radiating transmitter as such but a few feet of wire connected to the RF output terminal will extend the distance of operation slightly. Alternatively, replace the small 10uH inductor with the 13 turn Loo Roll coil as this will radiate a few feet.

If the modulator will be used predominantly with ferrite rod or frame aerial radios it's worth considering replacing L1 with a larger 10uH loop. A few turns of wire wound on a Corn Flakes packet is worth a try as a starting point! However in table 2 I have included a few options of 10uH loop antennas and calculated different combinations of size and number of turns. You don't get something for nothing with antennas and size does matter, particularly at low frequencies, so you will see that the large single turn loop is calculated to be 27dB better than the smallest five turn loop. I must acknowledge huge thanks to Reg. G4FGQ, now sadly 'silent key', who wrote so many useful programs for calculating just about anything to do with radio http://www.zerobeat.net/G4FGQ/ . These are all DOS programs but they run happily in Windows 7 and 10 via the DOSBox 'front end' freeware. 'RJELOOP3' was used to calculate the loops shown in Table 2.

Epilogue

The goal was to build a simple no frills modulator that produced a low level signal for direct connection to a vintage radio. Care has been taken to minimise distortion and unwanted frequency modulation whilst maintaining a low parts count and employing easily obtainable 'junk box' components. Obviously it cannot be classed as HiFi but when tested in conjunction with real vintage radios and real ears the results are quite pleasing, well to the author anyway!

The design process has been described in some detail in the hope that it will enable others to build, modify or adapt the basic design to their own requirements.

The MW and LW bands are steadily falling silent as they are being deserted by many broadcasters. With the possible exception of some remaining BBC services, and not forgetting RTE on 252kHz LW in Ireland of course (but its power has been turned down and I suspect its days are numbered), much of the current off-air MW and LW content is probably of limited appeal to many vintage radio collectors and restorers. Many of these transmissions also suffer interference from just about every modern appliance that plugs into a wall socket.

A decent DAB+ radio, given a decent signal so that it doesn't sound like it's 'gargling'(!), can provide a wide range of listening choice. This type of diabolical digital 'modern-fangled' audio source, in combination with a modulator and a vintage radio, can provide endless entertainment.

Hopefully the addition of this modulator will turn some currently neglected and dusty display items into useful glowing sources of entertainment for many years to come, just like their designers and builders intended possibly around 80 or more years ago

Made in Japan

Mike Barker

A few years ago, I received a letter with enclosed photos of a plain looking wooden radio. At first glance it looked like a small American early 1930s radio of the cheap manufacture. The size of the knobs compared to the overall cabinet height and width gave a good perspective.

Figure 1 The radio before restoration.

The cabinet was dirty and with several areas of split, lifting or missing veneers and missing decorative details. There were also some internal photographs which showed it to be a very simple three valve set.

The letter explained that the radio had belonged to the owner's late father who had brought it back from Japan sometime in the late 1940's or early 1950's, he was not sure.

The owner was looking to have the radio restored to working order but was very specific that he did not want the radio made to look new. It was most important that only the necessary work was done to restore the complete and original look, but leaving all the signs of its age.

I agreed to take on the restoration and would be as sympathetic as possible so that some cabinet damage was repaired, any lifting veneers and broken sections were dealt with and to give it a good clean, but not touch in and hide the signs of ageing.

Once the radio was on the bench, many pictures were taken for reference and the chassis was removed. The internals had already received the paintbrush and hoover treatment by the owner and was quite clean. Again, everything was photographed for reference.

At some point this radio had received a severe shock. Perhaps the radio had been dropped as the heavier components like the mains transformer had caused the thin tin plate chassis to become badly deformed. I wondered how the valves had survived.

The internal speaker being a simple high resistance reed type showed a healthy continuity and gave the customary clicks when tested.

An initial look showed this to be a basic detector, output and rectifier type TRF.

The valves, all of American design were types 27A (detector), 12A (triode output) and 12B (half wave rectifier). These were tested and thankfully found to be in good serviceable condition. A fuse holder mounted on the back of the chassis and connected to the mains lead was found to have no insulation between the holder clips and its metal cover so this was in need of attention. The mains transformer was checked for insulation and winding continuity.

I found that the dial lamp was a 2.5 volt bulb and as the 27A has a 2.5 volt filament this was a convenient point to test from. With all valves removed I powered the transformer from a variac whilst monitoring for the 2.5 volts and this showed that the radio was actually intended for 110 volt mains. The real give away was the original American style mains plug, but I wanted to be sure. The other transformer windings were checked for voltage and a healthy HT and all other LT's were present. My attention now turned to the intervalve transformer which when tested showed the secondary winding to be open circuit. There were a number of replacement electrolytic capacitors dotted around under the chassis with several almost crumbling solder joints. I guessed that these

Figure 2 Unrestored chassis showing bent chassis.

Figure 3 Underside of unrestored chassis.


Figure 4 Chassis stripped ready for restoration.


Figure 5 Underside of intervalve transformer.


Figure 6 Capacitor block label.

Figure 7 Removed extra and dud components.

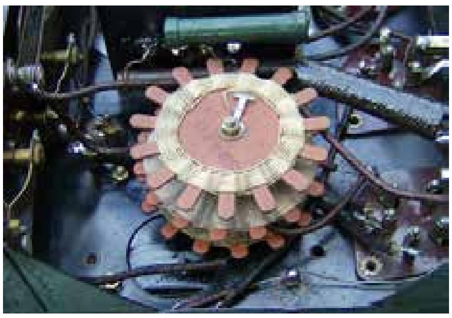


Figure 12 Aerial and reaction coils.


Figure 8 Reed type loudspeaker in cabinet.


Figure 9 Restored chassis, front view.


Figure 11 Underside of restored chassis.

were to add capacitance to a failing original capacitor block which was still in circuit.

At this point the cabinet was stripped of the speaker and decorative dial escutcheon. It was then handed over to John Sprange to do his usual cabinet restoration magic.

The next step was to trace out the circuit and identify all of the components and their values. Once this was complete, the metal chassis was stripped of all of the components so that the metalwork could be straightened and everything could be properly cleaned.

The original capacitor block was marked 6 MFD and the terminals labelled 2 2 1 1 so it was obvious and the block was rebuilt with Polypropylene 400 volt rated replacements of suitable values. This was confirmed by Yasuko Peskett who translated the label on the back of the block for me. A rewind of the intervalve transformer was the next job, but when removing the pitch filling of the metal case, I found that the four screw terminals were only held by a thin piece of card and the pitch itself. One of the terminals of the open circuit winding had suffered from the earlier mentioned mechanical shock and the fine connecting wire had detached.

This wire showed continuity to the other end of the winding so I decided to remove the rest of the pitch and make sure the other three connections were secure then make paxolin shims to replace the card, clean and re-solder all of the terminals and then refill the base of the transformer with fresh pitch.

The chassis was given a thorough clean with strong foam cleaner and a stiff brush and then bent back into the correct shape. No attempt to repaint or touch in any age related damage was made. The mains transformer had also lost some of its pitch filling so this was dealt with and a very thin piece of paxolin sheet cut to slip between the base of the transformer and the chassis for extra insulation.

Now it was time to re-assemble everything starting with the transformers. Everything was wired back into place and old reclaimed sleeving was used where the original was missing or disintegrating. Special attention was paid to the spacing of the aerial and reaction coils to place them back exactly where they had been found. A new cotton braided mains lead was made up and connected and the valves inserted. It was time to switch on.

The large outside aerial was used and the radio was again brought to life on the variac. Within seconds a low howling could be heard and with a quick adjustment of the reaction control faint background voices could be made out in the speaker. Tuning up and down the MW band with slight changes to the reaction found a few strong stations but the reaction was severe and unstable.

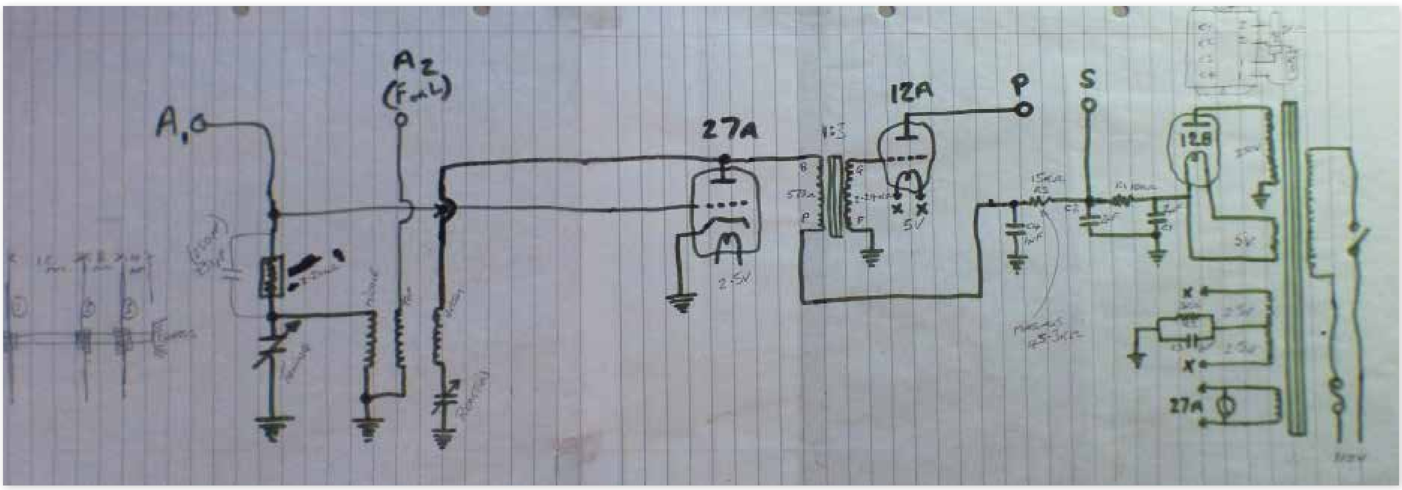
I found that by moving the reaction coil with a wooden prod away from the chassis and nearer to the aerial coil made a noticeable difference to the reaction range and also gave a little more gain. The coils were adjusted by trial and error until no better position could be found.

Although a very simple radio with a lo-fi reed speaker, the tuning was


Figure 13 Detail of radio back cover.

Figure 10 Restored chassis, back view.

Figure 14 The finished Receiver.



smooth and sound quality was quite acceptable for speech and music.

A signal generator and wire loop were used to establish that the radio only tuned down to about 225 Meters so perhaps there was nothing to hear in Japan any lower when this radio was made.

I made up a 240v to 110v unit containing an isolating transformer, fuse and the correct American two pin socket all housed in a plastic project box.

The chassis and speaker were reunited with the now splendid looking cabinet and the radio was given a good long soak test before being returned to its owner.

And now for something completely different...

Fons Vanden Berghen

"The BVWS is pleased to draw members attention a new website dealing with early telegraphy created by Fons Vanden Berghen at www.telegraphy.eu

The site contains the link to the whole of Fons' second book on early telegraphy which can be downloaded for free.

The site also contains a list of the exhibitions that Fons has been involved with over the years, the articles he has written, and some short movies of operating telegraphy hardware."

- Foreword from Guy Peskett

I have recently launched my new website www.telegraphy.eu .

As a result of circumstances outside my control, the entire content of the first version has disappeared. Well, that turned out as an opportunity to create a new, and I think a better and more elaborated, version.

There is certainly much more to see now in this one. You will find information around the many activities in and around my collection. It includes for example a series of my articles that have been published in the past , several of them here in The Bulletin. My first one appeared in Vol. 22-1 Autumn 1997, my last one in Vol. 39-3 Autumn 2014 (about Werner Siemens). You will find this last one back in the site. And yes, also my BVWS article on the famous TM valve is in it as well as the one on the AVO-meter!

Also some of my main exhibits are brought alive here thanks to many photo shoots. For example one of them goes back to 2007 as I then was asked by the BVWS team to come to the NVCF in Birmingham to display a big part of my collection as the 'special attraction' of that year. Also to see in the new site are some short movies showing working telegraphs.

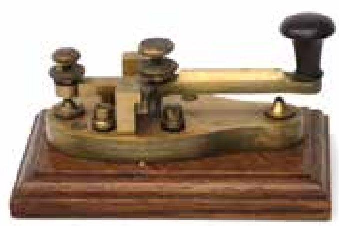
Some of the articles come in several languages, the rest is written in English

It might not be of interest to all members of course, but certainly to part of them. And hopefully it might raise more interest in this matter by the others.

In this website you will not learn anything about the telegraph and telegraphy as such. I have covered all of this in my second book, spread over 432 pages and illustrated with about 650 photos. That book is in Dutch, but the many images are in "an international language". You will find the link to it in the website (already in the WELCOME page).

My other 'very old' website (courtesy of Greg Raven, USA) is still alive; here you will see (just) a big bunch of images (including my items from the earliest years of Marconi as well as a couple of special radios) > www.telegraphsofeurope.net/

Thank you for your attention and with kind regards,



Grid Leak at the Show

DAILY SKETCH

RADIO AT A GLANCE

RADIOLYMPIA, FRIDAY, SEPTEMBER 3, 1937

RADIOLYMPIA FEATURED IN PICTURES

[illegible] provide the foreign newspapers.

The Radio Queen examines the R.G.D. King of Radio.

The Wireless Set of 1912.

View of Main Hall at Radiolympia.

Two well-known beauties exhibiting the 120-guinea H.M.V. television set

The Radio Queen, from painting by Pisani, presented to R.M.A. by [illegible]

G.E.C. television Set at £35 to attach to the ordinary radio.

A Novel Feature

[illegible] stand is an "All-world" centre; news comes through on telegriaters and all the leading newspapers of the world are on hand.

Punnetts Town Swapmeet, August 2017

Photos by Greg Hewitt

Philips TV display 405, 625 and 819 line sets by David Norton

KB Toaster atop a Raymond Radio

French Thomson set

Early BSA valves


GEC all electric compact receiver for AC mains


Pye QAC 5


A french Radiola (Philips) RA4402 TV on David's display at 819 lines.


Console yourself, it's a Pilot

A most important presentation...

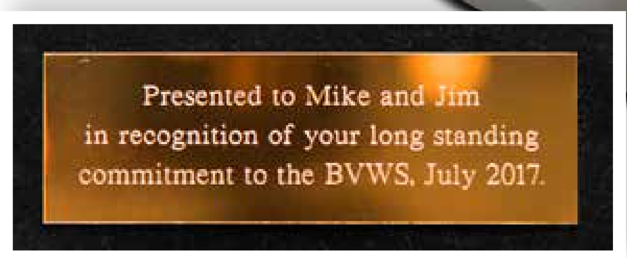
Greg Hewitt

Photograph by Lee Cross

On behalf of the BVWS Committee, chairman Greg Hewitt presenting previous chairman Mike Barker and his partner Jim Hambleton with a model of Broadcasting House in recognition of many years of hard work and dedication to the society.

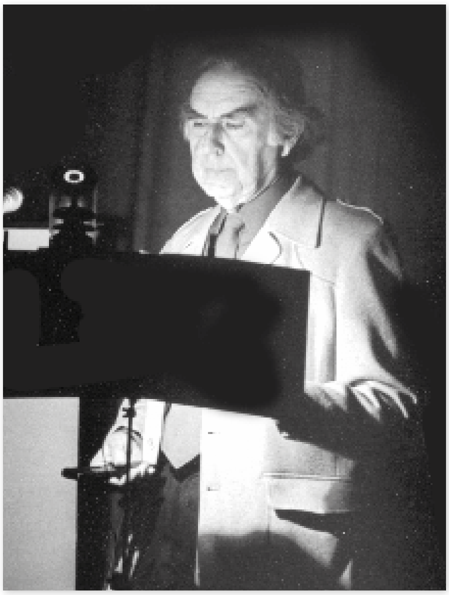
As mentioned in the summer issue's 'From the Chair' Mike had been on the Committee for 23 years and chairman for 18 of those. We are extremely fortunate to have Mike continue in his non-committee role as Auction Agent as his technical knowledge of vintage wireless equipment is unsurpassed and Jim's expertly prepared breakfasts are always enjoyed by members after their long drive to 'Bassett!' This presentation was made at the July Royal Wootton Bassett auction and swap meet that they arrange and run twice a year.

The plaster cast model which is hand finished with brass inserts was made by Chisel and Mouse of West Sussex who create architectural sculptures. The brass engraved plaque is affixed to the rear.



Ralph Barrett Remembered

Mike Barker



Earlier this year we were informed that Ralph Barrett, a very long standing member of the Society had passed away.

Ralph was well known for his very animated lectures on early Wireless and those scientists and pioneers that laid the foundations for broadcasting to become a reality.

Many of these lectures included demonstrations and re-enactments of experiments. Sometimes even with Ralph dressed in clothing of the type worn by those he was portraying. He had quite a costume wardrobe for such occasions.

Ralph gave a most interesting presentation on Heinrich Hertz at the BVWS 20th Anniversary celebrations weekend in 1996 (see accompanying picture).

From the 1950's onwards, Ralph worked for the BBC. He certainly saw service at the Alexandra Palace Television station working on much of the studio and transmitter equipment.

He was interested in music and owned many different musical instruments.

A significant achievement of Ralphs' after 7 years of negotiations with English Heritage, was to have a Blue Plaque placed upon the house of inventor David Edward Hughes (1831-1900) at 94 Great Portland Street, London.

David Hughes is widely documented as being the inventor of the Microphone, although not in the form that we usually associate with the device today.

In later years, The BVWS Committee awarded Ralph with honorary Society membership.

- Mike Barker

Roger Grant receiving the Geoffrey Dixon-Nuttall for best restoration article 2016 Award 'Fixing my Bush TV22' in Harpenden at the BVWS 2017 AGM Presented by Mike Barker

Stef Niewiadomski receiving the Pat Leggatt for best Article of 2016 'British Transistor Manufacturers in the 1950s' Award in Harpenden at the BVWS 2017 AGM Presented by Mike Barker

Letters

Email your letters to bulletin_editor@bvws.org.uk

First of all I'd like to thank the members of the Society for voting for my article British Transistor Manufacturers in the 1950s for which I won the Pat Leggatt award for best article of 2016. I had been slowly gathering information for the article for a few years and finally thought it was time to bring it all together and submit it to the Bulletin.

Further to my article about long wave broadcasting in the Summer 2017 issue of the Bulletin, as I write this letter in July 2017, RTE Radio 1 is still on the air, having confirmed that it will continue to broadcast on 252kHz at least until the end of June 2019. The only 'fly in the ointment' is that locals to the transmitter have expressed concern that the aerial mast is in poor condition, and may not last that long. The transmitter has recently been off the air for a couple of weeks for repairs to the base of the mast, which is encouraging for the long term future of long wave transmissions from the site. After that, RTE hopes to gain approval from UK authorities to launch Radio 1 via DAB+ networks which cover main urban centres in the UK.

In these days of AM shutdowns, it's good to hear that Radio Caroline – 'album music from the 1960s to the present day, for people aged 45+' - is about to resume MW broadcasting (legally this time) to the Suffolk and North Essex area. Ofcom has awarded an AM community license to the station, and 648kHz is expected to be the broadcast frequency and the power 1kW, and the switch on should be in August of this year. This is the defunct frequency once used by the BBC's World Service transmitter at Orfordness. Of course Caroline's broadcast is already available online at www.radiocaroline.co.uk.

I continue to gather the latest news on medium and long wave broadcasting from Communication, the journal of the British DX Club. A sample copy can be downloaded from their website, or a paper copy requested.

- Stef Niewiadomski

BVWS Spares Dept

DeoxIT D5 contact cleaner / lubricant £16.50
aerosol can. Not cheap – just the BEST.
Available at all BVWS events or by post for an additional £4.00

New manufacture high quality metallised polyester film capacitors to replace all old paper types in
vintage equipment. Ideally sized for re-stuffing

All capacitors are 630 Volt working
All prices are for packs of 50 components and include
postage and packing

Available in mix-and-match packs of 50 within price band by post.
Available in smaller quantities at all BVWS events.

0.001µF	**Price band A**
0.002µF	**Price band A**
0.003µF	**Price band A**
0.0047µF	**Price band A**
0.01µF	**Price band A**
0.022µF	**Price band B**
0.22µF	**Price band B**

Price band A is £25.50 (inc postage)
Price band B is £29.00 (inc postage)

Electrolytic smoothing capacitors, standard 'old-fashioned' size, 500 Volt DC working

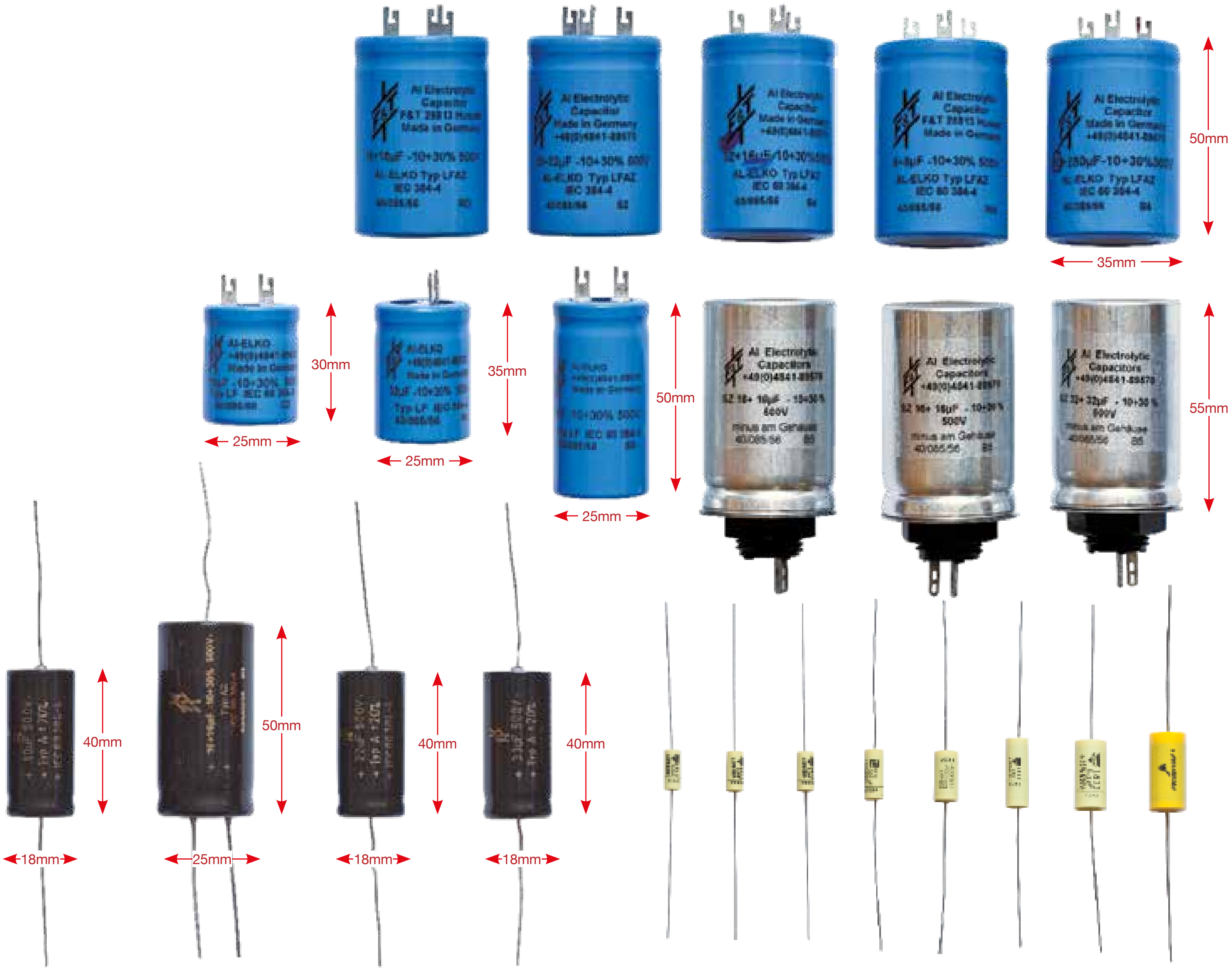
16/16µF £7.00 each
50/50µF £9.00 each
60/250µF for TV22 £9.00
8/8µF screw–type, 16/16µF screw–type,
32/32µF screw–type £9.00 each
16/16 µF tubular axial £6.50
10µF tubular axial £4.00
22µF tubular axial £4.00
33 µF tubular axial £4.00
47 µF tubular axial £4.50
70 µF tubular axial £4.50

NEW smaller 25mm can types for re-stuffing
original single electrolytic capacitors

32µF, 47µF, 500Volt DC working £5.00 each

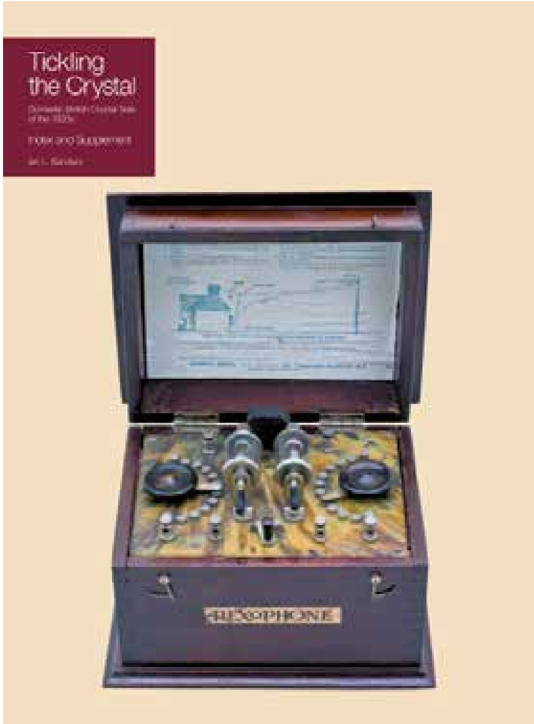
Postage and packing 1 – 4 caps £3.00 5 – 8 caps £4.50

All prices quoted are for BVWS members



For non UK addresses, please contact Mike Barker for prices, (see below). All orders should be sent (with payment made out to BVWS) to: Mike Barker, Pound Cottage, Coate, Devizes, Wiltshire, SN10 3LG. Cheques payable to British Vintage Wireless Society. Please allow 14 days for processing, but usually quicker!
The above capacitors are supplied as a BVWS member benefit. Anyone found to be reselling these items for profit will be expelled from the Society

BVWS Books



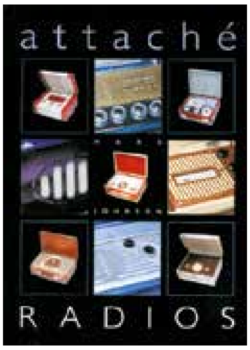
Tickling the Crystal

index and supplement
80 pages of GPO No. era British crystal sets.
including comprehensive index listing sets in
all five volumes of Tickling the Crystal
£11.95, £9.95 to BVWS members.
(+ £2.50 p&p UK) £3.50 EEC (rest of world £5.50)

Shareholders of the British Broadcasting Company

by Lorne Clark

68 pages. For the first time, a comprehensive listing of all of the companies, large and small, comprising the British Broadcasting Company - the forerunner to the British Broadcasting Corporation. Illustrated.
£10.95 (+ £2.50 p&p UK)
£3.50 EU (rest of world £5.50)



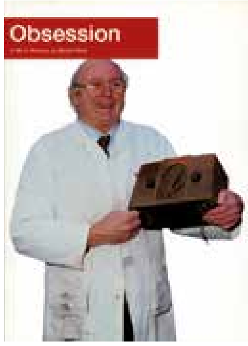
Attaché Radios

by Mark Johnson

An 80 page colour paperback guide to the Attaché portable

- Detailed specifications
- 140 radios in full colour
- Over 200 additional photos of sales literature, trade ads etc.

£12.00 (+ £2.50 p&p UK)
£3.50 EU (rest of world £5.50)



Obsession

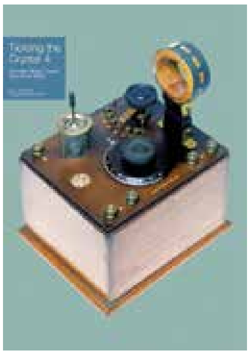
by Gerry Wells

Growing up in the 1930s, young Gerry Wells preferred wireless to toys. He had a postwar career as a radio and TV engineer designing and managing amplifiers, PA's and TVs. He founded the British Vintage Wireless and Television Museum from the home where he was born. This is the story of one man's dedication to wireless
£6.00 196 pages paperback (+ £2.50 p&p UK)
£3.50 EU (rest of world £5.50)

Tickling the Crystal
256 pages. Over 200 full-page photographs.
£14.95 for BVWS members plus £7 p&p for UK, £13 EU
(rest of world £19)

Tickling the Crystal 2
Limited, Only 750 copies printed. 208 pages.
Over 125 full-page photographs. £29.95 (£24.95 for BVWS members) plus £7 p&p for UK, £13 EU
(rest of world £19)

Tickling the Crystal 3
Limited, 500 copies printed. 240 pages of GPO No. era British crystal sets. Over 75 full-page photographs.
£29.95 (£24.95 for BVWS members) plus £7 p&p for UK, £13 EU (rest of world £19)

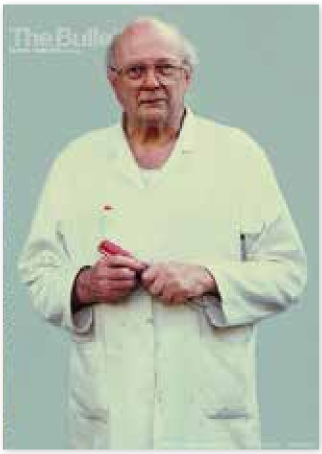


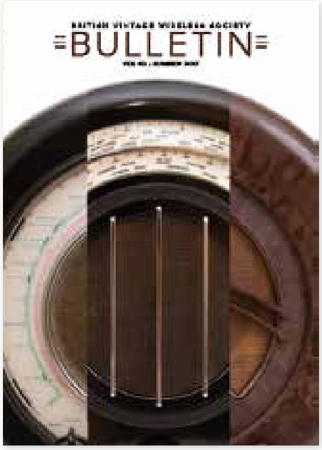
Tickling the Crystal 4
More Domestic British Crystal Sets of the 1920s.
280 pages of GPO No. era British crystal sets.
Over 115 full-page photographs. £29.95 (£24.95 for BVWS members) plus £7 p&p for UK, £13 EU
(rest of world £19)

Tickling the Crystal 5
More Domestic British Crystal Sets of the 1920s
The final edition in Ian Sanders' thorough five volume set exploring GPO No. era British crystal sets. 252 pages/ of GPO No. era British
£29.95 (£24.95 for BVWS members) plus £7 p&p for UK, £13 EU
(rest of world £19)

BVWS Books

Slipcase to house the first three volumes of Tickling the Crystal £9.95 Buy all three and get slipcase free! (postage £12 UK, £35 EEC, £55 US) BVWS members buy two and save £12 (postage £9 UK, £24 EEC £28 US)
Cheques payable to British Vintage Wireless Society
Mike Barker, Pound Cottage, Coate, Devizes, Wiltshire, SN10 3LG





The Bulletin back issues

All Bulletins and supplements are priced at £4.00 each + postage.

Postage: for individual Bulletins add £1.50, for all extra bulletins add £1 each. Cheques to be made payable to 'British Vintage Wireless Society'.

Mike Barker, Pound Cottage, Coate, Devizes, Wiltshire, SN10 3LG

Coil & Transformer Rewinds for Vintage Radio & TV equipment

Power Transformers, Audio Transformers, Chokes, LOPTX & IF Transformers etc.

Special designs also undertaken.
Call Mike Barker on 01380 860787

The British Vintage Wireless and Television Museum

TEMPORARILY CLOSED

Other times by prior arrangement
23 Rosendale Road, West Dulwich, London SE21 8DS
020 8670 3667 Registered Charity No. 1111516
Please make appointments beforehand

Stuck for a Stylus?

Thousands of new old stock vintage styluses & cartridges to fit a huge range of record players & radiograms from 1930 to 1970.

Please e-mail Bryan McAlley on brymac@btinternet.com with make and model required, including a photo of the existing stylus/cartridge if possible.

Styluses from £4.99 each post free to UK.
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Valveman

The story of one man's lifetime of obsession.

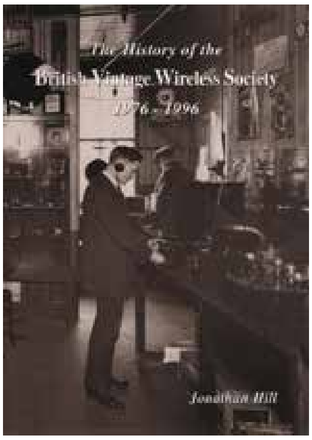
Gerald Wells was Valveman. His life's work was an attempt to amass one of the world's largest collection of valves, vintage radios and other early apparatus from the pioneering days of wireless communication.
This documentary film innovatively blends, using a variety of motion design and filmed reenactments, the last hundred years since radio began through to the early days of television.

£12.00 (including p&p) £14.00 in EEC. Rest of world £15.00

Mike Barker, Pound Cottage, Coate, Devizes, Wiltshire, SN10 3LG

£9.99 from The British Vintage Wireless and Television Museum, 23 Rosendale Road, West Dulwich, London SE21 8DS and all BVWS meetings

www.valveman.co.uk
www.bvws.org.uk
www.bvwm.org.uk



The History of the British Vintage Wireless Society 1976 - 1996

by Jonathan Hill

A personal account of the BVWS and of Radio Collecting. Find records of the year-by-year achievements of the BVWS from it's foundation in 1976 to it's 20th anniversary exhibition in 1996. It also contains a fascinating personal account of the history of radio collecting in Britain with descriptions of markets, auctions, exhibitions and many other events.
£5.00 (+ £2.85 p&p UK)

Sunday 1st October 2017
10.30AM - 4.30PM

AUDIOJUMBLE 2017

Sale of Vintage and Modern Hi-Fi Equipment at The Angel Leisure Centre, Tonbridge, Kent

10.30am Standard Entry £6-00 9:30am Early Entry £12-00 Stalls £30
Bookings/Enquiries 07873 862031
info@audiojumble.co.uk

12th November 2017

Golborne Swapmeet

Golborne Parkside Sports & Community Club, Rivington Avenue, Golborne, Warrington. WA3 3HG
Contact Mark Ryding 07861 234364

1/8 page advertisements cost £22.50 - 1/4 page advertisements cost £45 - 1/2 page advertisements cost £90 - full page advertisements cost £180.
Contact editor_bulletin@bvws.org.uk for more infomration.

Events Diary

2017 Meetings

September 10th Murphy Day at Mill Green Museum
September 24th Harpenden
October 1st Audiojumble
November 12th Golborne
December 3rd Royal Wootton Bassett

2018 Meetings

18th February Audiojumble
11th March Harpenden
8th April Golborne
13th May NVCF
8th July Royal Wootton Bassett
5th August Punnetts Town
9th September Murphy Day
23rd September Harpenden
7th October Audiojumble
11th Novmeber Golborne
9th December Royal Wootton Bassett

GPO Numbers
Martyn Bennett is the custodian of the BVWS GPO Registration Numbers list. As many members know, the project of assembling this list was started in the early days of the BVWS and was carried on by the late Pat Leggatt. Members are strongly urged to help build the list, whenever they get the opportunity, particularly as it is something that will help with the identification of vintage wireless in years to come. The list is by no means complete and the GPO no longer have a record of the numbers granted to wireless manufacturers.
The BVWS Handbook contains the current listings - one in numerical order and one ordered by name. Please let Martyn have any additions, or suggestions for corrections, by mail or over the phone.
Martyn Bennett, 58 Church Road, Fleet, Hampshire GU51 4LY
telephone: 01252-613660 e-mail: martyb@globalnet.co.uk

The British Vintage Wireless and Television Museum:
23 Rosendale Road, West Dulwich, London SE21 8DS
020 8670 3667
Harpenden: Harpenden Public Halls, Southdown Rd. Harpenden.
Doors open at 9:30, tickets for sale from 09:00, Auction at 13:00.
Contact Vic Williamson, 01582 593102
Audiojumble: The Angel Leisure Centre, Tonbridge, Kent.
Enquiries, 07873 862031 info@audiojumble.co.uk
NVCF: National Vintage Communications Fair
For more information visit: www.nvcf.co.uk
Royal Wootton Bassett: The Memorial Hall, Station Rd.
Wootton Bassett. Nr. Swindon (J16/M4). Doors open 10:00.
Contact Mike Barker, 01380 860787
Golborne: Golborne Parkside Sports & Community Club.
Rivington Avenue, Golborne, Warrington. WA3 3HG
contact Mark Ryding 07861 234364
Punnetts Town: Punnetts Town Village Hall, Heathfield,
East Sussex TN21 9DS (opposite school)
Contact John Howes 01435 830736
Mill Green Museum: Bush Hall Lane, Mill Green, Hatfield, AL9 5PD

For more details with maps to locations see the BVWS Website:
www.bvws.org.uk/events/locations.htm

24th September 2017
Harpenden Auction & Swapmeet

Harpenden Public Halls,
Southdown Rd, Harpenden AL5 1PD
Contact Vic Williamson 07805 213369

CONTRIBUTE TO THE BULLETIN

WE NEED YOUR ARTICLES!

Do you have a resoration you'd like to share?
Do you want to share any stories from working in the trade, i.e. manufacture, broadcast, retail or service?
Are their memories you'd like to share?
Do you want to talk about your current projects or collections?
Or anything Radio, Television or Audio related!

Even if it's just a letter send it our way!

Articles can be as long or as short as you like, about anything you want as long as it is relevant to the magazine. If you have an idea that you're not sure about, email **bulletin_editor@bvws.org.uk** and we'll be happy to listen.