The Bulletin

Vol. 36 no. 2 Summer 2011 www.bvws.org.uk

The Bulletin of the British Vintage Wireless Society £5.00 | free to members ISSN 0955-93


Up to 400 stalls, free parking!
6th November 2011
National Vintage Communications Fair
at Alexandra Palace
celebrating 75 years of the British Electronic Television Service
Free shuttle bus running from
Alexandra Palace rail station.
Massive display of television
equipment and receivers
from inception through
to the present day.
Outside Broadcast
units in operation.
Tours of original 1936
BBC studio areas
throughout the day
10.30 to 4.00 £10 admission (under-14s Free), early entry 9.00 £25
Stall bookings/Details
For any enquiries, please contact:
Post: NVCF, 13 Warneford Road Oxford OX4 1LT, UK
(please enclose an SAE)
Email: info@nvcf.org.uk
a downloadable booking form is available from www.nvcf.org.uk

Bulletin of the British Vintage Wireless Society
Incorporating 405 Alive
Volume 36 No.2 Summer 2011

www.bvws.org.uk

Separations and Printing by Hastings Print

Front cover: HMV 907, 1938 (there will be a restoration article on this historic television in the Autumn Bulletin).
Rear cover: Telefunken Cariño U1465, 1955
Photographed by Carl glover
Graphic design by Carl Glover and Christine Bone
Edited by Carl Glover. Sub-Edited by Ian Higginbottom
Proof-reading by Mike Barker,
Ian Higginbottom and Peter Merriman

Contents

From the Chair

Summer is now upon us. The garden is in near full bloom, which is rather early, and by the looks of the vegetable patch we will be able to eat well for the rest of the year. However it would not be a Good old British Summer without some rain, and boy we've had some in recent days.
Now on with the news:

There will be a second NVCF this year which will be combined with the celebration of 75 years of the British Electronic High Definition Television Service "Television 75".

This event is a "one-off" held in collaboration with the British Vintage Wireless and Television Museum, Dulwich. It will be held at the Magnificent Alexandra Palace, the birth place of the public television service in November 1936. The event will encompass the very beginnings of television right up to the very latest that technology can offer and everything along the way.

There will be a massive display of equipment and ephemera brought in from many collectors all around the country, much of this will be working. We have arranged for the original BBC studios, which are strictly out of bounds to the public to be opened up with guided tours taking place throughout the day and much more... You can find details on the opposite page and a stall booking form for the event is also enclosed with this Bulletin and on the NVCF website. Rail links have been checked and the Palace is very easy to get to, there is also a huge amount of free parking on site and a free shuttle bus will be run from the local rail station up to the front doors. Keep a watch out for more news of this event in the next Bulletin.

Since removing the June Harpenden from our regular calendar, I have had a good number of calls from members who feel it is a sad loss and have asked to have it reinstated. It was axed simply due to the high cost of the hall and the lower visitor numbers last year at this event. When this reason is made clear the general response has been a suggestion to increase the door entry fee to cover the extra cost, rather than lose the event. With this in mind we have decided to re-instate the June Harpenden event from 2012 onwards and taken the action of increasing the Harpenden entry fee a little. We will also be operating an 'armband' system of entry at future events which will speed up getting in at opening time.

Due to the ever increasing number of auction items we are being asked to deal with, we have also decided that there will probably be an extra 'auction only' event held at Wootton Bassett each year. Look out for the date in the diary page and on the BVWS website.

Congratulations are sent to Roger Grant (see below) for his article "Give us the tools and we'll finish the job" The R1155 Receiver. For winning the Pat Leggatt award and to Peter Lankshear, one of our New Zealand members, for his article "SE1420, IP501 and IP501A Marine Receivers." For winning the Geoffrey Dixon-Nuttall award.

Mike...

Roger Grant Receiving the Pat Leggatt award

Graham Terry with Peter Lankshear's award

'Questions from the floor' at the BVWS AGM

Notes from The Great Optical Illusion

by Gordon Bussey, John Liffen and Carl Glover

From March to September 1980 the Science Museum held a special exhibition dealing with television and its impact on the world. Instrumental in the event were the involvement of Gordon Bussey, then an employee of Philips, and Keith Geddes, the Science Museum's Deputy Keeper of Telecommunications.

The photographs (taken by the Science Museum Photo Studio) and printed ephemera were kindly supplied by Gordon Bussey. Permission to reproduce the floorplan and photographs was generously granted by the Science Museum, South Kensington.

1: A studio set by Yorkshire Television from 'The Good Companions' by J B Priestley, which had just finished production early in 1980. This was the first item seen by visitors entering the exhibition

2: One of the 1938 period rooms with a Baird mirror-lid television receiver.

2a: The Alexandra Palace display, with a model of the transmitter aerial, a 1936 Emitron camera tube and a Farnsworth image dissector.

3: 1938/9 Room with a Pye 817 television receiver (5 inch, vision–only receiver) and a Philips 634A wireless receiver.

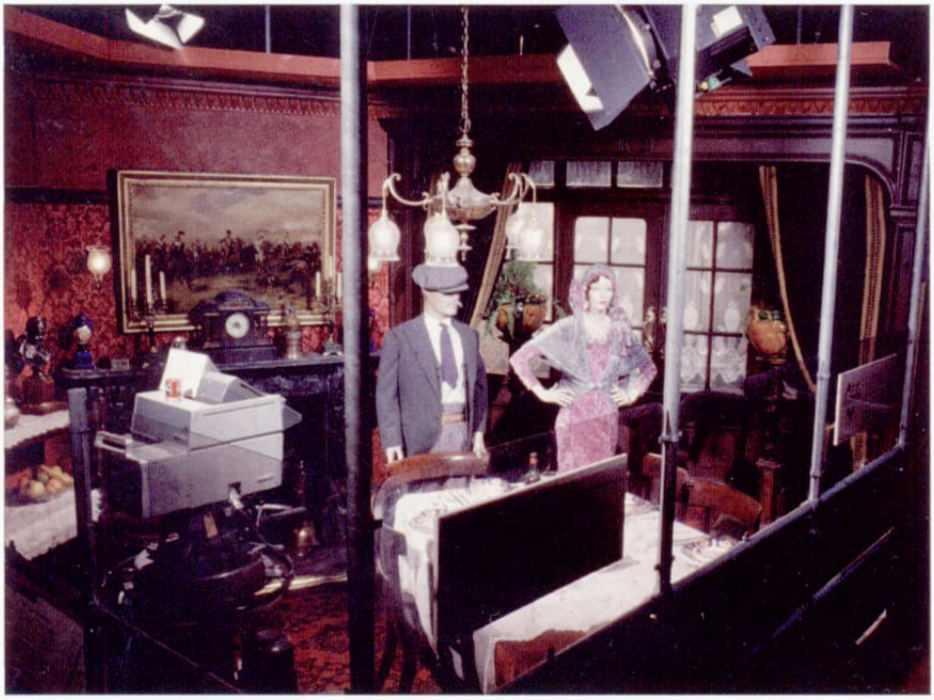
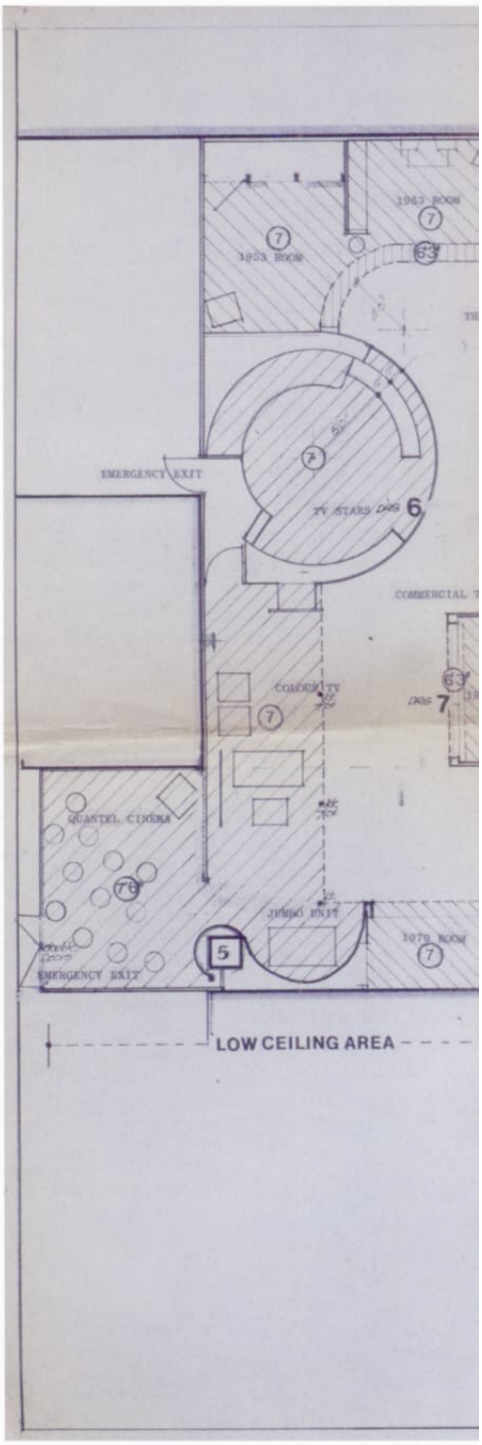


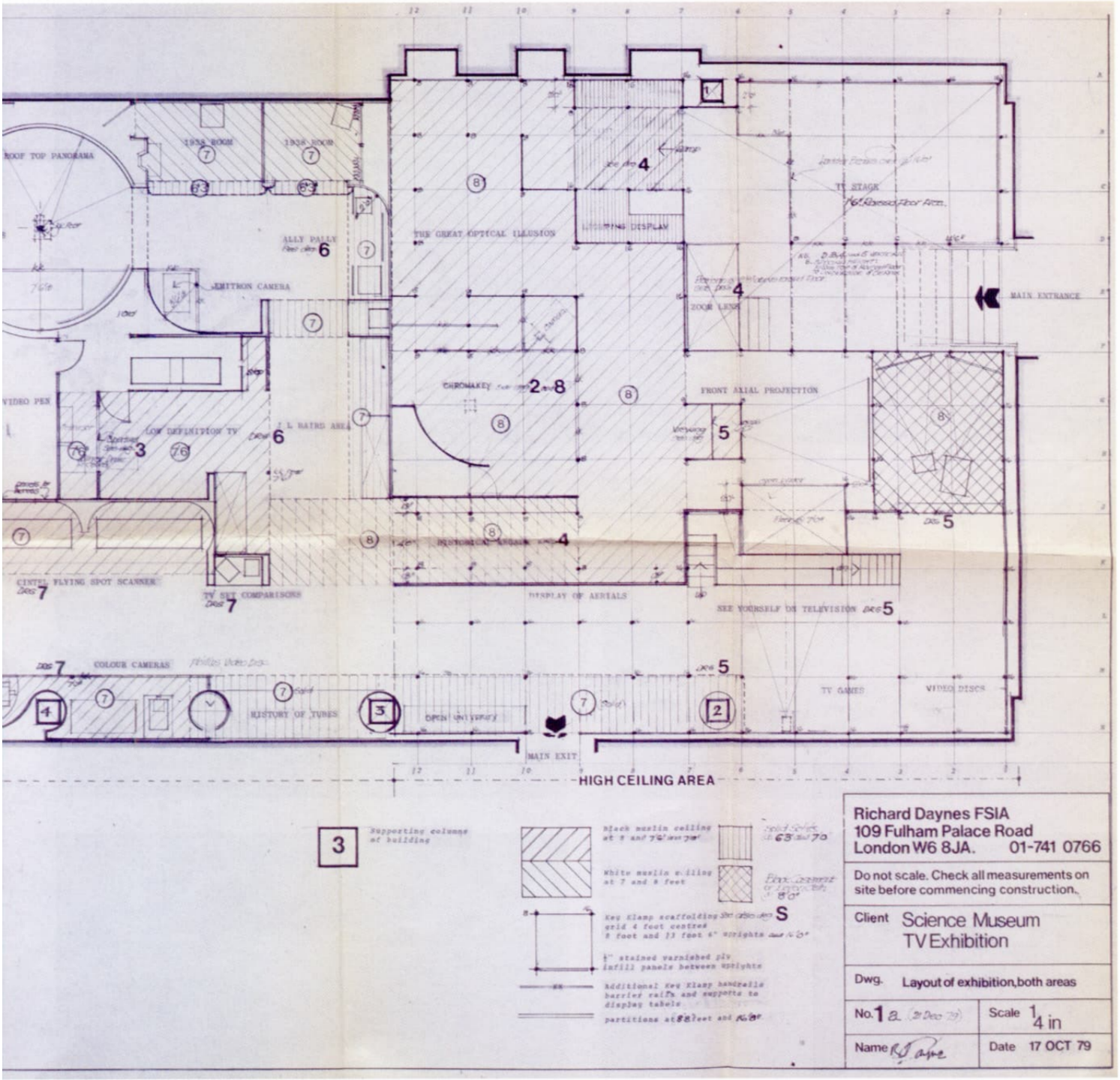
Figure 1



Floorplan of The Great Optical Illusion at the Science Muse

Figure 2

Figure 2a


ROOF TOP PANORAMA
1938 ROOM
1938 ROOM
ALLY PALLY
EMITRON CAMERA
THE GREAT OPTICAL ILLUSION
TV STAGE
MAIN ENTRANCE
ZOOM LENS
CHROMAKEY
FRONT AXIAL PROJECTION
VIDEO PEN
LOW DEFINITION TV
T.V. BAIRD AREA
CINTEL FLYING SPOT SCANNER
TV SET COMPARISONS
DISPLAY OF AERIALS
SEE YOURSELF ON TELEVISION
COLOUR CAMERAS
HISTORY OF TUBES
TV GAMES
VIDEO DISCS
MAIN EXIT
HIGH CEILING AREA
Supporting column of building
Black muslin ceiling at 9 and 7½ feet
White muslin ceiling at 7 and 8 feet
Key Klamp scaffolding grid 4 foot centres 8 foot and 13 foot 6" uprights
¼" stained varnished ply infill panels between uprights
Additional Key Klamp handrails barrier rails and supports to display tables
partitions at 8 feet and 10 feet
Richard Daynes FSIA
109 Fulham Palace Road
London W6 8JA. 01-741 0766
Do not scale. Check all measurements on site before commencing construction.
Client Science Museum
TV Exhibition
Dwg. Layout of exhibition, both areas
No. 1a
Scale 1/4 in
Name R.J. Payne
Date 17 OCT 79


olic television service

Figure 3

Figure 4

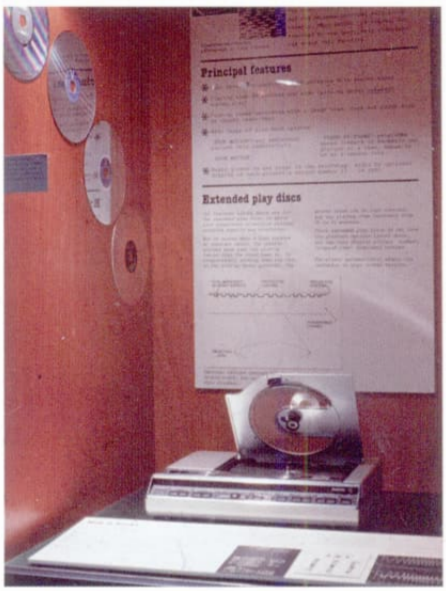
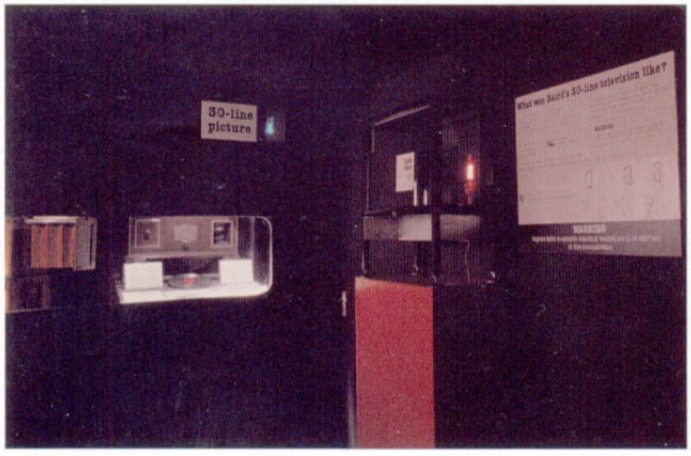


Figure 10

Figure 5

Figure 6



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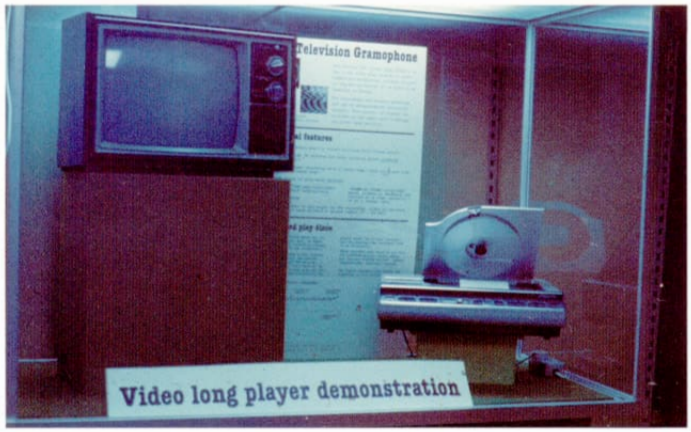

Figure 11

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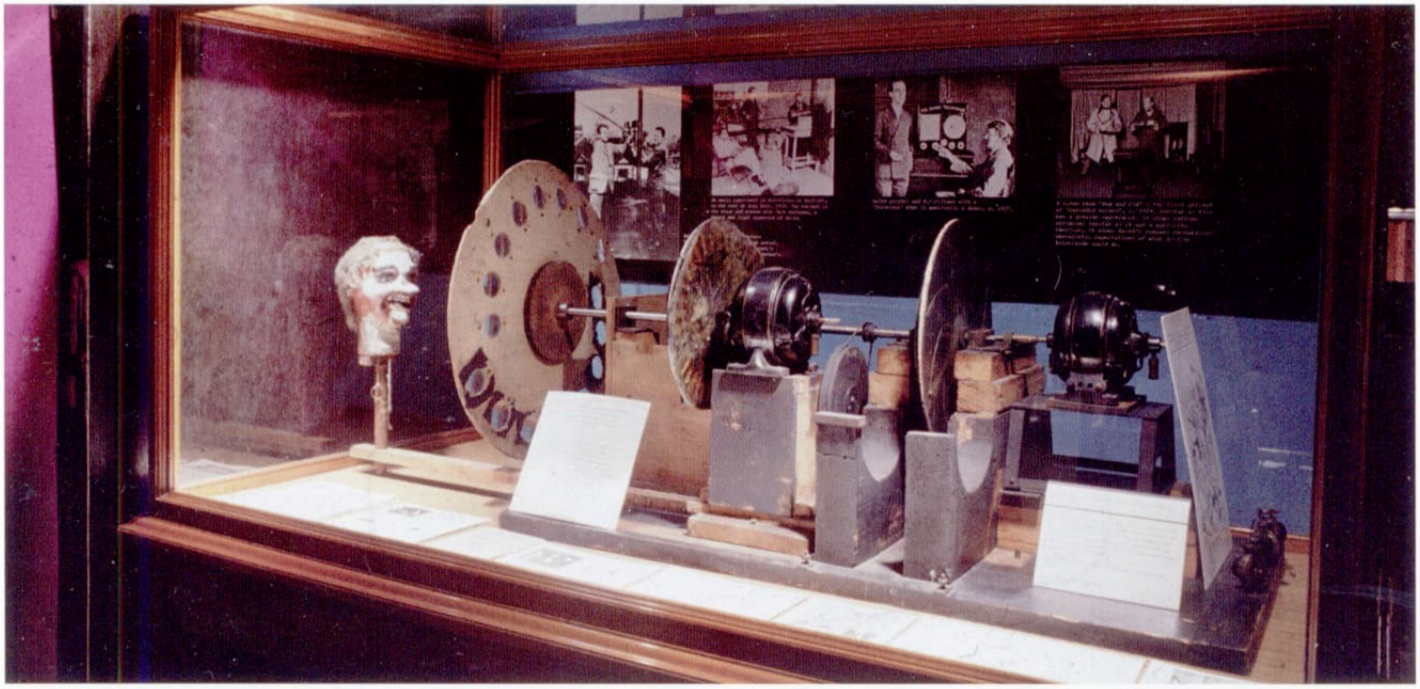


Figure 9

4: The 1953 rooms with (left) a Philips projection television receiver and (right) a Bush TV22 receiver.

5: 1959 room with a KB television receiver (1-9 rotary channel tuner on front).

6: 1969 room with a Ferguson colour television receiver.

7: The low-definition television section. Visitors were able to see 30-line images and fortunately Eryl Davies was able to persuade Imperial College to make a good supply of reproduction neon tubes.

8: Part of the Baird display, with a Nipkow disc lent by the Royal Television Society.

9: The Baird scanning apparatus which he presented to the Science Museum in 1926.

10: Philips video disc player of 1980.

11: Working demonstrations of the Philips video disc player were given by Jimmy and Ernie.

12: 1950s television cameras. In the background is the BBC's 'Little Ben' continuity clock.

13: 'Cutting the cameras down to size': RCA three-image-orthicon colour television camera of c.1960.

14: 'Cutting the cameras down to size': portable cameras of the late 1970s.

15: Belling-Lee provided a display of television aerials.

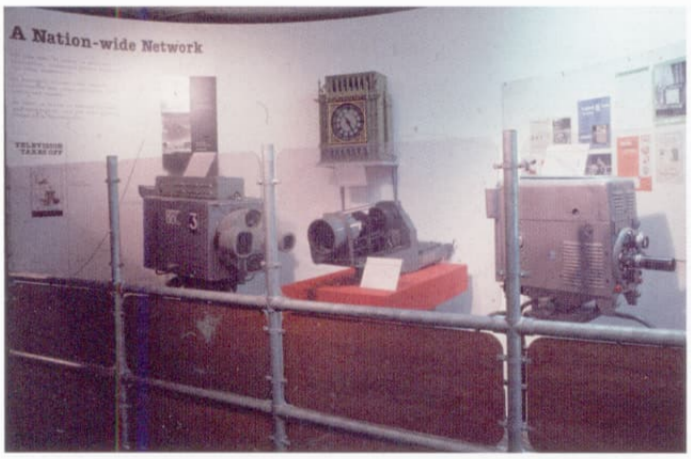


Figure 12

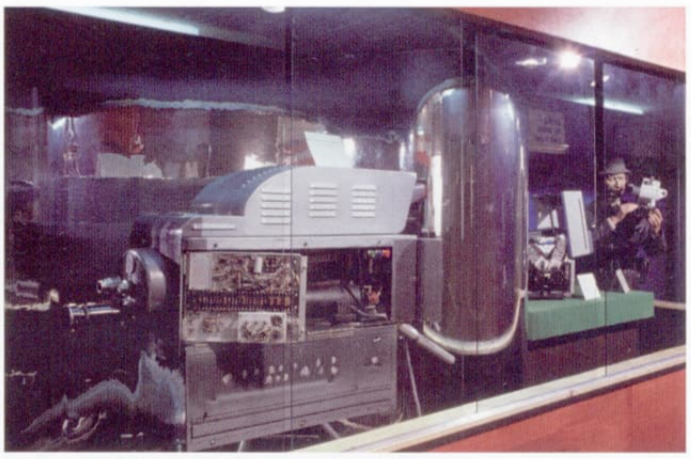


Figure 13

Figure 14

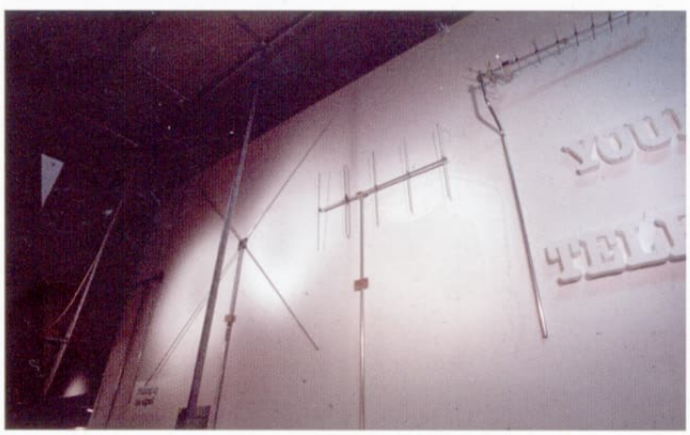


Figure 15

Figure 16

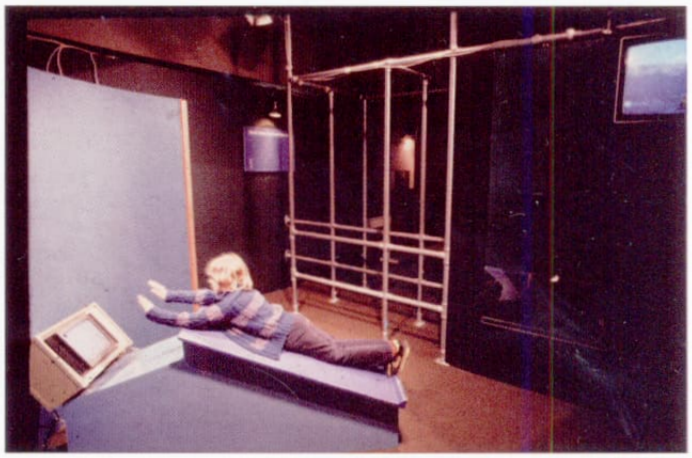


Figure 17

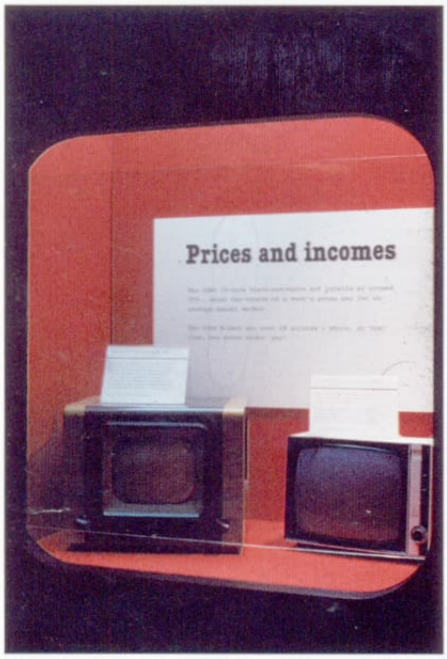


Figure 18

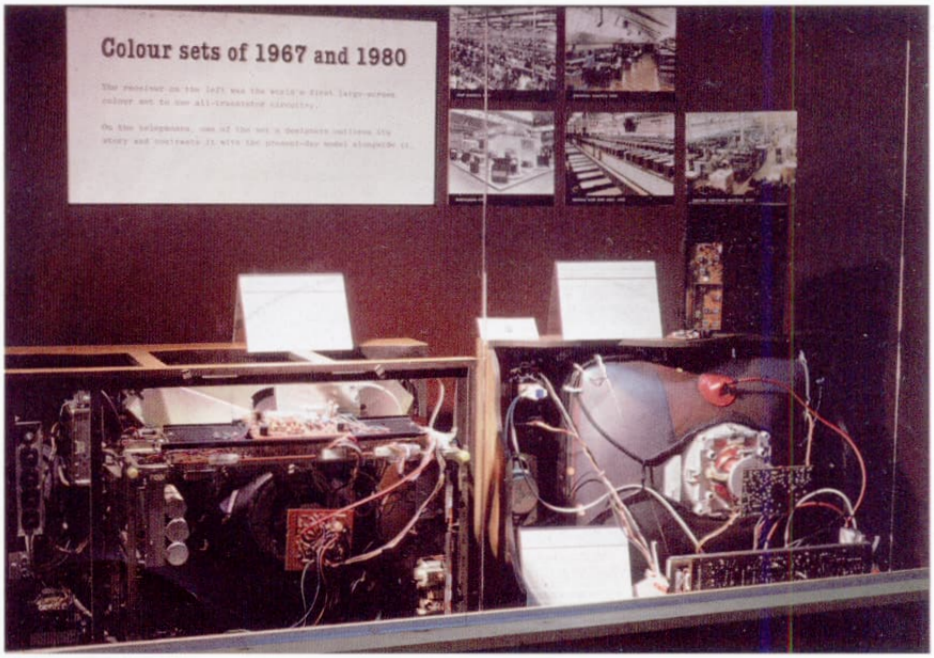


Figure 19

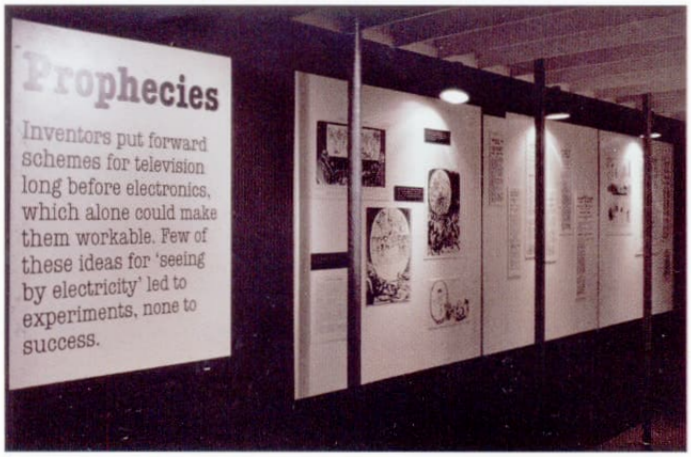


Figure 20

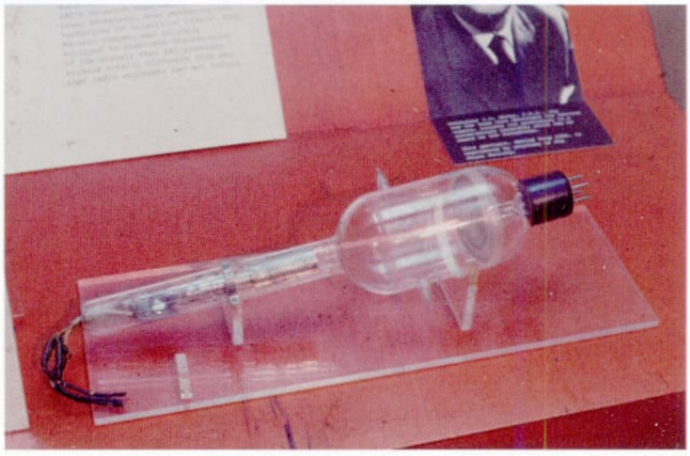


Figure 21

16: A display of early Pye television receivers: 1946 B16T, 1948 B18T and 1953 V4.

17: A visitor on the Chromakey 'magic carpet' interactive.

18: Ferguson televisions of the late 1940s and 1980, illustrating the steep fall in the cost of receivers in real terms over this period.

19: Ferguson colour sets of 1967 and 1980.

20: 'Prophecies' – the possibility of television foretold in the nineteenth century.

21: McGee and Tedham's experimental camera tube of 1932.

22: Development of the cathode-ray receiver tube.

23: Rank-Cintel flying-spot telecine scanner. Despite great hopes and much work this was never persuaded to manage a working demonstration.

24: 'Getting TV taped'.

25: Ceefax demonstration.

26: TV games interactives.

27: Projection television technology: comparison of 1980 (left) and 1953 images (barely visible alongside).

Figure 22

Figure 24

Figure 25

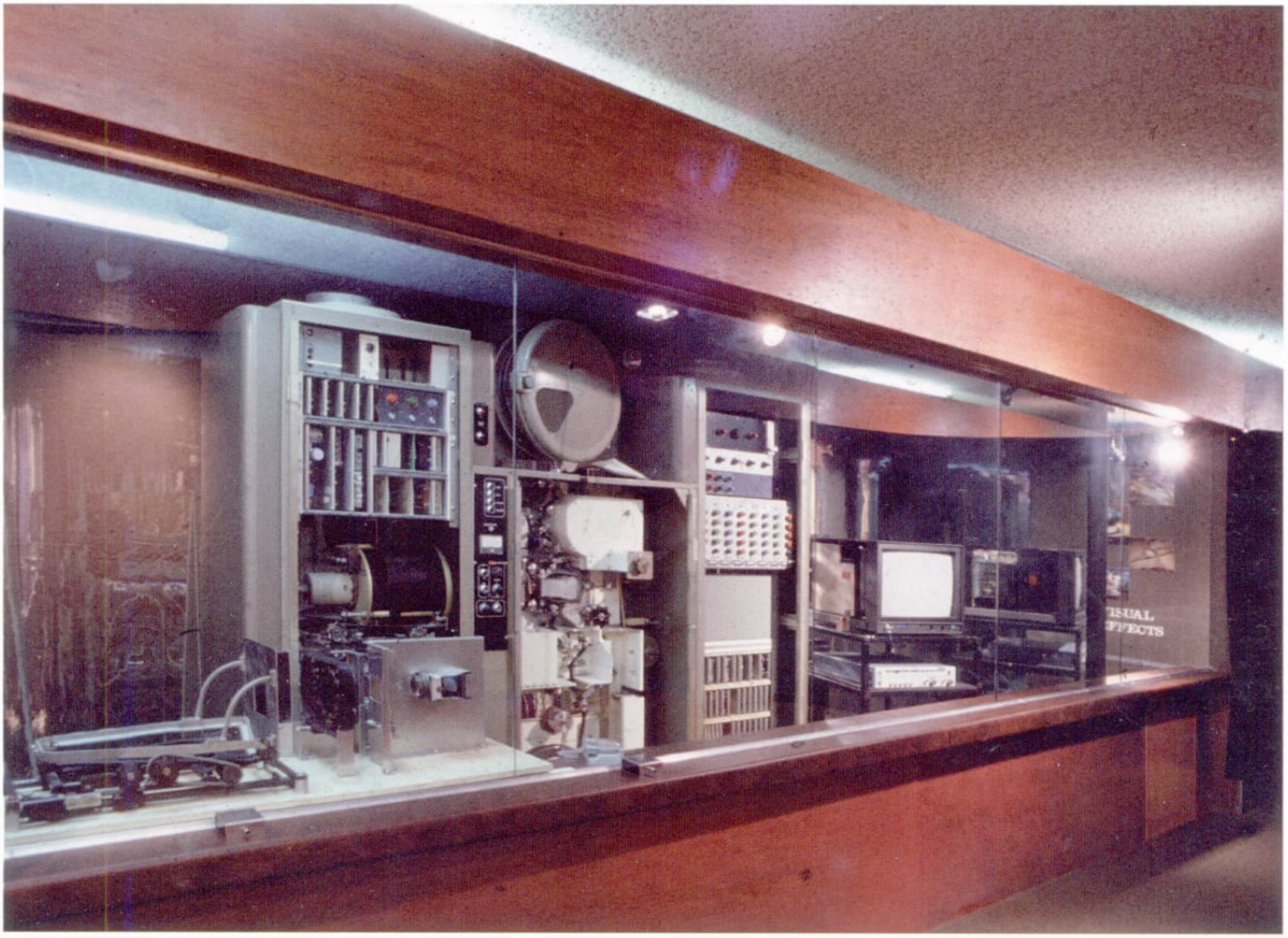


Figure 23

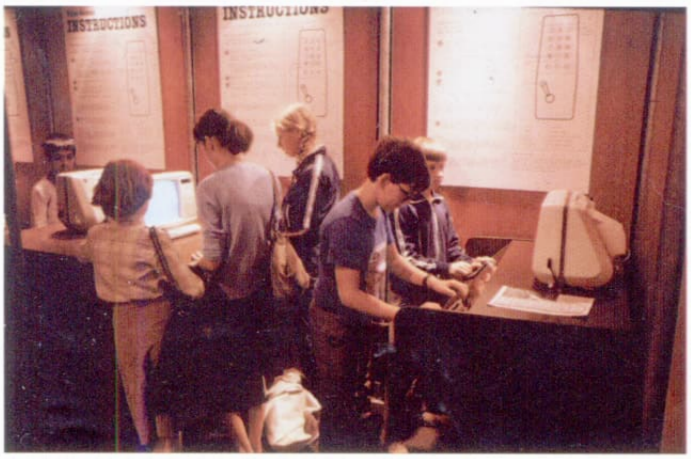


Figure 26

Figure 27

Personal memories of the exhibition

by John Liffen
Curator of Communications
Science Museum, London

At the time 'The Great Optical Illusion' (GOI) was being planned I was Museum Assistant (MA) for the Telecommunications collections and my boss was Keith Geddes, Deputy Keeper. Keith was the main creative force for the exhibition, aided and abetted by his Research Assistant, Eryl Davies. Keith had boundless energy and ideas and, if I may say it, never stopped talking! Eryl was a curator to his fingertips and lived life to the full. A warm-hearted person, he was always interested in people and his early death in 1997 was a tragedy. He is still missed by his former colleagues (and his many girlfriends!).

I think it was Gordon Bussey who originally suggested that the Science Museum should organize a television exhibition in response to the Victoria & Albert Museum's 'The Wireless Show' of 1977. Some kind of anniversary was needed to hang the exhibition on. As it was scheduled for 1980, the strapline 'Fifty years of broadcast television' was contrived, as television transmission by the Baird system with combined sound and vision had started in March 1930, coinciding with the introduction on public sale of Baird's 'Televisor'. Gordon became an honorary historical adviser to the exhibition, helping to source ephemera and loan-in objects. Welcome collaboration on the project was received from the BBC, IBA and ITV.

As MA my job was general assistance and logistics: listing and measuring objects, arranging their movement and photography,

Figure 28

Figure 29

Figure 30

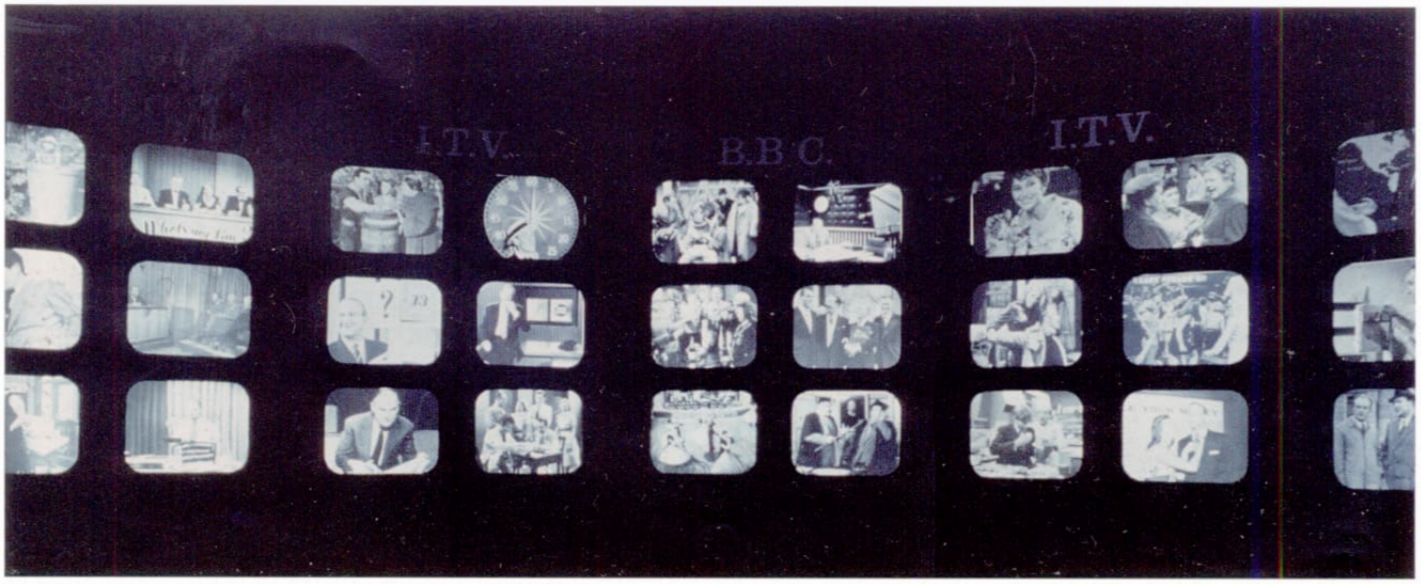


Figure 31

logging locations and acting as 'gofer'. It was still pretty fulfilling, though, despite the hard work. One job Eryl and I had to do was to transport eight or nine new Sony U-matic video players from the Sony offices near Reading to the Open University studios at Alexandra Palace where they were to be modified for 405-line operation. Eryl used his own Transit van and we made sure the job took the whole day, stopping off at a remote country pub 'somewhere in Berkshire' for lunch, with another pub visit in London after the valuable cargo had been delivered. Incidentally, while we were at AP we we given a tour of the studios and I always think it a privilege to have seen them while programmes were still being made there.

The key partnership in any museum exhibition is that between curator and designer. We were lucky in that the appointed external designer was Richard Daynes. He soon established a rapport with us all and produced an ingenious use of a tight space using, in effect, little more than scaffolding. I recall commenting to Keith how the move between the two levels of the exhibition was made not using the Museum building's own steps but others constructed elsewhere as part of the design infrastructure. 'Yes', said Keith, 'that shows the cleverness of the designer. He puts the change in level where he wants it, not where he's given it.'

An important part of the exhibition was the creation of period room settings for 1938, 1953, 1959 and 1969. In these were installed contemporary working television receivers playing selections from archive programmes. GOI was notable in that I believe it pioneered the use of adapted videotape players as feeds for 405-line television receivers. Deciding on the appropriate selection of furniture and decoration took a lot of thought too, especially for the 1969 room which in 1980 was only eleven years

Figure 32

Figure 33

28: 'See yourself on television' (autocue mounted on right-hand wall).

29: How colour television works.

30: Teletext / Viewdata interactive.

31: 'TV stars' montage.

32: 'Switchcraft': digital special effects.

33: General view of the 1930s display.

34: Introducing (left) Jimmy Drinkwater and (right) Ernie Lever, the Radio Rentals technical attendants.

35: Entrance to the exhibition with the 'Good Companions' studio set on right.

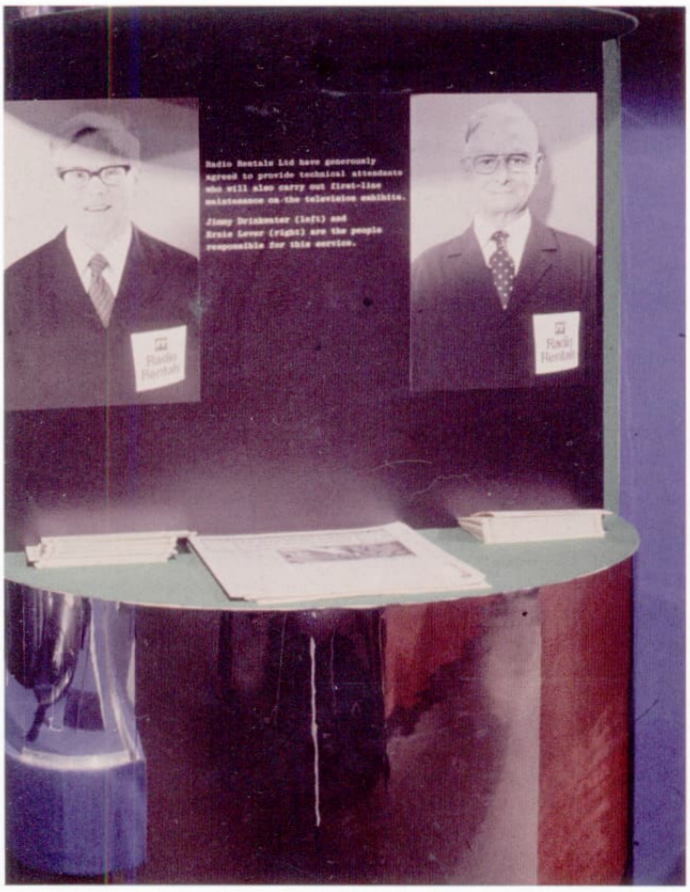


Figure 34

Figure 35

Figure 35

Figure 35a

Figure 36

previously. One thing I took pride in was fine-tuning the detail. For example, in the 1959 room I established the correct placement of a 1959 copy of Short Wave Magazine on the side table by sitting in the armchair reading it for a few minutes and tossing it down on the table as I got up to leave. That had to be the correct position!

Besides the vintage television sets there were many other working displays as well and the exhibition's principal sponsor, Radio Rentals, agreed to provide two technical attendants, Jimmy Drinkwater and Ernie Lever, to carry out first-line maintenance on the television exhibits during the exhibition's six-month run. Jimmy also played a big part in restoring the older television receivers to working order.

Planning and building the exhibition was a year's hard work for us all, but great fun too. Eventually we came to the official opening on 26 March 1980. Our guest opener was Leslie Mitchell, the pioneer television presenter. As it happened, he lived in Bayswater, only the other side of Kensington Gardens (this is relevant to what follows). Mitchell toured the exhibition in company with Dame Margaret Weston, Science Museum Director, and Keith. He then proceeded to deliver an animated and highly amusing opening speech. Clearly he loved it. The following morning I was in the exhibition well before Museum opening time, helping Jimmy and Ernie make last-minute adjustments. We were working on the Chromakey 'magic carpet' interactive which was proving troublesome. I was out front; Jimmy was behind by the equipment racks. I called out 'Give it one more try, Jimmy, see if that does it'. From behind me another voice echoed 'Yes, Jimmy, give it one more try!' I turned in surprise and found a grinning Leslie Mitchell standing there. He was so enthused with the exhibition that he had come straight across the park that morning to have another look and had talked his way past the warder at the staff entrance.

If you are lucky, there will be a special moment during the process of preparing a museum exhibition that makes it really memorable. You can't anticipate what it will be, but you will know straightaway. In this case it happened a couple of days before opening. I had stayed late and it was about 7 pm. The exhibition space was quiet and gloomy but I was aware that Eryl and the

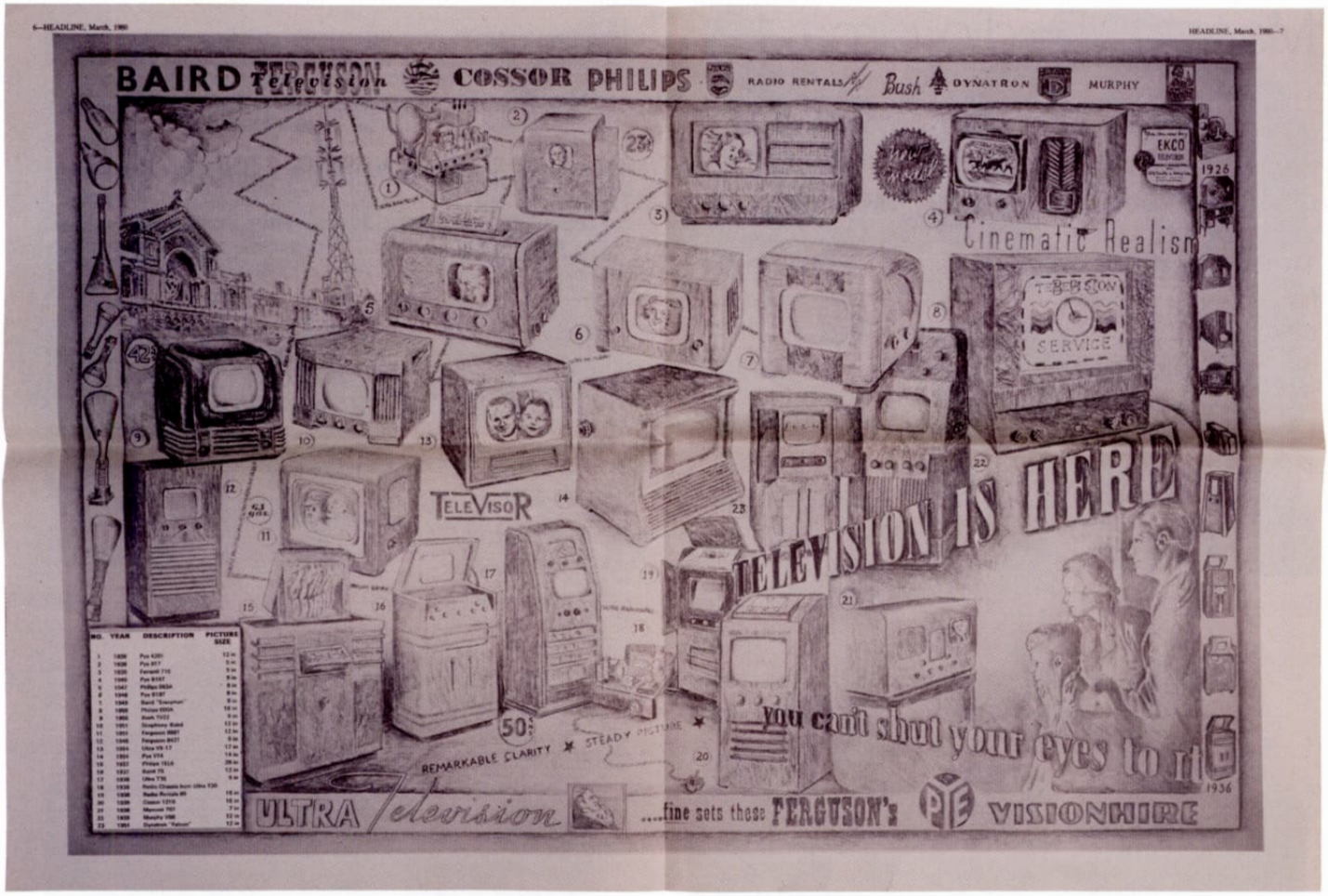


Figure 35b

Figure 37

technicians were working somewhere on the audiovisual displays. All the exhibits were in place and I was in one of the 1938 period rooms giving it a few last-minute adjustments and cleaning. Without any warning, the exhibition lights came on and the mirror-lid television in the corner sprang to life. On screen appeared Adele Dixon singing the familiar song about the 'mystic magic rays'. The sense of fulfilment expressed in the song and the images of the studio technicians making small adjustments to the transmitters as the programme went out I found deeply moving. This was truly the birth of a new technology. For a brief moment 1980 disappeared and I was back in the world of 1936. The exhibition had passed from being just a job to be completed to being a living entity. I shall never forget it.

35, 35a and 35b: The 4 page souvenir from 'The Great Optical Illusion' featuring a centre–spread of drawings by Patrick Cook.

36: Arthur Askey with the Philips Video Long Player at the press preview of 'The Great Optical Illusion'.

37: Jasmine Bligh, Leslie Mitchell and Joan Miller seen with an early TV camera at the official opening of "The Great Optical Illusion'

Maestro Radio circa 1932 by Gary Tempest

This set came from the NVCF some years ago. A personal hate is when you come to those overloaded stalls, complete with distracting fancy tablecloths, which confuse you with buying possibilities. No problems here: this was extreme minimalism, just two radios lavishly spaced out on the bare boards of a heavily distressed table. Sitting behind it was a guard for each but they were smiling. Hello! It's our Editor, Carl and his table mate Ian Sanders of Crystal Set book fame. They soon realised that I was not up for the expensive Catalin set and my interest was with the Maestro. I was high from buying a particular HMV radio which I had wanted for sometime, from the stall of my friend Louis Coakley, (even more of a friend after the deal was struck). Possibly if it hadn't been for this exuberant mood I would have passed the Maestro by. At times along the restoration I did wish I had. It was in a miserable condition and had apparently been carted to swap after swap meet with no one prepared to try his or her hand with it. I was paid the compliment, at least I think that's what it was, "...that you take on ones that others won't".

As it currently looks

Restored rear

This is not a large radio, being only 13" high by 10" wide and 8" deep but it is heavy, weighing in at 18 pounds. It's a simple four valve TRF from the USA and what sets it apart is that the cabinet is moulded from rubber. To be precise it is vulcanised rubber that was called by the brand name Ebonite. Its name comes from its intended use as an artificial substitute for ebony wood for such uses as black piano keys and bowling balls. If they had made those from solid Ebonite a few throws and your arm would likely have come off.

The Maestro, and a small number of other radios, were made by motor tyre manufacturers, most likely Goodyear, before Bakelite and Catalin became the standard materials for moulded cabinets.

A little history

'Vulcanized' rubber was first found by Charles Goodyear (1800 – 1860). In 1830 he came across India rubber in a hardware store. Intrigued with the material he began experimenting with it. Later he was to meet another inventor Nathaniel M. Haywood and bought his patent on mixing sulphur with rubber. So the story goes he accidentally dropped a piece of sulphur impregnated rubber on the stove and found that it did not melt but only charred slightly. Realising the implications of this he began experimenting to achieve the optimum mix of ingredients (rubber with 30 – 40% of sulphur) and the baking of this new product that he called 'vulcanized rubber'. His patent was issued in June 1844 and was accepted by all countries, except England, where a patent had already been issued to a Thomas Hancock in 1843.

Source: Answer.com

The Maestro as purchased

The Maestro looking very Art Deco

A 'Photoshop' version of the Maestro

Inside the unrestored set

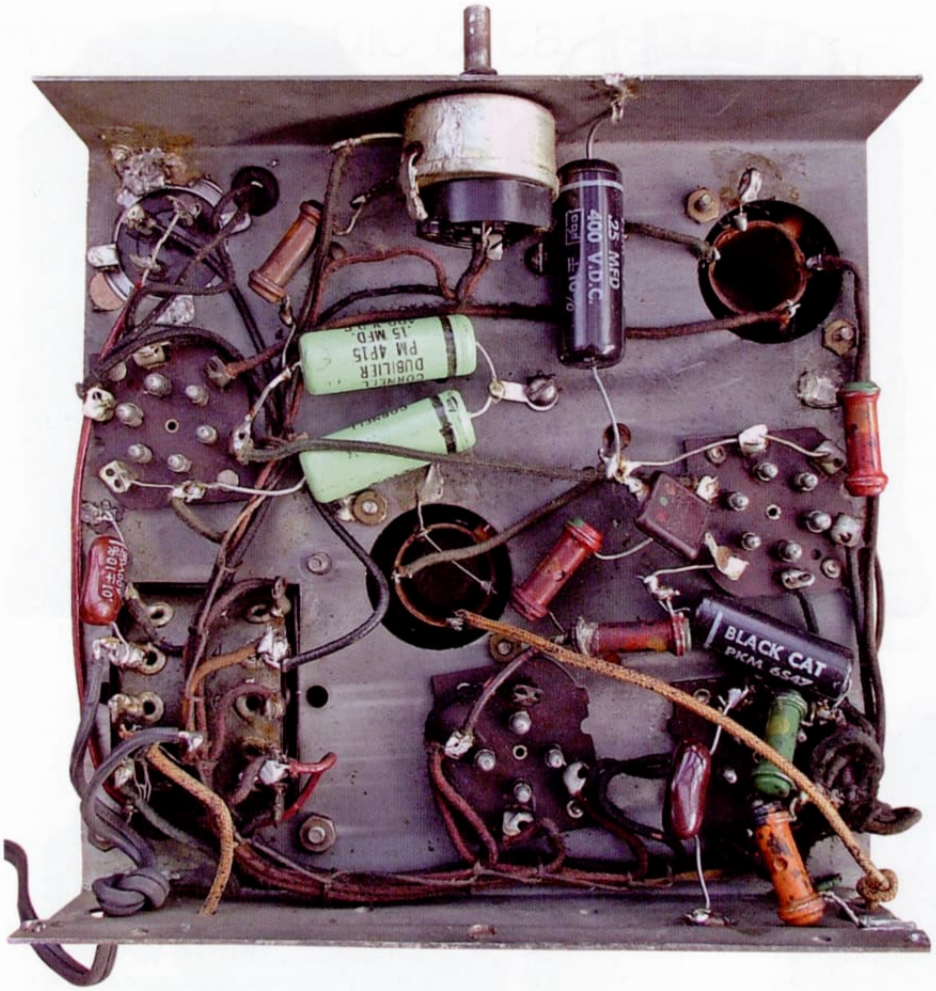
An example of the Maestro set as depicted in a 1996 issue of The Bulletin

Restoration of the Cabinet

The cabinet had some time ago lost its original finish and had been sprayed over with some silver paint that had subsequently been abraded away on the top. Perhaps someone thought that with enough elbow grease, they would produce a polish on the base material? Fortunately, it was structurally in good condition with only minor nicks and dents. Once roughened these were filled with car body filler that so far is well attached. So what to do next? After rubbing down with various grades of paper and cleaning off with white spirits I started with primer and silver acrylic and then went for a two tone art deco look similar to that shown above. The highlights, after what I had thought was plenty of time, were made with a light oak Mohawk dye toner that at first looked very attractive. Previously I had sprayed their cellulose lacquer over suitably hard acrylic paint, which had never given me a problem, but I had not tried toner. Alas, after some time, the toner developed thin cracks rather like a large crackle in paint. There was nothing for it but to flat down, re-spray with silver and then go through the laborious masking to apply highlights in gold acrylic finishing off with a satin lacquer. This time I was cautious and only used products from the same range and supplier (Halfords) for a seemingly successful result. The cabinet was left to rest whilst I sorted the chassis.

During this time I found some information about these radios from the Antique Radio Forum web site. Member Dale Davenport, kindly gave me this information:

"The two or three examples of these sets that I have seen were either a silver and black combination, to look like antique silver, and a greenish wash over silver. Both wash coats were selectively removed



The unrestored chassis showing the motley collection of plastic components

The new dial

Krylon Latex paint - ideal for vulcanised rubber

to highlight the high and low areas".

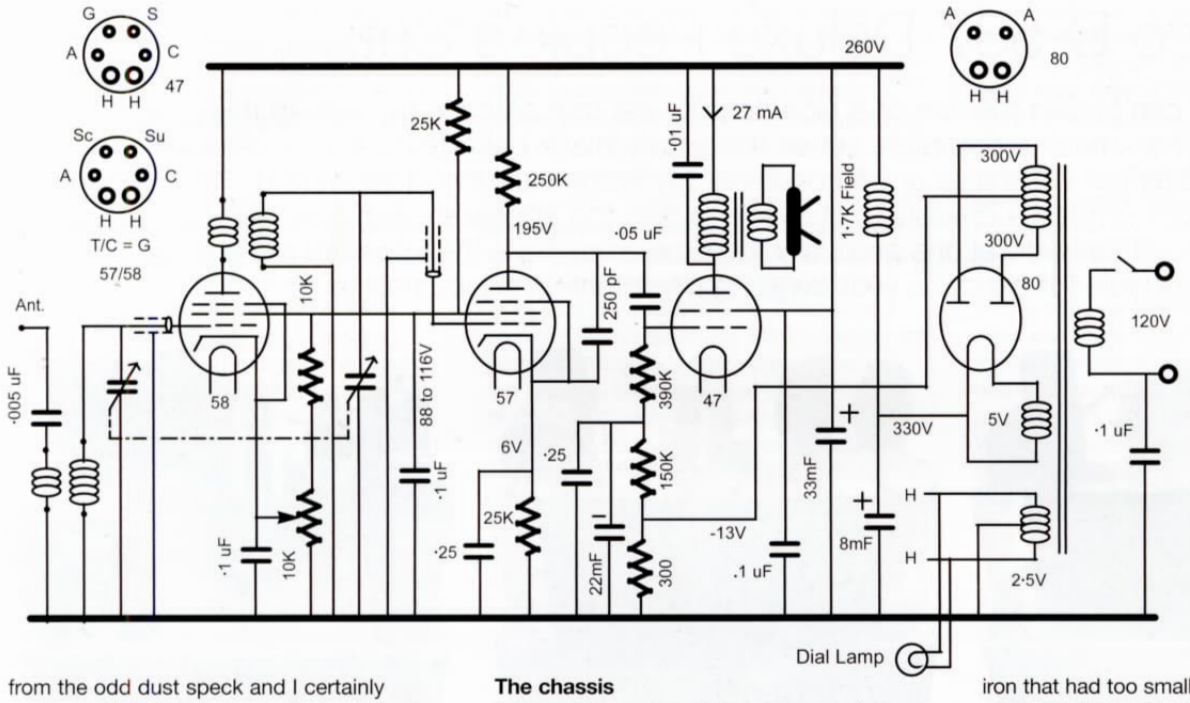
From a little of the original paint, found on the inside edges of the cabinet, possibly this one was green over silver. But would it have had dark brown knobs? There must also have been a brown wash over silver version, as one is shown in Bulletin Winter 1996 (see picture on page 15) where it is called the Music Master Maestro. Of course I found this picture accidently, after getting this far, whilst browsing through back issues of the Bulletin. As an aside, what did amaze me in this issue was 'The spread of equipment for auction during the viewing time' picture. There were things there that these days will only ever come up for sale by word of mouth or at Bonham's. It was an exhibition day and I thought I must be getting things wrong and these items were part of that. But close examination of the text confirmed that these really were auction items. Those times (before I joined the BVWS) must be called the "Golden Years of Harpenden".

Given a choice, I might have gone for the silver and green combination but that would have been impossible with spray cans. Where do you get a green dye toner? And of course it has to be compatible with the silver. You can of course get brown dye toners but I had already had failure with one of these and silver acrylic. Perhaps they may work if many weeks were left before applying over the base coats, assuming that it was these that shrunk beneath the toner to produce the crackle affect. However, I'm no longer a fan of aerosol dye toners. Getting a light, uniform, speckle free finish over the whole cabinet would be impossible for me. So at this time I was content with what I had achieved. However, I didn't stay that way: after a few months deep cracks started to appear in the paint finish of the concave sides. A scalpel under these easily flaked off layers of paint down to the bare rubber. It was interesting to measure the paint thickness, which was 23 'thou' (thousands of an inch), a credit card measures about 30, so it was not surprising that the undercoats could not continue to hang on. I guess, over its life, different people had put more and more spray on and I had added my fair share.

So back to before the start-line as now all the paint was going to be taken off. This was tedious as in lots of places, just to be even more awkward; it really didn't want to go. I didn't want to use paint stripper or cellulose thinners because of possible attack to the rubber and leaving undesirable residue behind. Better to be safe and just to spend time scraping and then sanding down.

Before doing anything else I decided to research what would be the best paint to bond to the base material. The manufacturers of Krylon products were most helpful for questions and answers. They advised that the only paint that was really suitable was a latex type called H20 that as the name implies is water–based. The colour range was limited with no metallic silver so I opted for 'Black Sea Satin'. The Krylon technician recommended washing off with water and a little household ammonia before spraying. He said that the paint could not be 'rubbed out' and satin shows less imperfections than a gloss so it was a reasonable choice. It sprayed well with no imperfections, apart

Auction lots at Harpenden, 1996



Circuit of Maestro vulcanised rubber radio circa 1932

from the odd dust speck and I certainly recommend it. Cellulose may have worked as that's what they would have used back in the 30's but of course that's unobtainable today. Would acrylic have been successful? It may have been but I was wary now and wanted success and the man from Krylon obviously knew much more about paints and chemical bonds than I did.

I did consider adding some gold highlights but in the end, having had enough of it, decided to leave well alone. It would be nice to get it back to a possible original colour scheme and maybe someone who has and is skilled with a spray gun set–up will cross my path. I have left the paint finish alone and not put any polish on it so it should hopefully make a sound primer. Another thought occurred as I was writing this: why not try the "artist's oil paint method" as described in Bulletin Winter 2009, "An HMV Record Player, Model 122". It would have to be sprayed silver first, then left before toning and spraying with Mohawk cellulose lacquer.

The knobs have been left brown; they stand out less in the flesh than in the pictures.

Whilst preparing the images, in Photoshop, I accidently did an invert of the colours, making it like an old film negative, for the picture of the silver with gold highlights version (see page 15). To me in a futuristic way this is quite attractive but of course not reproducible even if I wanted to do so.

The chassis

I'm normally very careful and remove dials immediately but the one on this chassis didn't want to come off. It was made from an early plastic with a rubber grommet in the centre to hold it in place on the tuning gang spindle. The rubber had gone as hard as the cabinet over time and I left the dial in place. The inevitable happened whilst examining the underside the chassis which slipped off the blocks of wood propping it up and the dial broke in two. I had to make a new dial, see my article in Bulletin Autumn 2009.

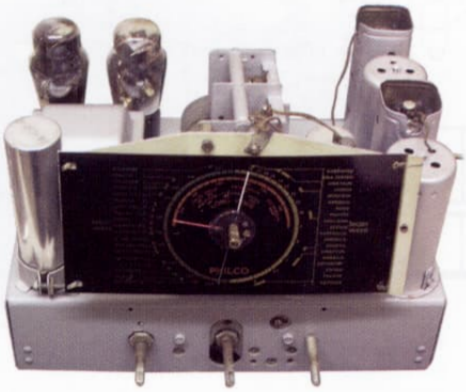
The chassis had been bodged up before; all the old wax and paper capacitors were replaced with a motley collection of plastic items. I didn't like it and as some rust needed treating I stripped it and drew the circuit diagram as I went. The operation of the rectifier circuit and obtaining negative bias for the output valve had not been understood; resulting in errors that made me certain that the radio had not worked. The reservoir and smoothing capacitors had been replaced with a much later can–type with metal twist lugs (Twistlock). These are meant to go through a large hole with a Paxolin washer on the underside, and twisted for securing. However, what had been done was to open out the original chassis hole, probably with a screw chassis punch, so that the lugs could be bent over on the underside. These had then been soldered to the chassis with an iron that had too small a thermal mass and solder had been piled on making a horrible mess. This took quite a lot of cleaning and the only way around the oversize hole was to cut two pieces of Paxolin, one for either side of the chassis, with the correct sized hole for a capacitor of the screw ended type. Of course I didn't have one of these and so the original replacement was re-stuffed and converted using the Hoselock connector and electricians bush method (see Radio Bygones issue 124). It was rebuilt with suitable period components (re-stuffing the wax caps of course), after treating the rust and spraying the chassis with Hammerite Smooth Silver. I made it safer by adding a cover over the output transformer with its open connections at HT+.

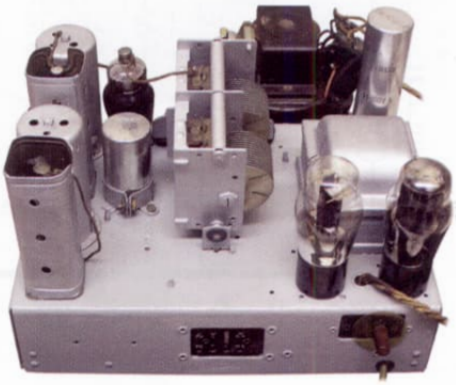
Conclusions

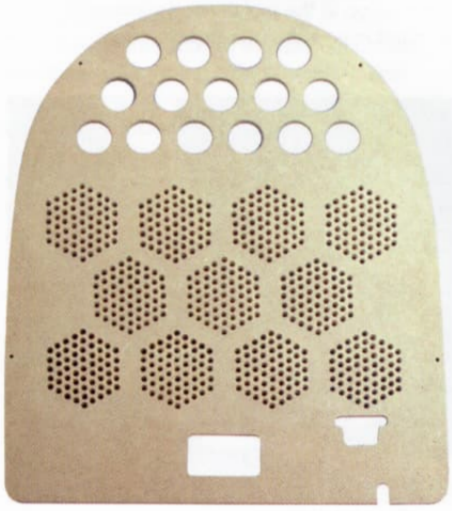
I'm not yet happy but at least it's presentable, working, and on display. There are possibilities in the future for getting an authentic colour scheme. When the weather warms I will spray up some scrap material and try the artist's toner method allowing lots of time before each iteration of paint. These will be H2O black, Halfords silver acrylic (or possibly Hammerite Smooth Silver), artists paint (I think I will go for the brown to match the knobs) and finally Mohawk cellulose lacquer. If all goes well, then by summer 2012, I may be ready to have another go at the real thing. If successful it might even warrant a Bulletin cover.

DIY Philco B-537 Deluxe People's Set by Robert Darwent

Like many, I just can't resist the lure of a nice bakelite set that catches my eye. In this instance it wasn't so much a complete set as the empty black bakelite case from a Philco 444 in a dirty but otherwise good condition. My immediate thoughts were to adapt or build from scratch a chassis to fit inside to give the appearance of a working original. However, other restorations gradually took me away from the intended project and the case stood idle for almost a year awaiting my attention again, until...







A friend telephoned telling me that whilst helping to clear out a garden shed he had come across a rusty old valve radio chassis and would I like to have it, otherwise it was going to be dumped along with the rest of the junk being cleared out. Of course I said yes expecting it to be only fit for stripping down for the odd useable part. However, it proved to be in a much better condition than I had first assumed. It was immediately obvious from the dial that it was from one of the many Philco people's set models. It was quite rusty on top, which is very common with these sets due to the chassis only being thinly plated, but in an otherwise remarkably good restorable condition. It had been discovered inside a disintegrating suitcase which had obviously offered it some protection. It still had a full set of original Philco branded valves, the speaker was in a good state, its celluloid tuning dial was very well preserved and even all its bakelite knobs were still present and intact rattling around in the bottom of the suitcase. After some research I narrowed down the model, despite no markings on the chassis or dial, to be either a B-537 or a C-537. After scrutinising the service sheets for those two sets I pinpointed it to be a C-537 of 1937 vintage, which was one of the deluxe people's sets that came in a veneered wooden case. The B-537, also of 1937 vintage came in the familiar domed bakelite case and used an almost identical chassis, differing in only having a rotary on/off control rather than the combined on/off and tone control present on the C-537. But would it be possible to get this chassis to fit into my earlier obtained bakelite case to make what would then be a do-it-yourself home built Philco B-537 model?

Chassis Restoration

I spent some time cleaning the accumulated dirt and rust from the chassis. I cleaned all the valve sockets using Servisol 10, and the pins of the valves themselves with a glass fibre pen. Referring to Philco Service Bulletin No.72 for the C-537 model, I replaced a dozen or so of the tubular capacitors and the electrolytics in the power supply section. I didn't bother testing or trying to reform them, as at this point I was just trying to get the chassis working quickly. After 70 or so years I reasoned the electrolytics in the power supply were probably not to be trusted anyway so simply bypassed them with modern components. After further continuity and resistance checks and a new length of mains cable fitted, I was ready to apply power for the first time via a lamp limiter. I switched on for a minute or so, no indication of a problem from the lamp, so applied power directly. A short while later and I had the local medium wave station coming in loud and clear, despite no external aerial connected at this point. BBC Radio 4 on long wave was a little quiet but soon came in loud and clear too with a few metres of aerial wire hooked up. As this chassis was one of the 'deluxe' models it also offered a short wave range from 5.7 to 18 MHz which also performed quite well. Spurred on by this initial success, I proceeded to restore the chassis more thoroughly. Whilst it was still on the bench I took the opportunity to replace two further electrolytics and all of the tubular wax capacitors that were remaining with modern polypropylene types. I also replaced the rubber mountings at the front of the tuning capacitor, the old ones were no longer flexible but just hard and brittle. The original large can-type electrolytics were carefully polished with Brasso, and retained for appearances sake whilst having been electrically disconnected below the chassis. I had intended to 're-stuff' these components, but decided it was not really necessary and far easier to add the new electrolytics out of sight underneath instead. The top and sides of the chassis were painted in grey 'Smoothrite' paint, whilst the frame of the tuning capacitor and the mains transformer have been given a coat of the same product in silver. It was quite time consuming, and a steady hand needed, to paint the chassis without stripping it down completely first. But I'm more than happy with how its turned out, a definite improvement I think to the overall appearance.

Case Restoration & Modification

Note, an original B-537 has a mottled black/brown bakelite case, whereas the set here is all black.

A couple of issues here. First, the case I had was from a standard Philco 444 model and only had two holes at the bottom for the control spindles whereas the C-537 had three, having an extra control in the middle. And second, I would need to make a replacement baffle-board to mount the speaker and to fit some new grille cloth to. Drilling a third hole in the bakelite case was fairly straight forward. After accurately marking out a position in-line and equi-distant from the two existing holes, it was a matter of careful drilling starting with a small diameter bit and progressively changing to larger sizes to enlarge the hole. Making a new baffle-board though was not as easy as I had first assumed. The angle and curve of the case made taking accurate measurements difficult, plus the four mounting holes needed drilling at an angle through the board in order to fit correctly. I eventually got the measurements necessary by using a sheet of paper carefully pushed on to the mounting threads, taking care to keep the paper taut, and then drawing around the speaker opening whilst holding it in place. This enabled me to make a thin card template with which to cut the baffle and grille cloth accurately to size. With the aid of the card template I marked out some 3/8 inch plywood, then using an electric jigsaw and an electric drill carefully cut out the speaker aperture and made the mounting holes. Using some nuts and bolts reclaimed from a baffle-board from an unrelated scrapped set, I was able to make the mounting points for the speaker itself. After a bit of fine tuning here and there I eventually got the board to fit snugly in the correct position inside the case. At this point I removed the plywood again and gave it a coat of dark-brown matt paint. I cleaned the accumulated dirt that had been present inside the case when I had obtained it by using foam cleanser and plenty of paper towels. The outside of the case was cleaned in the same fashion, then any minor scuffs, hairline scratches, and the inevitable tiny white spots of paint polished out with 'bake-o-bryte' paste. When the baffle was dry, I used the card template again to cut a piece of 'Tygon' type material for the grille, and attached it to the board using Vinyl Flooring Tile Adhesive. I find this type of glue ideal for this purpose. I've used it on other restorations with excellent results, and it has the advantage of being water based so if it goes anywhere it shouldn't it can be easily removed with a damp sponge.

Reproduction Back-Board

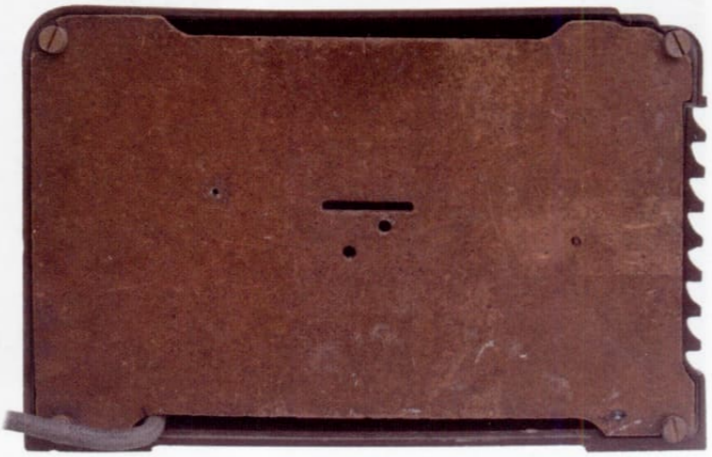
I was unable to find any photographs at the time showing the appearance of an original Philco B-537 back. Instead I decided to make one along the lines of a Philco 444 back, adding the different openings and cut-outs necessary for the C-537 chassis. Using images of the 444 back as a guide, along with a tracing of the opening of the bakelite case, I eventually achieved a full-sized paper drilling template. Obtaining some 3/16 inch thick MDF-board, I transferred the cut-out lines and drill points over to it using the template. After some careful cutting with an electric jigsaw and a total of 690 drilled holes later, I had produced the completed back-board ready for painting.

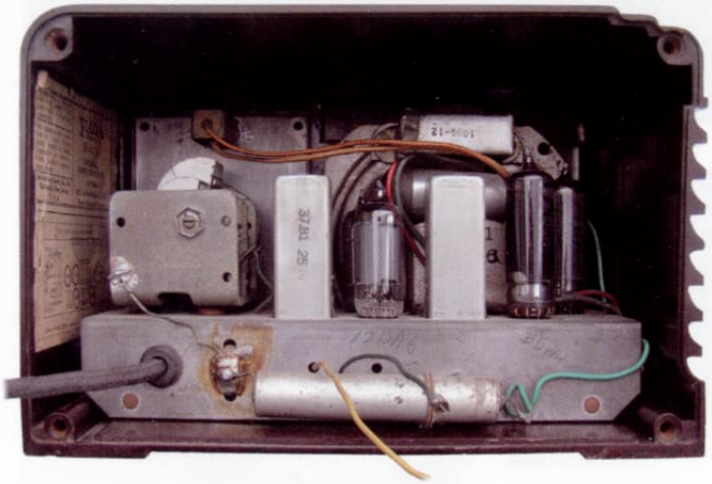
The Finished Result

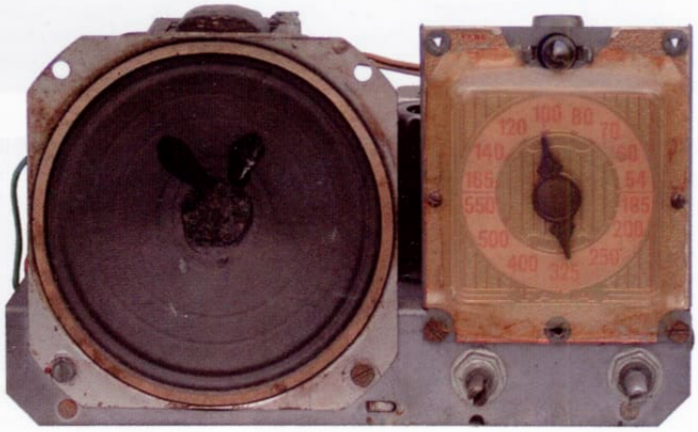
It was now a simple matter of assembling everything. I fitted the speaker to the baffle-board and likewise the chassis into the case, completing the set with the reproduction back-board. Note, an original B-537 has a mottled black/brown bakelite case, whereas the set here is all black. In addition, the control far-left was just a rotary on/off switch on the B-537, whereas the C-537 chassis has a combined on/off and tone control instead. There are Philco 444 sets out there with a third hole too, so I didn't have much reservations about doing a modification which Philco had apparently also done themselves. Philco produced several versions of the bakelite people's set, and judging by the variations seen, seemingly used whichever sort of case they had available at the time. Many 444's have a three-holed case with the extra hole blanked off by a plug. I have no intentions to deceive with this set, rather it was a just a way of making good use of a separate chassis and a bakelite case that uncombined would probably otherwise have just gathered further dust.

Pictures from Spring Harpenden 2011

photographs by Carl Glover







The FADA 740 An Amazing American Midget By Roger Grant

This set was an impulse purchase at the end of one of the Harpenden swap meets several years ago, it came quite cheap as the cabinet has a few cracks and it looks like a home made back has been fitted, plus its previous owner didn't want to take it home.

It has been in among my collection as a static display until recently, when a young colleague at work with a newly acquired interest in old technology, expressed an interest in owning a valve radio. Having seen several examples of my collection, he decided one of the smaller sets would be preferable so several midget sets were dragged out for an airing.

This set was passed–by as it's an American set and requires a 117 volt mains supply, but while it was on the bench I thought I'd give it a dusting off and a run up.

On removing the back I discovered this set uses the B7G series of valves, making it a bit younger than the style of cabinet suggests and the basic hardboard back turned out to be original, as it's the sets frame aerial.

A label stuck inside the cabinet revealed its manufacturer's model number and a bit of research soon completed its heritage, made by FADA Radio & Electric Co Inc, Belleville, New Jersey, USA around 1947. It must be one of the early sets to use this series of valves.

Having a 117v mains transformer to hand and after a few cold checks with the AVO, the set was plugged in and tried out. It crackled and hissed and eventually pulled in a few stations, albeit intermittently. Waggling the valves proved the pins to be very dirty and oxidised, after cleaning with a soft fine brass wire brush the situation was much improved but the set was still intermittent.

There appeared to be two separate faults, the first, the set cut out, no audio at all, this could be cleared by giving the set a light nudge, the second, the set's sensitivity would vary quite widely, also varying with a light nudge.

> The cabinet is a little tired, the surface of the Bakelite appears a bit coarse in places and there are two major cracks, these appear to be stress cracks rather than damage...

The first problem proved to be the audio coupling capacitor going open circuit, a bit difficult to trace for as soon as you moved the set the fault would clear, even with the lightest touch, the set might then work for a few hours before this fault would re-appear, no amount of prodding and nudging would induce this fault. Eventually I managed to touch the grid of the 12AT6 audio triode with the tip of a screwdriver without disturbing the fault, (pin 1) and got a good buzz from the speaker, but nothing on the other side of the capacitor on the wiper tag of the volume control.

While replacing this capacitor the end fell off of the 3.9meg grid resistor and I had to replace this as well.

The second fault was even harder to find, the output would vary quite considerably, at its best the set performed very well for its size, and would also run for quite a while before dropping to a varying lower level, the audio buzz test remained constant so the fault is RF or IF, the crackle from the grid of the mixer oscillator when tickled with a screwdriver also appeared to be constant (not very scientific but a good indicator without getting out the test gear), this left only the frame aerial attached to the back of the set, the push connectors had already

been cleaned, these were thoroughly cleaned again and any residual oxidation removed, this didn't make any difference, in fact this problem seems to be getting worse, the set's sensitivity is varying all the time and the more I tried to find this fault the worse it got. Mechanically isolating the frame aerial proved to be where the problem lay, a previous owner had already made repairs to this frame aerial, there's a short jumper link repairing a break in about middle of the winding and a wire replacing about three quarters of the outermost turn, this is glued down and there's a messy patch of glue covering a small part of the winding about the size of a thumb print. I discovered that it was there because the winding was lifting off from the hardboard back.

The aerial is manufactured using un-insulated copper foil tape about one millimetre wide glued vertically to the back, and it's now coming off in several other places, this allows the un-insulated windings to short out to varying degrees causing this variation in sensitivity. A rewind is going to be difficult as I've not come across this copper tape before and a jig would be required to get it anything like accurate.

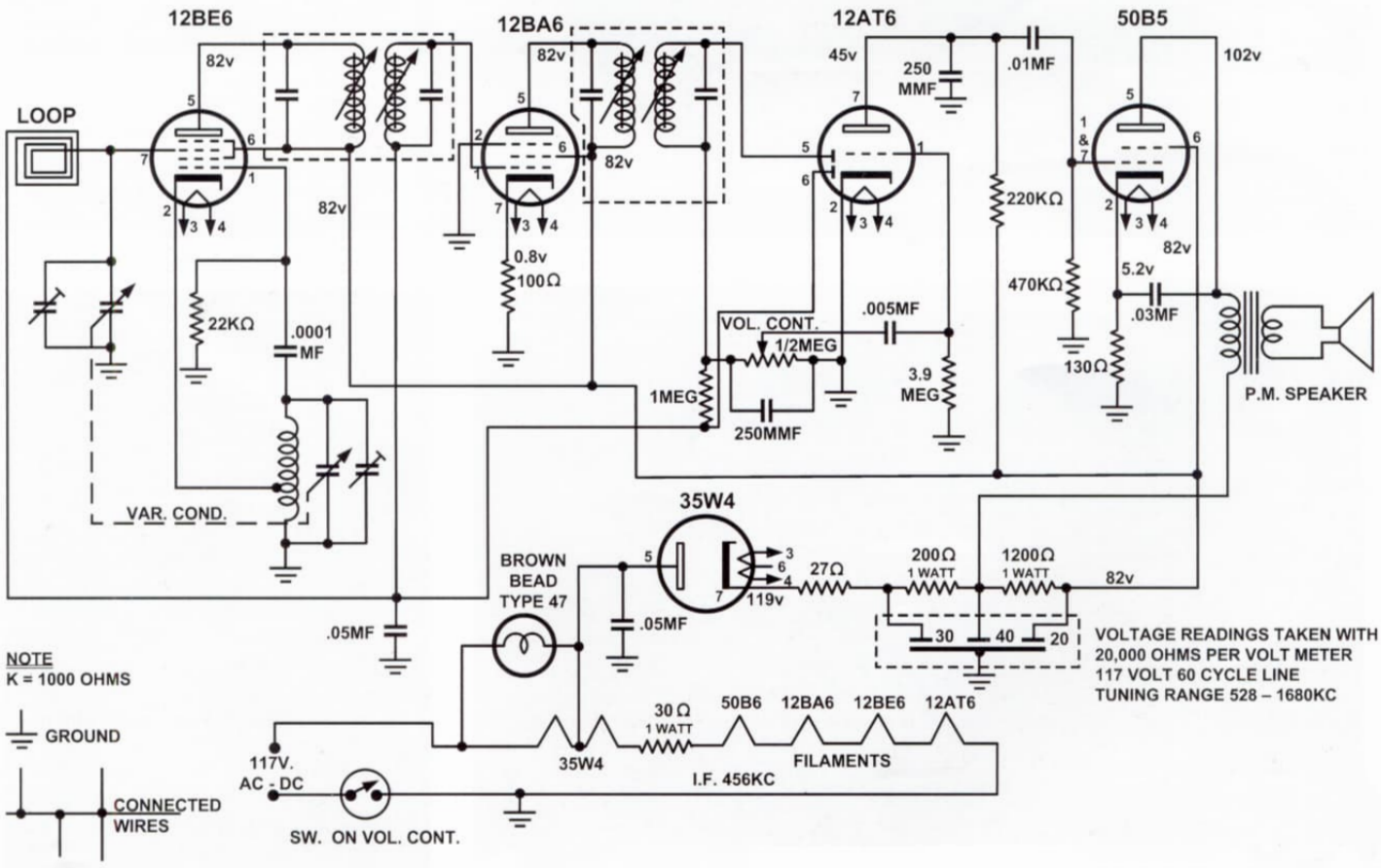
The copper tape windings can be separated using a modelling knife and held in place with masking tape but this is only a temporary solution.

As this frame aerial appears to be the heart of the set and I'd like to keep it as original as possible, I decided to follow the previous repairer's solution and glue the original back down.

After separating and holding the windings in place with strips of masking tape an inch or so apart, I applied some glue in between the strips keeping the separation and re-gluing the copper tape back to the hardboard, for this I used Araldite, lightly warmed up with a heat gun, this makes it very runny so it runs in between the windings, it also makes it set very fast so you have to work fast, this was best done in small batches.

This worked quite well and the masking tape was removed when the Araldite had

FADA 740



set. The finished job is a little unsightly but didn't impair this set's excellent performance and it has still got its original frame aerial.

The cabinet is a little tired, the surface of the Bakelite appears a bit coarse in places and there are two major cracks, these appear to be stress cracks rather than damage, evident by a definite gap and slight miss-alignment in the crack, damage cracks usually fit back together perfectly and are easily fixed with super glue sucked into the crack by capillary action.

The first of the cracks in this set is on the front top right hand corner, this is only about an inch long and self supporting, it doesn't require repair and trying to fill it would only make it look worse, so best left alone.

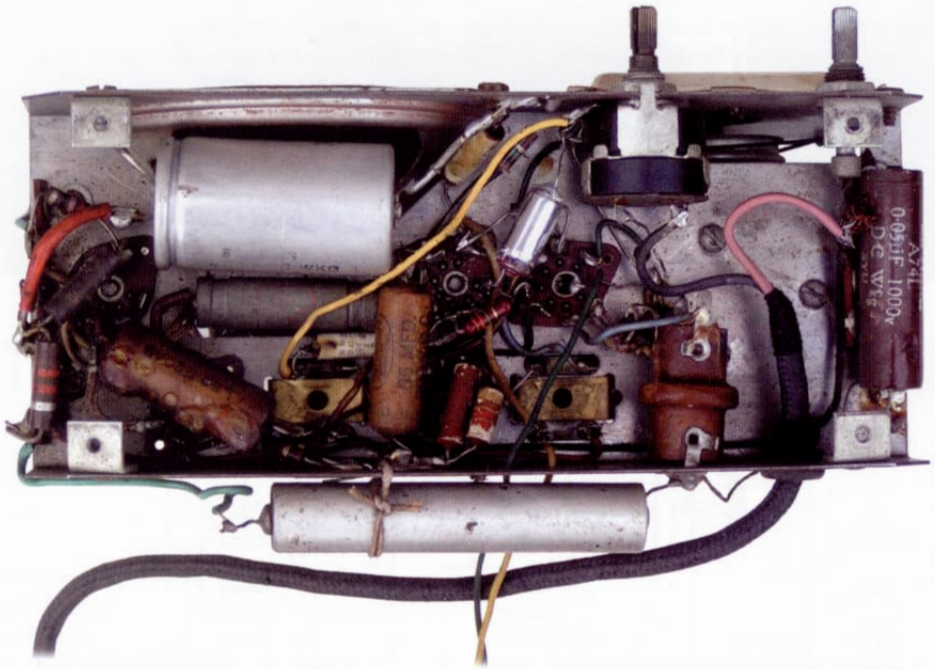
The other crack is along the whole length of the left side just under the moulded grille, the angle in this grille forms a thinner strip in the Bakelite and weak point in the cabinet, this required a strong repair to re-instate the structural strength of the cabinet, fortunately this angle also forms a nice trough inside the cabinet, this was easily filled with Araldite and will be thick enough to give it bit of extra re-enforcement, realigned and held its original position with masking tape stuck on the outside of the cabinet while the Araldite sets.

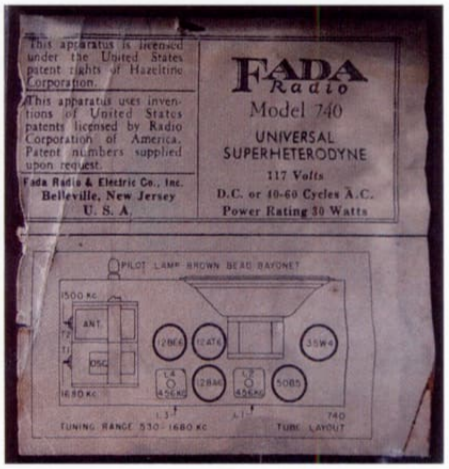
With the repairs to the aerial and cabinet, I didn't feel the need to disguise the replacement capacitor and resistor to look like types of the correct period, just local components to hand, as you're not going to see them.

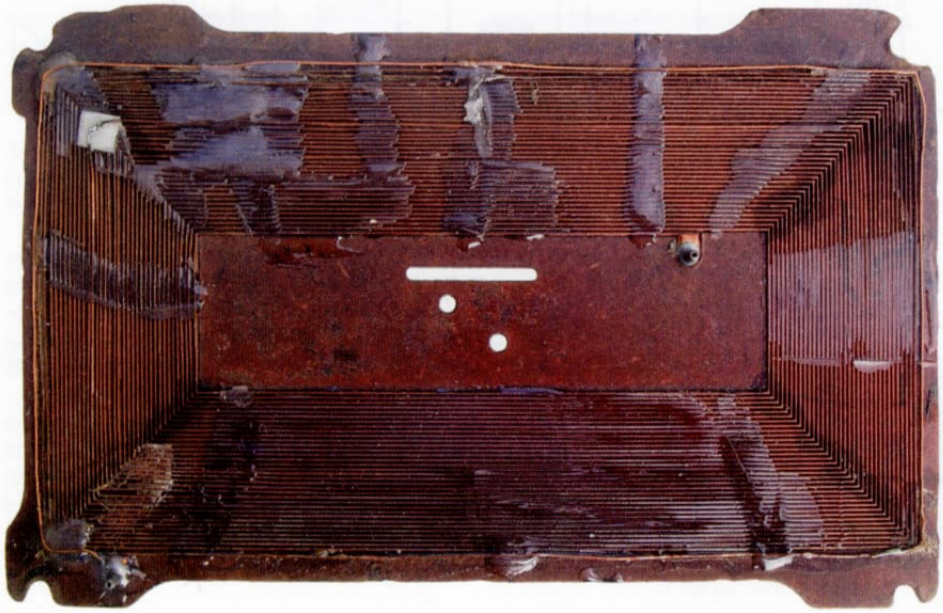
The cherry on the cake was in playing a CD recording I have of 'The Chesterfield Broadcasts' A New York radio show from 1940...

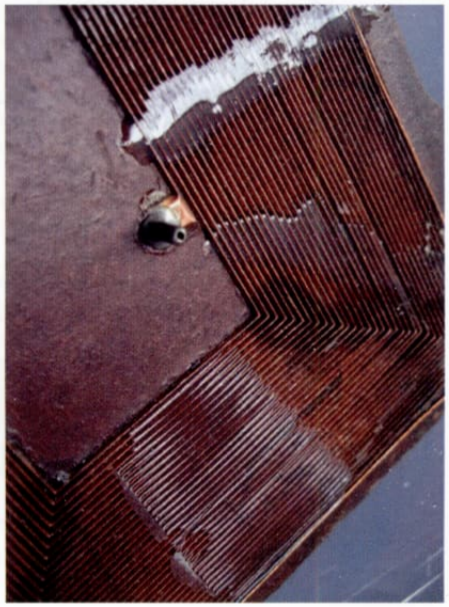
This is quite an interesting little set a little different from the norm, I managed to acquire a circuit diagram, a bit tatty so I've redrawn it trying to keep it as close to the original as possible, I only gave the chassis a light cleaning so other than my repairs the set's still as original as possible.

The cherry on the cake was in playing a CD recording I have of 'The Chesterfield Broadcasts' A New York radio show from 1940, The Andrews Sisters with the Glenn Miller Orchestra interspersed with Chesterfield cigarette advertisements. This was played through my nearby 1 Mc/s modulated oscillator and really demonstrates this little set at it best, (albeit seven years younger than the program on the CD) and gave a first class step back in time demonstration to my young colleague, a real window on 1940's New York on a radio of that time. (CD No:- BMG 09026 63113 2)





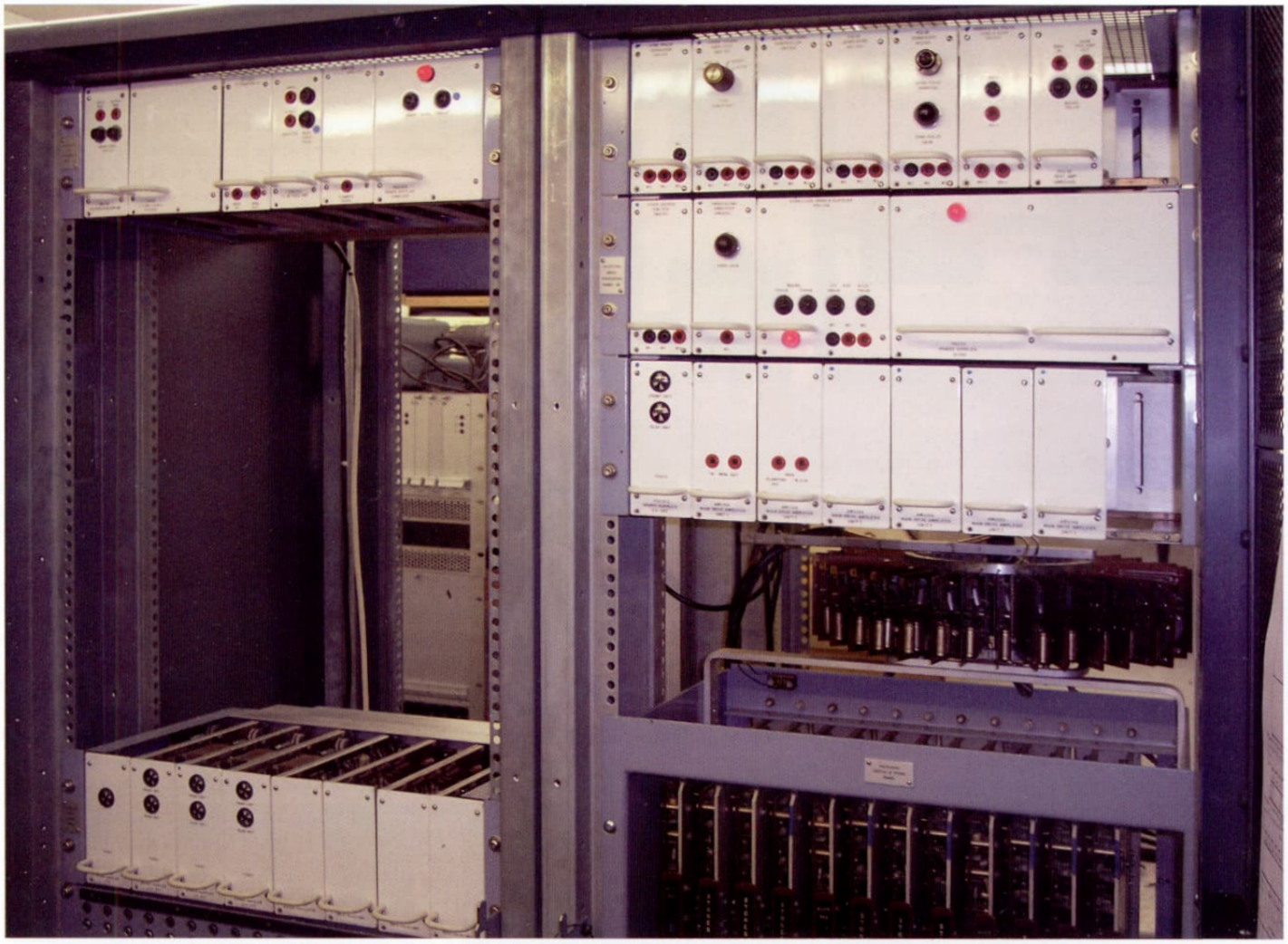




So you want to build a standards converter revisited. Again!

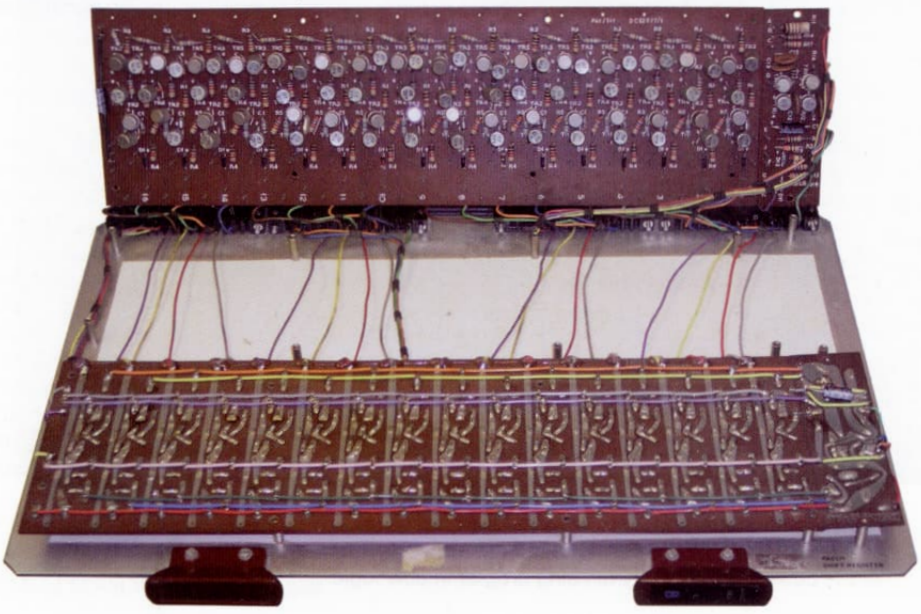
Yet more thoughts and reflections on generating signals for historic TVs. Jeffrey Borinsky FIEE CEng

It is 5 years since I last wrote about standards conversion. My articles in 2002 and 2006 summarised the state of art at those times. The main development since then is the dominance of Aurora converters.



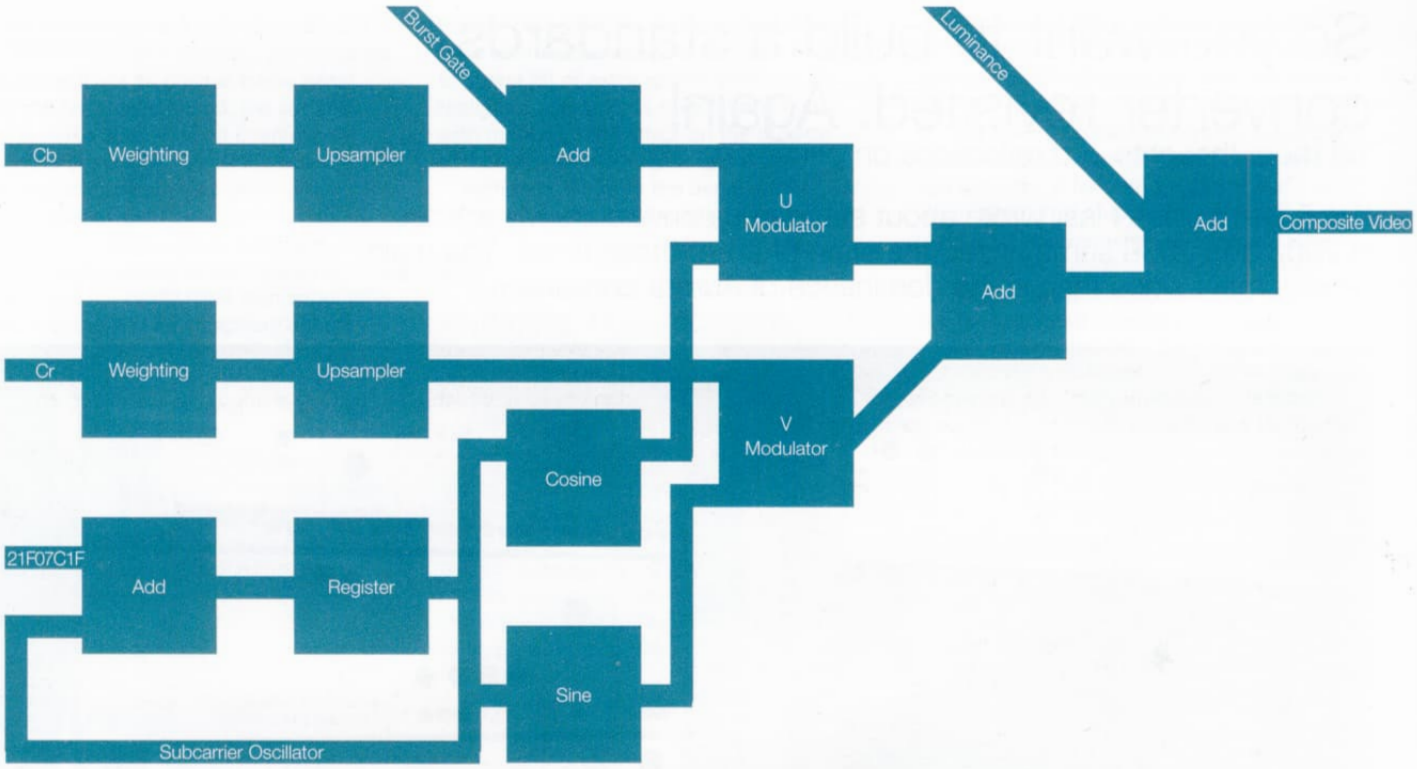
Above: Malcolm's CO6/501 – General view

Below: Malcolm's CO6/501 – Low speed store



Aurora SCRF success

When Darryl Hock designed the diminutive Aurora SCRF converter I doubt he could have predicted its success. Not only does it give excellent picture quality, it is also exceptionally easy to use. Just connect it to a small power supply and it will deliver test card with tone to your vintage TV. At the time of writing almost 500 of the single standard SCRF converters have been sold. The vast majority have been supplied to the UK for use with 405 line sets. A few have been supplied for 819, 441 and mechanical standards. At $235 + postage (currently around £165 plus typically £35 customs fees) the price was low enough to find a significant market. Quite a few enthusiasts have bought more than one, either for running individual TVs or perhaps to recreate a dual channel BBC/ITV environment. Reliability is excellent with just a single reported failure in



NTSC coder block diagram

service. Actually it was dead on arrival, due to a soldering problem on the big Xilinx FPGA (Field Programmable Gate Array) chip.

There have been 3 iterations of the SCRF hardware, mainly to avoid the need for users to remove the cover to select certain functions.

I offer a Europe based support service for the SCRF. I have upgraded the firmware in a few, reprogrammed a couple to a different output standard and liaised with the British Heritage TV Group who needed a special RF channel 4A for their engineering trials. I hope these will have been successfully completed by the time you read this.

Aurora world converter

The SCRF has some limitations. The FPGA has a limited amount of memory within the chip, sufficient for several whole lines of video data but not whole frames. Hence it cannot change the frame rate, something that requires a much larger memory that can hold at least an entire frame. This means that the Baird 240 line 25 frame and RCA sequential colour standards are not feasible. To overcome this and also to provide the ultimate in flexible standards conversion Darryl designed the WC-01 World Converter. This will convert from 525 or 625 to any historic standard selected by simple user controls. It includes a universal RF modulator with settings for all historic channels. Low cost was not a priority for this product, it sells for over $900. This accounts for the limited sales. While it is undoubtedly a superb piece of engineering you can buy 4 SCRF converters for the price of a WC-01. It has been used in the UK to demonstrate 240 line pictures on a Marconiphone 702. The results were flickery as might be expected but entirely watchable.

405 NTSC colour

In my previous articles I said:

A clever approach would be to do the whole NTSC encoder digitally in programmable logic. I reckon this will need rather more programmable logic resource than the whole of the rest of the converter.

Darryl and I discussed this possibility in some detail and we think it feasible but he has not explored it in practice. For once I was right and we were sure that the coder would consume a lot of FPGA resources. There would be no hardware changes, purely new code for the FPGA. This would be a demonstration of the power and flexibility of using programmable logic.

Darryl succeeded again. The only hardware change is a larger FPGA which fortunately could be fitted on the existing PCB. Actually when you try to do it, a coder uses a lot of logic but isn't too hard to design in an FPGA. I've done a full broadcast grade PAL/NTSC coder for a client and the essential core of the coder was simpler than I expected. Let's have a look at how it's done. It's going to get rather technical in places so hang on for a bumpy ride. FPGAs are usually designed using a high level hardware description language, usually VHDL or Verilog. Both Darryl and I are familiar with VHDL, in particular as it is applied by the Xilinx tools for their FPGAs. The Xilinx tools take VHDL code and synthesise how the hardware is configured within the FPGA. This process is largely automatic though the designer can intervene in many ways to optimise the design.

These are the essential functions of an NTSC 405 coder. Apart from the 405 and sample rate conversions, exactly the same steps would be needed in a traditional analogue NTSC encoder.

- Convert the decoded colour difference (Cb and Cr) signals to 405
- Apply weighting factors to convert Cb to U and Cr to V
- Increase the sampling rate of the U and V colour difference signals
- Generate burst gate and add this to the U signal
- Generate quadrature subcarriers on U and V axes
- Modulate the colour difference signals on to the subcarriers
- Add modulated U to modulated V to make chroma
- Add chroma to luminance

Decoder chips, such as the TVP5150 used in the Aurora SCRF, give colour difference outputs as well as luminance. In most SCRF converters the Cb and Cr colour difference signals are ignored. In the NTSC 405 version they are converted to 405 in exactly the same way as luminance. No innovation needed, just duplicated line storage and interpolators.

The Cb and Cr signals cover the digital range 16 to 240, with 128 representing the central zero point. The U and V signals specified in the NTSC (or PAL) standards have a different range so they need to be multiplied by constants. Here's how it might be done in VHDL. You don't need to know VHDL to understand what's happening. The synthesis tools will look after the exact implementation. You only have to worry if FPGA resources are in short supply.

```
U <= Cb * Cb_to_U_WEIGHTING_FACTOR;

V <= Cr * Cr_to_V_WEIGHTING_FACTOR;
```

The Cb and Cr signals emerge from the decoder at 6.75MHz sampling rate. Weighting them to U and V leaves this unchanged. You can't do NTSC coding at this low sample rate because you can't represent 3.58MHz subcarrier with 6.75MHz sampling. Mr Nyquist's famous rule says this needs at least 7.16MHz. At some point the coded chroma will have to be added to the luminance so they will need to be at the same sample rate. Darryl already upsamples luminance from 13.5MHz to 27MHz to ease the analogue output filter so it makes sense to upsample U and V to 27MHz too. The simplest method is to repeat each sample 4 times but this is not very satisfactory. This is a job for a FIR or transversal filter. A really high quality filter needs lots of multipliers and adders. Fortunately the bandwidth of the signals is already limited by the original PAL 625 input to the decoder so only a modest filter is needed.

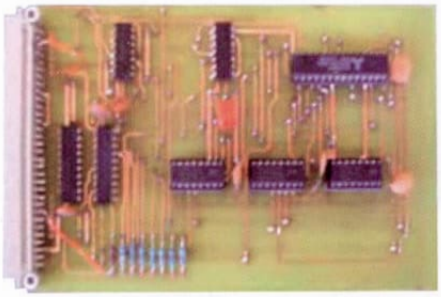
The burst gate is timed from the line sync datum. The only refinement is a small lookup table of values so that the burst edges are nicely shaped. This is then added to the U signal. In NTSC, unlike PAL, there is no burst on the V signal.

Subcarrier generation is a little more complex. A DTO (discrete time oscillator) is an adder/accumulator which can generate digital sawtooth waveforms at up to half the clock frequency. Typically we might use a 32 bit accumulator. For a clock frequency of 27MHz and subcarrier of 3.57945455MHz the coefficient is 2^32 * 3.57945455MHz/27MHz = 569408543 or 21F07C1F in hexadecimal. The sawtooth output of the DTO represents the phase of subcarrier. Sine and cosine waveforms are made from the phase data using lookup tables that reside in the RAM blocks found in the FPGA. You can do this the hard way using a spreadsheet to calculate all the values and declare the memory contents but Xilinx makes life easy for designers. Their tools include a facility called Coregen which automates the design of many useful functions which happen to include sine and cosine tables.

There is little point in observing the nicety of IQ axis modulation with narrow band Q which was specified in the original NTSC standard. As a result the modulators are very simple. Modern FPGAs include multiplier blocks. Even if they didn't, the VHDL synthesis tools would create multipliers from ordinary logic cells, albeit using rather a lot of cells. Here are the modulators and subsequent processing from my own coder design. This is only very slightly simplified from my own code. Again you don't need to understand VHDL to work out what's going on.

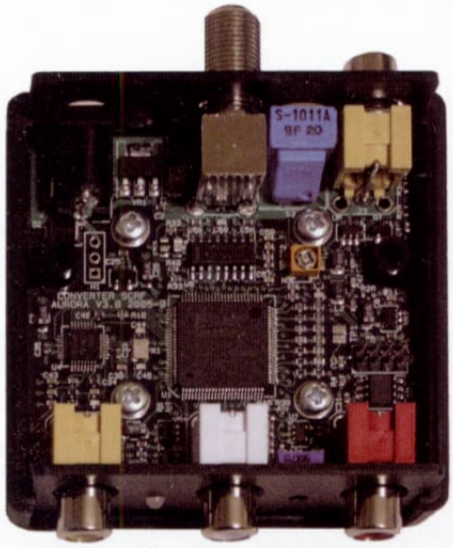
```
U_MODULATED <= (U + BURST) * U_SUBCARRIER;

V_MODULATED <=  V          * V_SUBCARRIER;

CHROMA <= U_MODULATED + V_MODULATED;

COMPOSITE_VIDEO <= LUMINANCE + CHROMINANCE;
```

As if by magic you now have a full NTSC signal. There are lots of details which would obscure this summary. Such as timing,

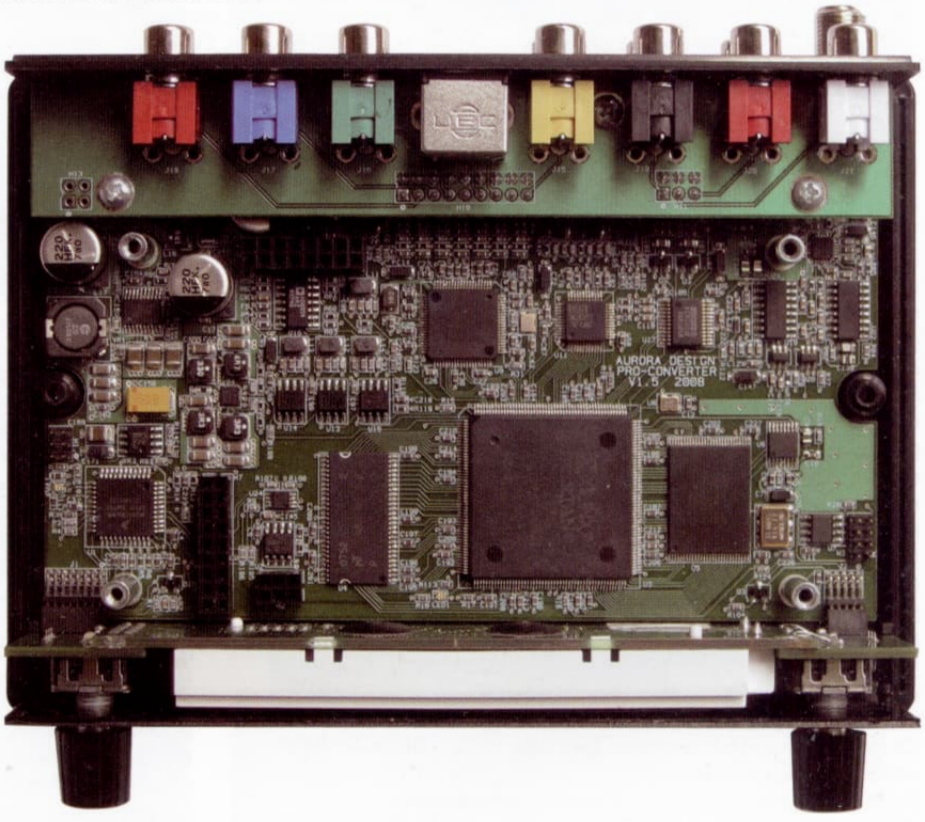


A line store from emerald48's converter

Aurora WC-01 World Converter



Aurora SCRF Converter



Aurora WC-01 World Converter inside

word lengths and representation of signals but these are a normal part of programming an FPGA using VHDL rather than specific to an NTSC coder.

Looking forwards

Where will standards conversion be in a few years time? It's difficult to see how anyone could improve on the Aurora SCRF or make it much cheaper. The only way to do that is large scale production which just isn't going to happen. We will need to face the gradual decline of 625 and 525 systems. Analogue PAL and NTSC will be available from most video devices for some years but eventually they will die out. Then we will need a box to convert from HDMI, or whatever interconnect is then in use, to 405. It might be simplest to rely on HDMI to PAL/NTSC converters which will almost certainly be available for a long time to come. Conceptually it's not hard to design an HDMI to 405 converter but the Digital Rights Management associated with HDMI could make this unduly difficult.

Looking back

The world's first electronic standards converter was the BBC's CO6/501. Malcolm Everiss, well known for designing the Domino 625 to 405 converter, has restored one of these monsters to working order. One simple but lengthy and tedious job was replacing many hundreds of electrolytics. There were also lots of problems with old germanium transistors, notably the ASZ20 and OC140. The ASZ20 was very unreliable and used in great numbers so the only way was to find a suitable silicon replacement. The OC140 is a unique symmetric device where you can swap collector and emitter. There is no satisfactory replacement and even NOS devices don't always work. Malcolm says it's now about 95% working. Even when new, maintenance must have been difficult, so Malcolm has performed a herculean task to get it to work again. It's hardly surprising that the BBC designed the digital CO6/509 which is a fraction of the size, works better and is also a lot more reliable. Malcolm has restored one of those too.

What else

Just because an excellent converter is available at a reasonable price that's no reason for enthusiasts to stop experimenting. A man in France is taking his first steps to generate 819 line signals using FPGA methods. Another in Germany is attempting to build a copy of David Looser's early design which was based on ordinary TTL devices. You can learn a lot from such experiments even if the results don't quite justify the means. My warning from earlier articles still stands; it's not easy to build a standards converter.

Which leads me to a mystery. A man known only as emerald48 put a video on Youtube showing his own converter which he claimed was cheap and easy to design and build out of standard logic parts. All credit for his achievement but another video, now gone from Youtube, shows that it's not as simple as he claimed. There are about seven handmade Eurocard size PCBs, each with various chips. Mainly ordinary logic but also some memories and other devices. I would estimate the overall complexity as about equivalent to Dave Grant's Dinosaur. This sort of design is certainly not cheap. It's also quite complex, even if the principles are simple enough. I have managed a poor quality screen grab of one the five line store cards.

References

All my previous articles about converters and conversion can be seen on my website www.borinsky.co.uk Here are the references to those published in the BVWS Bulletin. Earlier articles from 405 Alive and Television can also be found on my website.

Borinsky, J.D., 2006. *So You Want to Build a Standards Converter Revisited: Some further thoughts and reflections on generating 405 line signals.* BVWS Bulletin,31 (3), pp.24-27.

Borinsky, J.D., 2006. *Aurora Standards Converter With RF Modulator: A review.* BVWS Bulletin,31 (2), pp.14-15,33.

Borinsky, J.D., 2005. *Aurora Standards Converter: A review.* BVWS Bulletin,30 (2), pp.32-34.

Borinsky, J.D., 2002. *So You Want to Build a Standards Converter: Some thoughts and reflections on generating 405 line signals.* BVWS Bulletin,27 (3), pp.18-24.

Borinsky, J.D., 2002. *Domino 625 To 405 Standards Converter.* BVWS Bulletin,27 (3), p.43.

Links

http://www.tech-retro.com/Aurora_Design/Home.html
Aurora standards converters

http://www.405-line.tv
The British Heritage TV Group aims to provide a 405 line broadcast service on Band I

www.bbc.co.uk/rd/index.shtml
Many of the BBC Research Department reports are available here including several from the 1960s and 1970s that are relevant to standards conversion.

www.vintage-radio.net
Latest news about standards converters is likely to appear here first

http://en.wikipedia.org/wiki/Upsampling
Further detail on upsampling digital signals

http://www.youtube.com/watch?v=RJVCA2OvQng
A video by Malcolm Everiss of his restored CO6/501

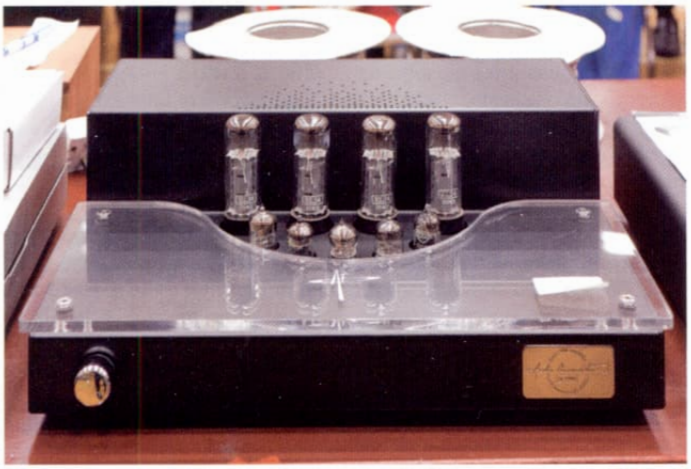
http://www.youtube.com/watch?v=w1DsM2_LApc
emerald48's somewhat mysterious converter in action

Queries and responses from the floor at the BVWS AGM, 2011

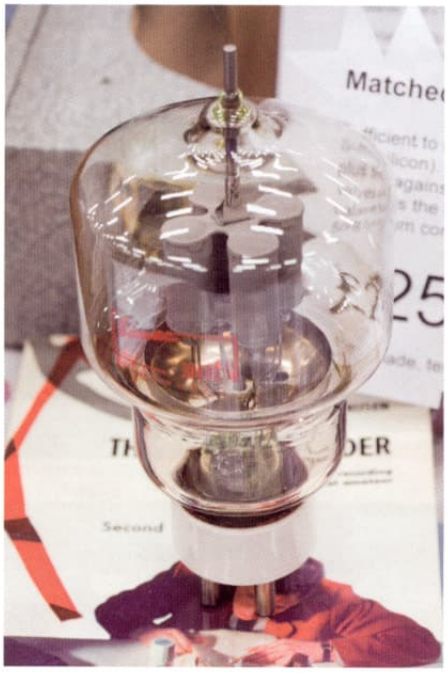
(Q) Entry to the hall took ¾ hour today (personal experience of questioner). Could the practice of selling stickers for swap meets down the entry queue be introduced?
(A) We will introduce ticket sales along the queue at Harpenden, as at NVCF. This WILL require you to show your membership card and will only be performed up until 5 mins. before opening time.
(Q) Should back numbers of the Bulletin be put onto DVD?
(A) We certainly could do this, as everything from 1994 is archived electronically. We will look into doing this in 2012.
(Q) Will the new BVWS calendar be an annual publication?
(A) We are happy to say YES! Providing the Society's financial state allows.
(Q) Is anything needed for the TV celebration later this year?
(A) Yes a great deal of work and organization is needed, but we are having trouble getting a decision on a date out of the Alexandra Palace management. (This has now been resolved, 13th November 2011.)
The following questions and comments were voiced on the current auction procedures:-
(Q) Could payment for items won be made without waiting until the end?
(A) This is already possible but is by prior arrangement
(Q) Could early payment for just two items be considered?
(A) We already operate early cash up by prior arrangement with the auctioneer. This is for those who need to leave for trains, buses and international ferry crossings.
(Q) Could there be a half time cashup?
(A) We could operate this providing each person had only one or two items to collect and pay for.
Note: This was trialed on the day, it is believed that the questioner had already left so did not see the disruption this caused to the auction flow or the eventual lengthening of proceedings by 42 minutes, in which time we could have done a full cash up and cleared the stage, as is the usual case. It also means that the porters who work very hard do not get a break! Therefore we will in future only operate this by prior arrangement with the auctioneer.
(Q) Could a video display be used to save having to hold up items?
(A) This is in theory possible, but only at Harpenden where there is a drop down screen installed. The Society would have to purchase the required equipment and then store and transport it to each event. After some consideration it was thought that it was not necessary. The porters also thought it would take some of the fun out of the auction for those participating and make the whole proceedings slightly clinical.
(Q) What limits the number of lots?
(A) The size of the van we use to bring the items to the hall, the estimated finish time of the auction and the auctioneer. It is worth pointing out to anyone who thinks the auction is too large, that the commission raised is what pays for all of the extra's like the DVD's, Calendar and supplements.

Audiojumble 2011

photographs by Carl Glover




QUAD 303
LEAK

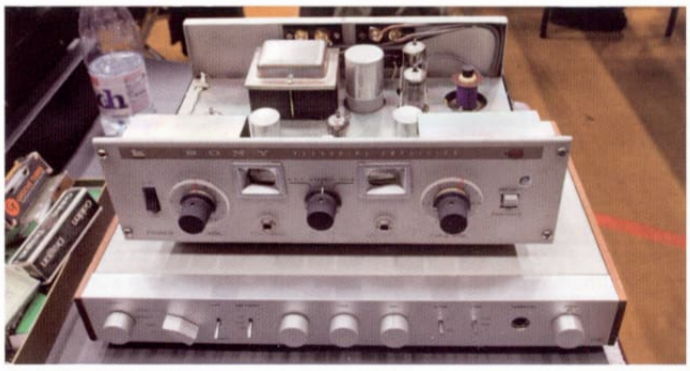

Matched
Second


SONY


Ferguson
Ferguson


VALVE CHARACTERISTIC
PETER PARKER TV
THE CAVE—VALVE DATA MANUAL


SOUND CITY



McMichael Duplex Four – a chance discovery

by Ray Bayliss

It was in 2006 that in connection with my other interest, namely vintage motorcycles, I attended a classic vehicle rally at Cranleigh, Surrey. In addition to the vehicles there were various stalls and on one of these was a tatty leather covered box which at first glance looked like an old portable gramophone. Opening the box I discovered that it contained not a gramophone but a McMichael Duplex Four Type S portable wireless and apart from a little dust and dirt it looked perfect!

I had seen a picture of this set in Radio Radio and liked the look of it. Seeing it for real more than confirmed this appreciation. Unlike many portables of the time it had been designed as an integrated whole and was not made up from various manufacturers' bits and pieces. Sufficient to say, that after some haggling it was mine!

On getting the set home I did some preliminary checks with an AVO which revealed that the valve filaments were ok, there was resistance between HT+ and HT– which was unacceptable on a battery set. Where the HT was permanently connected, only the LT supply switched. Also, there was no continuity between the output valve anode and HT. It would have to be dismantled. The battery compartment and valve cover can be removed by means of a pair of nicely–made spring catches. Next, the control panel screws were removed, which enabled the panel to be swung upwards revealing most of the components and connections to the aluminium box/chassis which contained the valveholders and intervalve transformer. It also revealed the leads going through the sides of the case to the lid which houses the loudspeaker and frame aerial. Nothing appeared to have been touched since the wireless' manufacture in 1932!

I was now able, with the aid of a testmeter to work out the circuit and inspect the components. Two 1µF decoupling capacitors were leaking so I disconnected their positive ends leaving them in situ and wired in two small, modern components. Further inspection revealed that the RF choke in the first valve anode was open circuit, with Sod's law declaring that the break was on the inside of the winding; it was unwound and rewound using the original wire The other component with a problem was the 25Ω volume control/switch which was oxidised and giving intermittent contact. Being rather thick wire this was easily remedied by rubbing down with fine emery paper and giving it a squirt of contact cleaner.

Now it is time to see why the loudspeaker is open circuit. The moulded bakelite loudspeaker plus frame aerial housing was removed from the lid giving access to the loudspeaker connections. The winding was tapped with a .001µF capacitor attached to the tapping point. The smaller section of the winding was open circuit so I decided to try using the main section only, by moving the HT connecting wire to the tap.

Having got the set working I turned my attention to the cabinet exterior. The leatherette covering had the surface scuffed in places showing brown under the black finish plus the leather of the carrying handle had decayed and was breaking up.

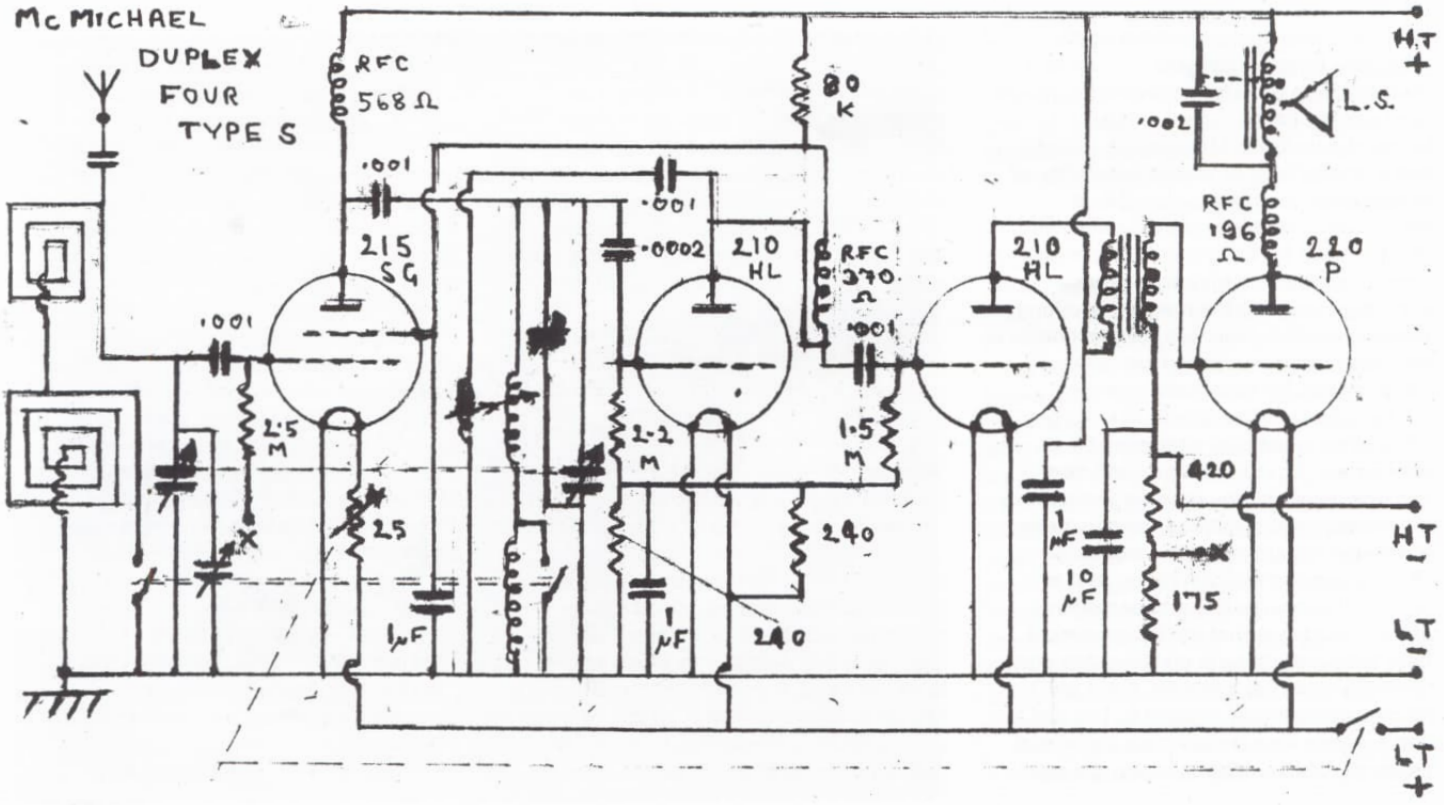
All the valves dispayed full emission when inspected on my AVO valve tester although the output valve was probably not original, being a Marconi LP2, not a Cossor 22OP. The circuit provides automatic grid bias, so all that was necessary to power up the radio was HT and LT. Not knowing what voltage was recommended for HTI decided to use the 90 Volt rechargeable battery I made up some time ago and for LT a small 2 volt Cyclone cell.

Switching on with the tuning set to Long Wave 1500 metres and setting the volume/selectivity control, (V1 filament voltage!) to approximately halfway I was soon listening to Radio 4. Moving the 'adjust' control to align the RF tuned circuit increased the volume some more. Finally the reaction/sensitivity control was tried and proved smooth in operation. In fact all the controls were easy to use, the only disconcerting factor being the lag in the volume control caused by the filament of the Screen Grid valve warming or cooling; perhaps not the best method although it appeared to be quite common practice at that date. The sound quality being acceptable I decided to leave the speaker winding as it was for the time being.

Having got the set working I turned my attention to the cabinet exterior. The leatherette covering had the surface scuffed in places showing brown under the black finish plus the leather of the carrying handle had decayed and was breaking up. The case was treated with black Kiwi Scuff–Cote intended for scuffed shoes. After several coatings and a good polish it came up rather well.

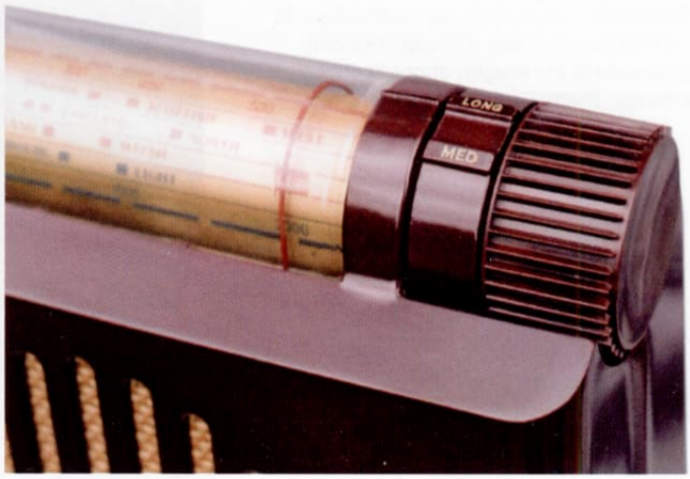
Finally, there was the handle to deal with. I had some black leather from an old attaché case which happened to be the correct thickness and with stitching holes already around the edge. I cut a long strip matching the width of the old leather, cut the length in half and put them back–to–back. I then sewed through the pre–existing holes to bring the two pieces together forming a sleeve around a spring strip from the original handle. I got the local shoe–repairer to buff and blacken the cut edges of the leather. When reassembled it looked as good as new.

I now have a set that when opened up looked as pristine as when it left Leslie McMichael's factory the year I was born. Externally, it was as acceptable as I could make it, what's more it works! The only downside is the weight, about twenty pounds. Thank God for transistors!



The Murphy A100 by Peter Nash

In the mid–1940's British radio manufacturers were trying to resume domestic receiver production which had largely come to a halt during wartime. With the new market conditions it did not take long before a need was identified for a so–called 'second set'. The lady of the house may have wanted to follow a play in the other room while hubby took down the football results. Dad could listen to a concert in the lounge while the kids ate their tea in the kitchen with Children's Hour to keep them amused. Quite a few homes already boasted, typically, a large 5 valve superhet gracing the sideboard in the lounge, but while this would have given a good deal of satisfaction, it was hardly portable. A typical wooden cased superhet of the period could have weighed in at a mighty 15 kilogrammes – that's fifteen bags of sugar to the housewife! Also, the receiver position was likely to be limited by the need for a fixed long wire aerial. Although most receivers were equipped with extension speaker sockets, the need to drape cable round the home coupled with the fact you could only have the same programme revealed limitations with the idea.



With the new miniature valve introduced, it became possible to produce compact receivers with a performance that matched or exceeded earlier types, certainly in terms of sensitivity. Many could operate satisfactorily from an inbuilt aerial. Power output could be around a couple of watts, within constraints of speaker size and the need for low power dissipation. Circuits were generally very simple superhets covering the medium and long wavebands. This then was the 'second set'. For many the 'second set' served perfectly well as their main receiver.

The subject of this article, the Murphy A100, is an interesting example of a second set. As one would expect from this manufacturer, the receiver would have represented good value for money, being a well–designed product consequent of the prevailing Murphy ethos. Just to look at this receiver imparts something of the confidence that its designer must have felt: everything is consolidated into one neat form. For instance, there are no protruding knobs to spoil it. The dial and controls form a distinctive cylindrical assembly which reposes along the apex of the cabinet. The annular controls are disposed symmetrically to each side of the dial. This is one of those receivers designed to look the same from the front or the rear. The dial has a double aspect so it can be read equally well from either side. The speaker grille is mimicked to the rear and provides ventillation. Controls and cabinet are all moulded from the same colour material thus reinforcing the general view of a unified construction. Unusually, there is no handle or any kind of recess to aid transportation: one has to carry the receiver in a similar way to picking up a brick. The size–to–weight ratio feels similar too; it's a solid little set. A handle would spoil it. Front to back only measures 4½" wide by 9" long, and 7½ inches high.

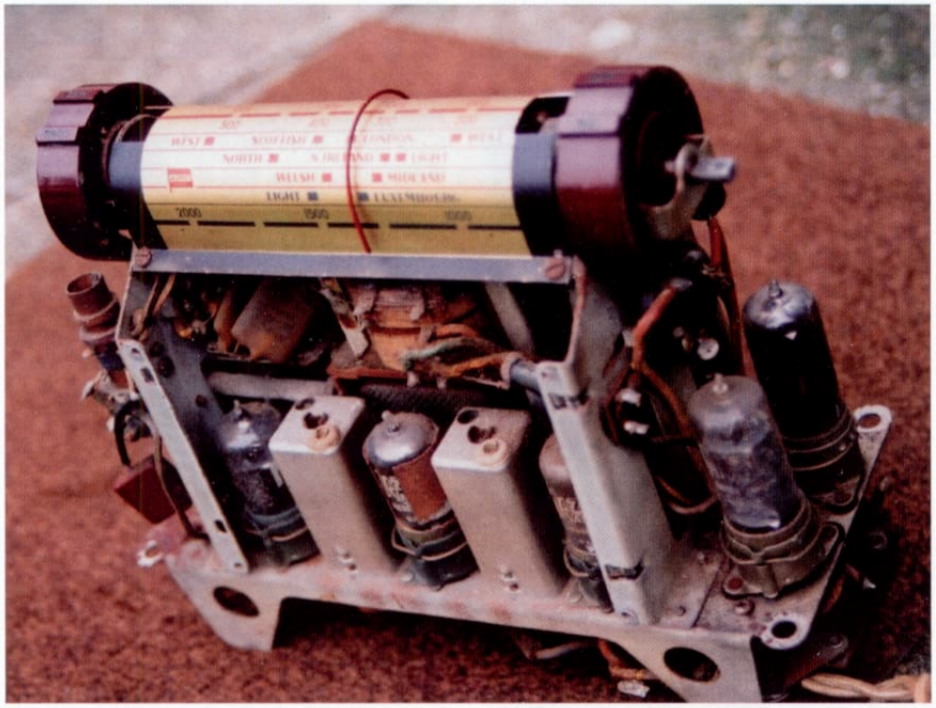
A feature rarely seen is the provision of a mechanical stop to the end limits of the tuning range, easing the strain on the tuning gang and its mountings

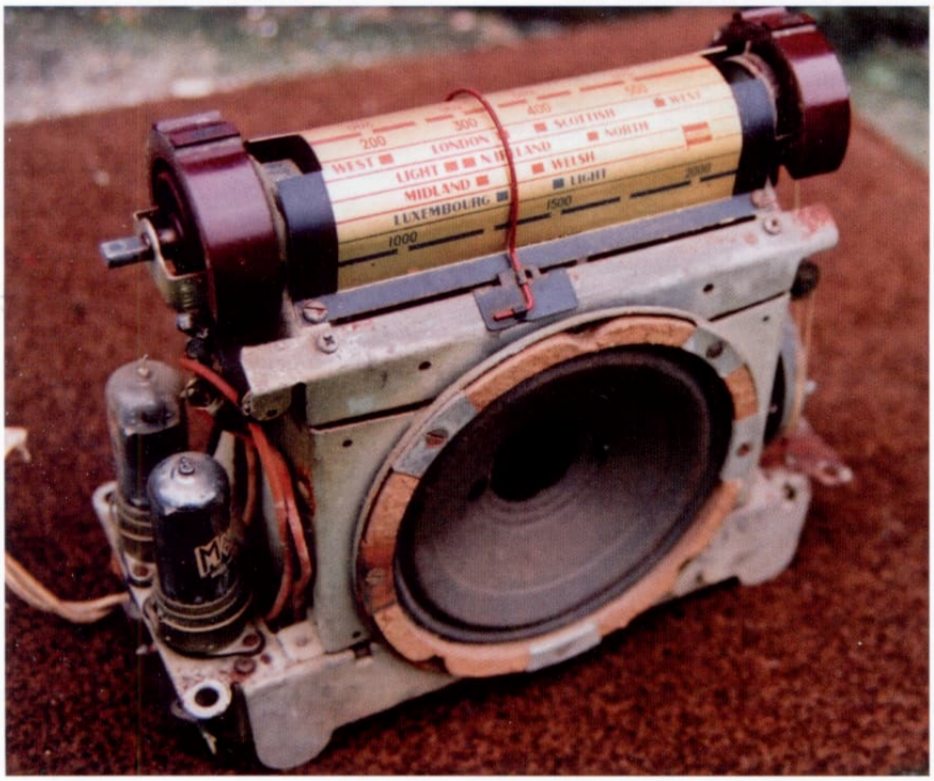
The circuit

The A100, which was released in 1946 is an AC mains–operated superhet covering the medium and long waves. There is no internal aerial, but so that it can be qualified as self–contained there is the option of using using a mains aerial. This is strictly for local station use only and even then its value is doubtful. The earth lead in the mains cable is left unconnected in the plug. At the receiver end, it is terminated in a standard wander plug which can either be inserted into the aerial socket or parked in an adjacent blank position so that another more efficient aerial can be used. Murphy seem to have acknowledged the shortcomings of the mains aerial (which we will examine soon) and later offered a modified version of the receiver, the A100F, which had a frame aerial.

The valve line–up (all Mazda) is: 10C1 frequency changer, 10F9 IF amplifier, 10LD11 demodulation, AVC and first audio amplifier, 10P13 output valve and U404 half wave rectifier. The circuit broadly follows conventional practice but a couple of points are worth noting. Firstly, use is made of an autotransformer in the power supply to

feed the series connected valve heaters. The autotransformer offers a substantial reduction of waste heat generated compared with a more conventional resistive dropper. Also, it is much smaller and lighter than its double wound counterpart. Both are big advantages for this type of receiver where everything is so enclosed. Secondly, the audio amplifier contains a circuit to give bass boost. Such a compact receiver with a small loudspeaker and no proper baffle is bound to have a poor low frequency response, so something to 'beef up' the output would be desirable. Murphy have achieved this aim by the surprising but judicious use of positive feedback. It's quite clever. Most simple bass–boosting circuits consist of an RC network which causes some attenuation at frequencies above, say, 500 Hz. In other words, there is a loss and more gain is needed to compensate. With the A100 system, there is no loss of gain and the only extra component required is one resistor! In normal practice, the output valve receives its bias by means of a series resistor in the cathode circuit. In many cases, to prevent loss of again, the resistor is bypassed by a large value electrolytic capacitor which is chosen to have a negligible reactance at the lowest anticipated audio frequency. 25 to 50 microfarads are common values. In the Murphy however, the electrolytic has a deliberately smaller value (10 microfarads) meaning that the cathode resistor is not completely bypassed for bass frequencies. A small resistance is inserted between the cathode resistor and chassis forming a potential divider. The junction of the two resistors, which contains the bass signal is fed, in phase, directly to the cathode of the preceding valve. Only a very small proportion of the signal is fed back otherwise increased distortion and instability would rapidly set in.





The chassis

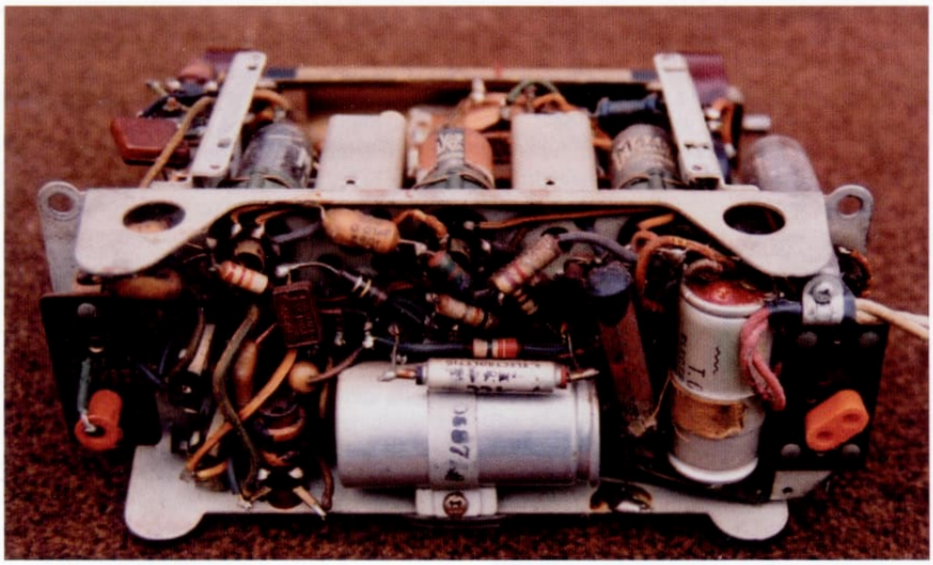
Removal of the base and threaded corner pillars allows the chassis to be slid out of the cabinet after removing the knobs. I would call it a 'high rise' chassis because the metalwork extends upwards on both sides to support the dial and controls. The loudspeaker occupies the void at the front and a slotted paxolin panel at the rear. The output and rectifier valves sit in the narrow space just beside the high rise. Removal of the paxolin panel allows access to the remainder of the valves and the IF transformers. Also within the high rise enclosure is the tuning gang, output transformer and, mounted surprisingly high up, the diminutive auto transformer. The loudspeaker magnet just about backs into the remaining gap. In fact, the power of the magnet and the confined space contrive to make removal of the speaker a difficult operation. Five screws around the speaker perimeter hold it to the front of the chassis. Once these are removed, the magnet snaps onto the nearest metalwork, calling for use of a lever to gradually 'walk' the speaker out. Replacing the speaker can be even more fun until at least two of the screws are back in. A feature rarely seen is the provision of a mechanical stop to the end limits of the tuning range, easing the strain on the tuning gang and its mountings. This is simply achieved by chassis pressings engaging with moulded stops on the tuning gang pulley.

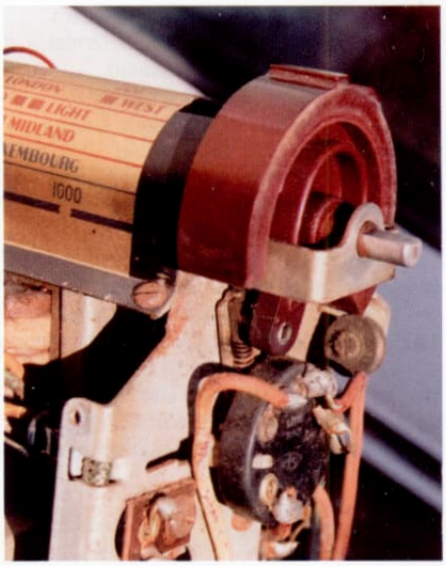
The chassis is a marvel of miniaturisation. One would think about the resultant heat from all the valves crammed into a small box but the only concession that Murphy have deemed necessary is a small aluminium heat shield inside one end of the cabinet.

Repairs

My example of the Murphy A100 was bought from an antique shop on the Isle of Wight. The receiver had generally been looked after, most of the problems being age–related. Initial inspection revealed that the volume control shaft had seized onto the mains switch actuator. Similarly, the tuning control and wavechange switch had seized together. Inside the receiver, lots of rubber insulated wire had been used, much of this visibly deteriorated and flaky, exposing the live conductors. The HT–smoothing electrolytic had grown a large boil in the rubber seal, the speaker cone felt graunchy when gently pressed and there was the usual complement of waxed capacitor suspects.

A drop of oil was left to work its magic on the seized control spindles while the wiring





was tackled. Some of it was absolutely fine to leave, being supple and in good order, but the rest was in a really dangerous condition. In this receiver, some of the cables are quite tightly bunched together in narrow spaces and pulled taut in close proximity to hot valves and other live parts, so it is essential that the wiring be in first–class condition. Unfortunately, this exercise revealed the fragility of the valveholders. The least disturbance to the tags or removal of the valves caused the paxolin retaining ring to drop out so all the tags would float about. Replacement of the valveholders on this chassis looked to involve an inordinate amount of work due to difficult access, so I settled instead for a repair by a drop of Araldite spread around the paxolin ring. The electrolytics were next to receive attention; all were beyond retrieval so were replaced. The waxed capacitors were down to around 100 kOhms insulation resistance at only 15 volts so again were replaced in all positions of audio coupling, HT and AVC decoupling. It was now safe to apply power.

Initial trials brought forth crackly, distorted and intermittent results. The distortion was cured by re–sticking the circular centring ring in the loudspeaker where the original adhesive had dried out. All of the other problems were traced to the valveholders. Mechanical fit of the valve was very tight but electrical connection remained poor. It seemed as if the valve pins were not quite long enough to reliably reach the sockets. Eventually, and after some difficulty, reliable connection was finally established and there was no further trouble. Definitely a dodgy batch of valveholders had escaped onto the Murphy production line.

To finish work on the chassis, an alignment check was given, a new mains lead fitted (3 metres long as it contains the aerial) and the embossed lettering on the mains and wavechange switches was repainted in gold.

For routine servicing, general accesibility for most of the passive components I've found to be fairly good, but there is no room to be untidy when making relacements. The brackets for the electrolytics can be released from one side and the mains voltage selector panel can be unscrewed and pushed aside (limited by the stiffness of the wiring) to make it a little easier to get a soldering iron tip beneath the output and rectifier valve holders. Having said that, I am glad that I did not need to replace the valveholders or the output transformer. For the latter only an extremely close physical replacement would do. When re–wiring it is necessary to spend that little extra time to dress tha cables neatly away from hot valves and resistors. most importantly, remember that the chassis is connected to one side of the mains.

Performance

Using the mains aerial was generally unsatisfactory. In my locality (North Surrey) at any time, one can generally expect to receive at least a dozen quite strong stations on medium wave alone. With the mains aerial, only about half of these were audible and of these again only half were usable without an intrusive level of noise. Even then, doing something mundane like switching on the kettle would introduce modulation hum. Of course, in other locations, especially away from the plethora of devices using switched mode power supplies that contaminate the mains with mush, results may be better.

The Murphy is much happier with a traditional type of long wire aerial; indeed, I believe when originally sold, it was supplied with twelve feet of aerial wire. If this extended to the nearest high point, at least that should ensure reception of all the locals on medium wave and three or four stations on long wave if you are lucky, but only if you are far enough away from anything using a switched mode power supply. On my receiver, coverage just about extended down to the local gold station on 197 metres but only with the oscillator trimmer wide open.

Tonally, the reproduction is very bright with little apparent bass. I have investigated the effect of the bass boost. It rolls in gradually from just above 500Hz to have most effect around 100–200 Hz. it counters the sharp low frequency roll off of the small speaker in a miniature receiver. The bass boost does make a subtle audible difference, mainly with speech and is worth it being there. The Murphy is not short of audio gain. For most local station listening I've found that the volume control only need be set to around 20 to 25% of its travel.

After an hour or so of operation, the cabinet does have warm areas but there are no hot spots as such. There are plenty of gaps around the casing and this helps the receiver to breathe rather better than one might expect. Murphy's far–sighted and uncommon use of an autotransformer was pivotal in reducing heat.

Conclusion

The radio was never intended as a long distance receiver but is perfectly adequate for its remit as a 'second set'. Cleaned up and polished it looks striking in its maroon and gold colours. I like the way that the controls and dial are incorporated, also the sound and solid engineering on the chassis. The Murphy is certainly a classic in my books.

A Transformer Shorted Turns Tester

by Stef Niewiadomski

A recent discussion on the UK Vintage Radio Repair and Restoration forum (Reference 1) stimulated my interest in designing and building a simple tester able to detect when a transformer has any shorted turns in its windings. I use the word 'transformer' loosely here: the tester will also work with single-winding inductors, specifically power supply chokes

In essence the tester measures the inductance and 'Q' of the winding by establishing a fairly small DC current through the inductor and then quickly breaking this current. This results in the magnetic field in the core collapsing, and inducing a voltage at the terminals which is proportional to the rate at which the current is interrupted and the inductance of the winding. A 'good' inductor is capable of generating a voltage of several hundred volts and this is used to flash a neon which gives a visual indication that the inductor is good. The stored magnetic energy in a 'bad' inductor is absorbed in the shorted turn(s) and hence the neon doesn't flash.

The tester checks mains transformers ('valve' and lower voltage ones), output transformers, and power supply chokes. I suspect it could also be used to check the windings on line output transformers and motors, but I haven't tried this.

Shorted Turns

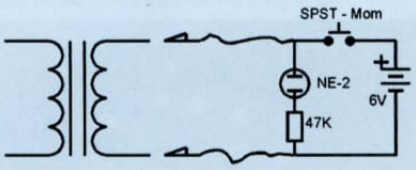
You might think that a few or even a single shorted turn in amongst many thousands of others is insignificant. This is not so: current flowing in just one shorted turn will be very high because there is very little impedance to oppose the current flow and so the turn gets hot. In fact this might be the symptom you first spot that makes you suspect something wrong with the transformer. The medium to long term effect of this is that more insulation is likely to break down and therefore more turns will become shorted which generates more heat, and so on. The short circuit might be caused by the breakdown of the insulation between adjacent turns on the same layer, or between turns in adjacent layers.

The Circuit Used

Figure 1 shows the circuit referred to in the forum discussion (Reference 2). I was concerned that when the momentary switch is made, the battery is connected directly across the coil with apparently no limit to the final current. Of course any coil has a DC resistance simply because of the length of wire used and so I presume the design is relying on this resistance to limit the current. For example a 240V mains primary winding uses relatively thin wire and might have a DC resistance of 200Ω or so. A mains power supply choke of 10-15H would have a DC resistance of typically 300-500Ω, which is about the same range as for a valve output transformer.

Figure 2 shows my adaptation of this circuit. By including R1 and SW1 I've given the option of having or not having a 1kΩ resistor in series with the battery. I've called the momentary action switch SW2 TEST, though it should be noted that it's the releasing of this button that tests the inductor.

Shorted Winding Tester



Works ONLY if all windings are open circuit – no external load. Connect clips to winding, then press button. If there is no short, the neon bulb will flash brightly. If there is a shorted turn, the neon bulb will either not light or light very dimly. Try it on a known good one to calibrate your eye. See the flash a couple of times then short the winding you're not connected to and try it. You should see flashes on no short, no flashes with the short. Contributed by Wayne Homer from an article in Popular Electronics.

Figure 1: The shorted winding tester circuit referenced in the UK Vintage Radio Repair and Restoration forum discussion

The neon and 47kΩ resistor arrangement have been replaced by the easier-to-obtain neon with an integral resistor typically found in the neon's housing. I used a neon with a clear plastic viewing window, rather than the more common red, orange or green, as I thought this would make it easier to see the neon flash. You can still get a 'naked' neon from Maplin, and experiment with the value of the series resistor if you want to. The polarity of the battery doesn't matter. The output from the tester is connected to the inductor via plastic coated crocodile clips marked +CROC and –CROC on the schematic.

Building the Tester

The photo (Figure 3) shows the tester I built. I strongly advise that you build the unit in an insulated plastic case, rather than in a metal one. If an internal wire were to touch the inside of an unearthed metal case this could result in the user getting a 'belt' from the inductor being tested, probably not lethal but definitely unpleasant. Also I advise that the unit is battery powered, and not powered from an external power supply. This is to protect any external supply you might think about using which might not take kindly to having spikes of possibly several hundreds of volts applied to its terminals. I used a PP3 battery which should give a long life bearing in mind the low value and briefness of any current used in a test.

For SW2 I used a Maplin FF98G (red) momentary action switch. The voltage generated by the transformer/inductor winding is directly proportional to how quickly this switch breaks the current path once it's established. This time is not normally specified for a cheap switch but I've found that this particular switch works well in this application.

The leads have crocodile clips attached and are secured to a P-clip inside the box to prevent their being accidentally pulled out of the box.

Testing a Winding

I suggest the first step of testing a winding is to measure its DC resistance to make sure that there is continuity between terminals. Also it's worth checking that separate windings are isolated from each other, showing that there isn't a catastrophic short circuit between windings.

To test an inductor (which has only one winding of course) simply connect the tester's crocodile clips across its terminals, set SW1 to have the 1kΩ resistor in circuit, press the TEST switch briefly and release it quickly, and watch the neon. It helps to have the test set up in a not-too-bright room to see the neon more clearly. Assuming the inductor is good then the neon will flash and its brightness will depend on the inductance of the winding. Note that the neon doesn't flash when the TEST switch is pressed, only when it is released. Now you can toggle SW1 and try the test again. The neon should flash even brighter now. The setting of SW1 makes a difference because it determines the current through the inductor which is broken when the TEST switch is released, and therefore the voltage generated.

With a mains transformer connect +CROC and –CROC across the mains or HT winding (that is the one with the highest DC resistance), having ensured that all the windings are disconnected from each other and from any external circuit, and test as above. Assuming the neon flashes then you can short one of the windings on the transformer and you'll see that the neon no longer flashes when the test is carried out. An output transformer is tested in the same way, that is, by applying the tester to the high impedance winding. If you now short circuit the loudspeaker winding of the output transformer you'll find that the neon doesn't flash any more as SW2 is released.

Avoid touching any of the terminals of the transformer or inductor being tested as you can easily get a shock from the high voltage generated.

How Long Do I Press the TEST Button For?

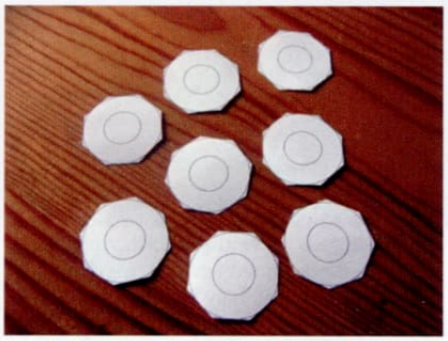
When SW2 is pressed the voltage from the battery is applied to the terminals of the inductor being tested (either through the 1kΩ resistor, or direct) and the voltage across the inductor immediately jumps to the battery voltage because initially the inductor acts as an open circuit. Current

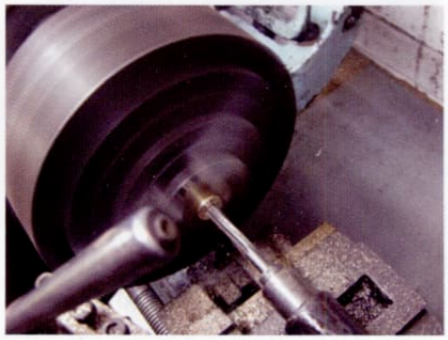
Article continued on page 43

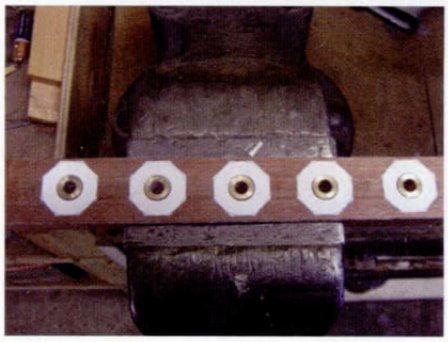
Making replica wooden radio knobs By Colin Wood.

Here's an interesting little project I decided to attempt on behalf of a fellow forum member who was willing to pay for a set of four replica wooden radio knobs making.

I own both woodturning and metal turning lathes so this would appear to be a pushover; surely there can't be much involved as it's only a matter of chucking four bits of wood and reducing them to size adding a decent finish completing the job easily in a couple of hours?







These knobs are quite special having facets or flats as finger grips arranged octagonaly with all edges nicely rounded; to the front there is a turned single bead. The original knob appears to be turned from a meranti kind of timber of which I had plenty in stock and is finished with a dark brown lacquer of some kind.

Mick the vintage radio forum member very kindly sent me the original knob to copy and I was keen to make a start. The weather as usual was dire and I decided to try to work around the car in the garage by pushing my Startrite combination woodworking machine right up to the car to give me access to both lathes.

I selected a length of 3/8 dia. Brass bar stock and cut off 5 lengths at 5/8". I started to face these in the Myford MF36 metal lathe but decided they looked a bit too light not allowing much wall thickness for subsequent drilling and tapping to accept a grub screw. Next I pulled out a length of ½" dia. Brass bar stock and once again cut off five lengths. Facing these in the Myford I thought it looks a bit on the heavy side? Measuring with the digital caliper revealed it to be 9/16" Oh dear now too thick; I wanted ½" dia but had non in stock although I still had the 9/16" bar. It was still cold in the garage but by now I was enjoying myself. At this point I thought about drilling the blind holes to accept these inserts and checked my large assortment of drill bits; having measured the depth of the hole and the total thickness of the original knob I was now in trouble; all my drill bits would break through the new knob front before reaching the correct depth for the inserts due to the length of the bit points including the spur point bits. I could grind a ½" dia bit down greatly reducing the point but this meant pulling the car out to gain access to the grinder.

Then I remembered I had a special 12mm bit that might be ideal with a short brad point. This bit would do the job at a pinch but now I needed suitable 12mm dia. Brass rod. Nothing for it but to start over and I turned five 12mm blanks on the Myford; these were faced; centred; through drilled axially at 5.5mm then run through with a ¼"reamer. Three hours later I finally had 5 brass inserts in my hand. In fairness I had two false starts; was very limited for space and had put all my tools away for winter. Normally I would never work with machinery in such confined space especially whilst wearing a thick coat but this wasn't normal; it was Yorkshire mid winter and I had an interesting project on the go.

> Making octagonal shaped radio knobs isn't as easy as it would appear as accuracy is needed or the knobs would end up looking strange

Next day it was dry so I could pull the car out of the garage allowing me to use the Startrite Combination Woodworker. I pulled the Startrite into the centre of the garage and plugged it in. From my stock of timber I pulled out a previously used length of 7/8" thick Meranti which had been fully varnished and known to be decent timber. I ripped this on the circular saw to 1 1/4" giving 1/8" extra allowance. It was then passed through the thickness planer removing the varnish from one face then turned over and run through once again to reduce it to 5/8" thick giving plenty of depth to play with.

Taking care to ensure the marks were down the centre I used a pointed tool adding indents where the holes needed drilling for the brass inserts allowing plenty length between each indent. The special 12mm drill bit was chucked in the drill press; a scrap piece of MDF was nipped in the machine vice to rest the timber on whilst being drilled and the depth stop was set by bringing the bit down onto the timber burying the short point then holding the bit in contact whilst one of the brass inserts was used to adjust the drill stop; this was done with care as a mistake could see the bit break through

whilst drilling as a blind hole was needed.

The holes were quickly drilled without fuss and a last small job was to grip each brass insert in the engineering vice and drag the hacksaw blade causing deep scratches into the brass; this would afford better grip for the glue; Normally I would have enjoyed taking my time and knurled the brass in the lathe but working like this wasn't normal. Then I could tidy up, put the tools, Startrite and car away bringing the brass inserts and bit of drilled timber up into the bungalow.

After dinner I glued in the inserts using epoxy. I did this in the kitchen after first protecting the work surface with sheets of paper. Masking tape was applied to the drilled face of the timber to protect it from epoxy as it was to be stained later. A match stick was used to mix the epoxy and apply it to the drilled holes then the brass inserts were firstly located by using a bit of wood to push them into their respective hole ensuring they went in straight then a quick trip into the workshop where they were pressed fully home using the large woodworking vice; two inserts were done for the first trip into the workshop followed by the remaining three brass inserts. Now after some four hours in total a short length of timber with five brass inserts added was sitting on the computer table where it was warm to let the epoxy harden. Expecting trouble along the way five knob blanks have been made although only four were needed. The inserts were a nice snug fit into the holes; too tight and the timber would have split. I was concerned about the thickness of the timber where the bit point penetrated and thought it might be prudent to add a curve to the front middle section of each knob just to be sure otherwise a small hole might appear when the knob was turned to size. A spare was available to experiment with.

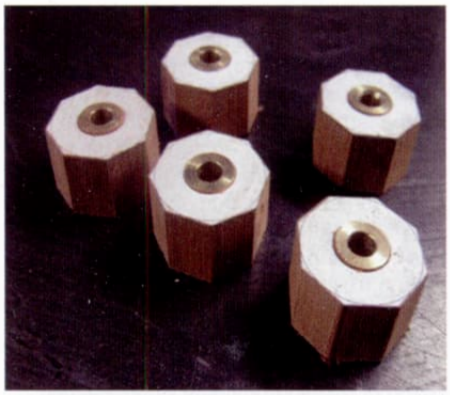
Making octagonal shaped radio knobs isn't as easy as it would appear as accuracy is needed or the knobs would end up looking strange; all the facets/ flats need to be the same length as each other and concentric around the knob's axis or the rounded sections between each facet will be unbalanced.

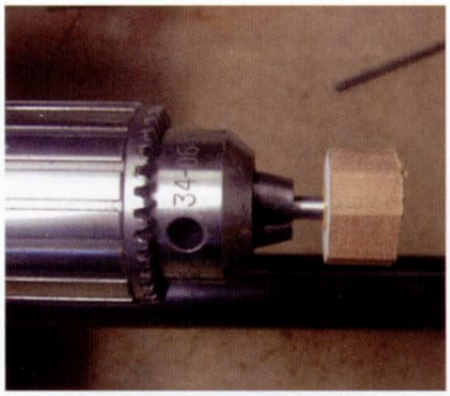
To ensure such accuracy I decided to once again use the idea I came up with whilst machining the gears for my wave winder restoration and use paper templates. The principle is simple but coming up with the idea in the first place was the difficult bit.

I'm still learning TurboCad basics causing me much frustration whilst I tried various ways of trying to draw an octagon inside circles. I could draw concentric circles dead easy and with great accuracy in seconds but adding an octagon took it to a whole new level. TurboCad is brilliant and selecting "polygon" I entered 8 for the number of sides but then the fun started because the next input was length and/or angle? I didn't know these but wanted to add the 1.0625" between two opposing lines as this measurement was known but this function wasn't available; I tried drawing parallel lines in the hope of dropping the octagon neatly between the lines; I zoomed the drawing in order to make it easier but again had problems. I tried magnetic point; I tried using snap and in the end set the drawing up using the grid taking the cross of the grid on 2" x 2" as the datum and tried using snap which worked great for the circles but didn't want to play when I tried adding the Octagon so after much trial and error finally won through and the drawing was then rubber stamped to give multiple templates; I had tried placing the octagon inside and outside of circles but couldn't get it to centre exactly; across the flats measured 1.0625 and the maximum dia measures 1.125". When I printed the templates off I ended up with a blank sheet of paper? In my eagerness to get stuck into drawing I had overlooked setting up the page details so more time was lost whilst I transferred the template drawings onto a page that could be printed. Yes I have a great deal to learn using TurboCad and can hear the members familiar with CAD howling with laughter but it's not so long ago that I couldn't even draw a straight line whilst using TurboCad.

Using sharp scissors I took my time and cut out eight paper templates; I had taken the trouble of adding the inner circle at 12mm dia to match the outer dia of the brass inserts. These brass insets were not pressed fully home as the spring clip on the original knob stands proud.

Previously when I've made wooden knobs I've cut the blanks out first then spent ages aligning to drill the tapping holes for the grub screws; this time the





obvious hit me; drill the holes whilst the inserts are still in the length of timber; a square was used to add lines and the hole centers were pricked; so simple if pointed out but easily overlooked whilst trying to plan each stage. I have a stock of 4BA socket grub screws so pulled out a 4BA nut and set about finding a drill bit that was a nice sliding fit but even this took ages; I tried all the bits in the garage and eventually found a suitable bit in the workshop so finally I drilled all five holes at tapping size using the drill press with the timber mounted in the machine vice.

Transferring the timber to the big engineering vice I ran a 4BA tap through using a tap wrench. Tapping brass dry like this always puts me on edge as the tap creaks and groans as it makes progress through the brass and care is needed not to break the tap.

The 12mm dia holes needed cutting out in the paper templates so I chucked a short length of suitable steel in the Myford and turned a punch; resting the paper templates on MDF the holes were then accurately punched out. Double sided tape was added to the timber and the templates were secured.

The blanks were then roughed out using the large Startrite bandsaw taking care not to cut right up to the lines on the template; after previously cutting a lot of metal the bandsaw blade could have been sharper but by now I had become too cold to carry on; feeling like this changing a large bandsaw blade didn't appeal to me although I didn't rush whilst cutting out the blanks as this would have been highly dangerous; I used a push stick to keep my fingers well clear of the cutting area because I wanted to retain all my fingers and both thumbs; the saw doesn't care whether it cuts metal; wood or me. I now had five knob blanks ready for the next stage.

I had been giving a great deal of thought as to how to add the facets/ flats to the knobs and although I have plenty of machinery to choose from the job still appeared difficult. I could have set the router up but this would mean making a jig allowing indexing as would using my saws and planers. In the end I thought about using my home made 4" belt sander. WOW!! It was brilliant and I had to be extremely careful not to remove too much whilst sanding each facet down to the template line; the sander is fitted with a 60 grit belt so left deep scratches but hopefully these would be removed by subsequent hand sanding; all I wanted to do was to test this method out and the result can be seen in the pictures; I noticed slight differences in lengths of each facet but the lighting was very poor whilst sanding so next session with clean hands I could touch them up but the method works and works well; in fact I bet it only took five minutes to add facets to all five knobs as the belt sander fitted with the 60 grit belt is very aggressive indeed.

The weather became slightly warmer but I had the fan heater switched on for comfort but was deeply troubled by the doom and gloom; I thought there was going to be cloudburst it was so dark; with both garage strip lights switched on I couldn't see what I was doing so pulled out my 60W inspection lamp and set this up at the tailstock end of the lathe; this was slightly better but still there were many shadows especially whilst trying to take measurements and when the tool was applied but this was as good as it was going to get until July so I carried on best I could.

My fingers were well and truly crossed that I could now turn the knobs to complete them without mishap. I chucked a short length of ¼" dia silver steel in the woodturning lathe (Record DML 24") and mounted each knob blank onto this in turn securing each with the grub screw. I tried reducing the corners between the facets using a spindle gouge but it was difficult to judge how much material I was removing and the finish was poor. I decided to try turning the knob front whilst I thought about knocking the corners off and taking careful measurements using my digital vernier caliper I set about turning the circular bead using a 1/8" sharp parting tool; this worked well

Had the knobs been plain round without facets they would easily have been made on a warm day in a couple of hours but these took a great deal more time and effort to make; the paper templates were first class and a huge aid in producing decent facets

and at this stage I didn't try to round the bead as the original wasn't a true bead.

Adjusting the tool rest the outer edge of the front face was rounded over using the spindle gouge taking very light cuts followed by rounding over the back outer edge. By now I had come up with the idea of simply using abrasive paper to round the corners between the facets and was surprised how well this worked; the abrasive paper was used freehand but had more accuracy been required the paper could have been wrapped around a length of timber.

Using 240 grit abrasive paper the knobs were given a good sanding and removing the corners of the bead with the lathe at speed completed this stage. The next stage was to remove the belt sander marks and this proved quite difficult as I don't have a disc sander so I placed a full sheet of 240 grit abrasive paper onto the cast iron table of the bandsaw and tried to draw the knob across this but found control was very poor. I settled for taking the harder option of hand filing each facet after first mounting the knob in the engineering vice rotating for each facet; 40 facets later the facets looked a lot better.

The knobs are not perfect but considering the conditions I was working in they were certainly acceptable; some belt sander marks remain on the facets but are very slight and possibly un-noticed by anyone else.

The last job was to stain the knobs and I used a spirit stain in order not to raise the grain; the stain chosen was Colron Jacobean Dark Oak. I wanted to spray these knobs with auto clear lacquer but by using spirit stain the lacquer would possibly react adversely so to be on the safe side once the stain dried, completed the job using shellac.

This was only one way of making wooden knobs and with hindsight I could have done certain stages differently especially adding the facets as the 60 grit on the belt sander was much too aggressive but these belts are the only ones I have in stock so were pressed into service. Possibly a better job of the facets could have been made by mounting a faceplate sanding disc on the lathe using finer grit abrasive but again I don't posses such a luxury although I'll make such a sanding disc this year to supplement my belt sander.

Had the knobs been plain round without facets they would easily have been made on a warm day in a couple of hours but these took a great deal more time and effort to make; the paper templates were first class and a huge aid in producing decent facets; this is the second time now that drawing paper templates has proved worthwhile and the job would have been far more difficult without as a jig would have had to be made; with better lighting and a finer grit on the belt sander together with taking more time to adjust the belt sander I feel perfect knobs could easily be produced in reasonable time using this method. Turning the first knob on the lathe took ages but by the time the fifth knob was mounted confidence had been gained and this knob was easily turned in less than five minutes.

What an interesting little project this has been and apart from frostbite and feeling frozen most of the time it had been most enjoyable; I'll record all measurements for future reference as it could be fun to have a go at producing a batch of these knobs later on in the year if the global warming ever appears.

I explained to Mick that I don't take on paid work as this is my hobby and was happy to treat making the knobs as a project; Mick was delighted with the knobs and it completed his radio restoration.

Gordon Bussey an Obituary

By David Read

Gordon and Claire Blackman at the Bodleian Library

Gordon Bussey, Fellow of the Royal Historical Society, died peacefully of cancer on the 20th January 2011 at the age of 75. He will be remembered as one of the country's foremost historians of the development of radio and its manufacturing in the United Kingdom.
In the early 1970's early wireless was in the air, both as a subject for historical research and as a fruitful field for collectors. It was in this period in 1976 that his first book, *Vintage Crystal Sets -1922 to 1927* was published by Wireless World Publications. It was the first wireless book written with the collector in mind, and emerged out of research into the manufacturers of crystal sets and the associated ephemera and advertising. It was also in 1976 that the BVWS was founded and in 1977 it held its first official meeting in the famous Marconi Writtle Hut at Chemlsford where its first Committee was agreed by the membership present. Gordon was not a member at that time but joined BVWS in the following year.

He was by then already known to Society's members and my first meeting with him took place when he visited me at home in order to examine a rare Viennese Crystal set, which with characteristic energy he proceeded to acquire by means of an exchange. He told me that he was a collector of decorative china and had come across a Grafton China figure of a gentleman in a top hat in which a coil was wound on the hat and the crystal and cat's whisker took the place of a button on the waistcoat.

He didn't at first know what it could be and set about finding out. That research led to the question of who made crystal sets and what they looked like.

His discovery of the Grafton china figure marked the start of an unceasing endeavour that through sheer hard work and meticulous attention to detail was to lead to a string of books of which the best known are *Marconi's Atlantic Leap* authored by Gordon and published by Marconi PLC in 2000, and *The Setmakers*, authored by Keith Geddes in collaboration with Gordon and published by BREMA in 1991.

Gordon was employed for the greater part of his career in Philips, as Spares and Supplies Manager in Central Electronic Services Ltd. where in 1979 he wrote his first illustrated company history, *"The story of Pye Wireless"*. When restructuring closed the department of Philips' business in which he worked, he became Historical Adviser to both Philips Electronics (UK) and GEC-Marconi.
A complete list of publications for which he was author, collaborator or producer is given in the concluding appendix. Some of these were facsimile reprints of early catalogues and prepared specifically for the BVWS and issued to members as supplements to the Bulletin.
It was in one particular role, however, that he played a role that was decisive in ensuring the continuing success of the Society.
At the 1994 Annual General Meeting, a secretly organised and dishonest attempt was made from the floor to throw out the Commitee and Constitution. Its Chairman was shouted off the platform and resigned in disgust. The meeting was aborted and in a scene of chaos, Gordon, also from the floor, rescued the situation. With great skill he devised and brought about a solution comprising an emergency committee, new elections, a new Journal for which he prepared the first edition, and appointed a new printing company. That the Society thrives today reflects the quality of the work put in by Gordon, the emergency committee, and its successors.

Following many years of work in connection with the Marconi Archives, Gordon Bussey was directly involved with the company's Wireless Centenary Celebrations in the late 1990s which coincided with a period when the company's share value was at its peak. In spite of this, in 1997 the extraordinary decision was taken by the company to auction the archive and associated artifacts at Christie's. The intended disposal was described in a bizarre explanation as being part of the celebrations, but opinion both at public and government levels prevented this from taking place. The Archive seemed safe but another threat soon arose. Mounting debt problems and a prolonged downturn in the telecoms equipment market destroyed Marconi's market value and on Friday, 16th May, 2003 it was declared bankrupt. It was the biggest bankruptcy in British company history and a suitable home for its prestigious archives had to be found.

Gordon Bussey conceived the idea of gifting the Archives and associated hardware to the Bodleian Library and the Museum of The History of Science next door. Funds from the Wireless Preservation Society, in a scheme created by Rod Burman and Gordon Bussey, paid for the immense sorting and cataloguing project over three years, without which Oxford might not have been able to accept the gift. In November 2008 after a period of the most skillful diplomacy and detailed organization, the transfer was celebrated by a reception in the great hall of the Bodleian at which Gordon was awarded Honorary Life Membership of the Friends of the Bodleian Library. My photograph shows Gordon with his partner Claire Blackman at the celebration. The preservation of the invaluable archive of the world's first global communications company will remain his greatest achievement.

Gordon was an intensely private individual whose personality was enigmatic. Those who worked with him found that he could be impatient to see progress. He had been elected from ordinary to honorary member of the British Vintage Wireless Society in recognition of his contributions as a historian, but although he attended many meetings of the Society he never stopped to socialise. Neither did he seek to disguise how he felt about sloppy thinking or lack of effort in others, and this could make him seem autocratic or even rude. Yet all this was misleading. His brusque manner was a mask that hid an innate shyness and kindness. Behind his protective disguise, his first priority was always to be helpful, and those who got to know him found in him a constant friend whose help was unstinting and available immediately rather than tomorrow or next week. His death leaves a hole that cannot be filled.

Appendix

List of publications for which Gordon Bussey was author, collaborator, producer, or facilitator.

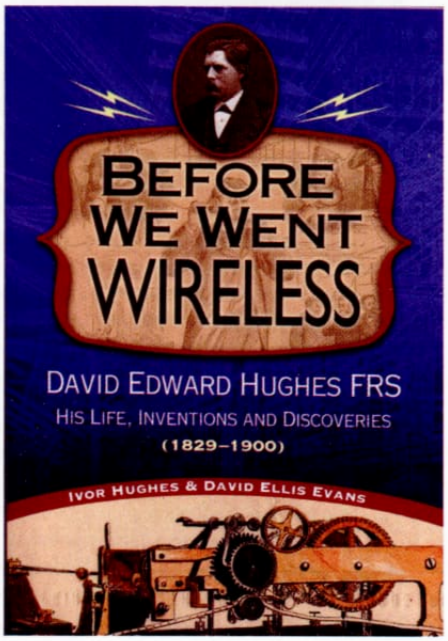
1976
Vintage Crystal Sets 1922 -1927.
Wireless World Publication. Author.
1977
Philips Supplement to V&A Exhibition
"The Wireless Show". Philips Industries 1977.
1978
BVWS reprint "The Marconiphone
Catalogue" organised by G.B.
1979
BVWS reprint "True Music (TMC) Radio
sets Catalogue" organised by G.B.
1979 Television: the first fifty years. Bradford
National Museum of Photography, Film & TV.
Keith Geddes and G.B.
1979
The story of PYE Wireless. Pye Ltd 1979. Author.
1980
Supplement to the Science Museum Exhibition
"The Great Optical Illusion". Philips Ltd.
1987
The History of Roberts Radio. Roberts Radio
Ltd 1987 by Keith Geddes and GB
1988
BVWS reprint "Brown Brothers Ltd
Catalogue 1925/6 produced by G.B.
1990
Wireless: The Crucial Decade 1924-34 Peter
Peregrinus Ltd. Autumn 1990. Author
1991
The Setmakers, BREMA 1991.
Keith Geddes and G.B.
1993
Hacker Radio. GDN publications 1993.
Geoffrey Dixon-Nuttall and G.B.
1995
BVWS Christmas Card. GEC-Marconi
Ltd. Arranged by G.B.
1996
BVWS Christmas Card. GEC-Marconi
Ltd. Arranged by G.B.
2000
Marconi's Atlantic Leap. Marconi PLC. 2000. Author
2002
Radio Man: The Remarkable Rise and Fall of
C.O.Stanley. IEE History of Technology.
Mark Frankland, G.B. as consultant

Book Review

Before We Went Wireless - David Edward Hughes FRS - His Life, Inventions and Discoveries. (1829-1900)
by Ivor Hughes and David Ellis Evans

Images of the Past, Bennington, Vermont, U.S.A.. 2011 ISBN 978-1-884592-54-6 hardcover 978-1-884592-53-9 Pbk

Reviewed by Anthony Constable



Having studied the work of David Hughes in the 1970s, I fondly thought I knew quite a lot about the life and inventions of this remarkable man. However, the authors of Before We Went Wireless showed me how wrong I could be. At last we have a very detailed account of the complete man: David Hughes, musician, teacher, inventor and businessman.

Hughes was a practical man but his experimental researches frequently revealed matters so poorly understood by theoreticians that they can now be seen as bridging the gap between theory and practice. When he gave his inaugural presidential address to the Society of Telegraph Engineers and Electricians in 1886 he put himself right at the centre of that great and long lasting battle of the 1880s between the practical men led by William Preece and the mathematicians characterised by the writings of Oliver Heaviside. Hughes's work benefited both camps equally.

David Hughes was a man of enormous energy with an ability to rig up experimental apparatus from whatever was available - often held together with a copious supply of sealing wax - and then to pursue these breadboard models to the point of technical and commercial success. Alone among his numerous experiments, the one carried out on wireless communication he left at the breadboard stage of development and this unique work was abandoned and very nearly forgotten altogether.

When, in 1879/80, David Hughes transmitted the sounds generated by electrical interruptions of an inductive circuit and heard the recognisable clicking sound in a telephone earpiece some distance away on Great Portland Street in London, there was no doubt in his mind that the phenomenon he was observing was something utterly new. He had no idea how the signals came from his room to his ear and he invited a few friends from the Royal Society to witness his findings. Early in 1880 he contacted the president of the Royal Society who, soon after, went to witness Hughes's demonstrations together with two other prominent scientists. These men were unable to understand the significance of Hughes's work and may also have been somewhat confused by Hughes's talk of 'air conduction'. Their negative response was so disappointing that Hughes discontinued his investigations altogether.

We may speculate on the possibility that Hughes's discovery could have prompted an early start in the technology of wireless communication. It was a premature adventure involving a genuine glimpse into the practical art of communicating without wires with little or no understanding of the underlying physics. It was a very early example of how to generate and detect Maxwell's electromagnetic waves in the very year of Maxwell's death. It was an early demonstration of how the Maxwellians, George Francis FitzGerald, Oliver Lodge and Oliver Heaviside, could have proceeded in their hunt for Maxwellian radiations from tangible electrical circuits. It was also a qualitative precursor to Heinrich Hertz's fine quantitative work using entirely different methods of generating and detecting Maxwell's waves. Had Hughes's very simple demonstration been taken more seriously by those pundits from the Royal Society, it might well have become the true birth of wireless communication.

History was made and witnessed on that remarkable occasion. No further work was carried out by Hughes or others on this curious phenomenon and the event was temporarily forgotten.... only to be anonymously referred to by one of the original witnesses, William Crookes, in an article in the Fortnightly Review in 1892 and recalled again by Crookes with full reference to David Hughes in response to a letter from J. J. Fahie in 1899, three years after Marconi had filed his wireless patent in 1896.

It is astonishing how close Hughes came to the form of communication that would only come about over half way through the first decade of the next century. Hughes's transmitter was a simple interrupted inductive circuit but it was quite enough to transmit amplitude modulated radio waves by way of an antenna into the surrounding rooms and adjacent streets. He received the sound of the interruptions with an antenna connected to a circuit containing a rectifying detector and a telephone receiver. This untuned receiver was not too different in design and in performance from some of the poorly tuned commercial crystal sets of the 1920s.

For the wireless historian Hughes's 1879/80 transmission may be thought of as an example of just another 'near miss' that came within a whisker of heralding the new age of radio. But it is also often thought of as a major scientific blunder. The blunder was the failure of good scientists to appreciate what they had witnessed and to then walk away from one of history's scientific golden moments.

The authors of this biographical study, Ivor Hughes and David Evans, have told us the life story of David Hughes with great thoroughness. We may have already known something about David Hughes as a most persistent experimenter but the authors have now provided us with a study of David Hughes the complete person. They recount the fine details of his life from his early childhood in England as a musical prodigy, to his young life in America as a performing musician and teacher and on through to his globe trotting adult life as an inventor and businessman. Hughes's life was unconventional in almost every way imaginable.

His education did not prepare him for a life in experimental science and technology and yet it seems he took to it from an early age like a duck to water. His early studies of music brought him and his two brothers to the attention of Victorian Music Hall audiences in London and throughout Britain. They were accompanied by their amateur musician father (Dafydd Hughes) who had given up his job as a boot maker to manage the performances of his gifted children.

The whole Hughes family went on a performing tour to America in 1840 when David was about 11 years old. Although this visit to the new world was undertaken as a short 'tour', David was the only member of the family who eventually returned to England many years later. While in America, he became interested in the new cable telegraphy and decided he could make original contributions to the subject. After long and arduous experiments, he eventually produced an alphabetic keyboard printing telegraph machine which, following refinements to the synchronisation system by George Phelps, became the world leader in the transmission of the printed word - the ancestor of a long line of teleprinter developments. Hughes took out patents in England in 1855 and in France and the USA in 1856. All this happened before the introduction of the commercial typewriter and well before the first Imperial typewriter with its QWERTY keyboard in 1873.

The authors of this Edward Hughes biography deal with the intriguing history of the carbon microphone very thoroughly. Alexander Graham Bell's telephone was introduced in 1876 and this was soon taken up by Western Electric for development into a commercial instrument. The new device was in need of a sensitive microphone and Thomas Edison immediately began work to develop one. In England David Hughes also realised the Bell transmitter needed to be greatly improved. How the microphone

arose from the original work of Philipp Reis in Germany, Thomas Edison in the USA and David Hughes in England, and how the carbon microphone grew out of all this is dealt with in considerable detail in chapter 7. The microphonic properties of the 'loose contact' were discovered and thoroughly investigated by Hughes and all his work was published and became freely available for all to use. Edison's approach was to take out patents wherever he could so we might conclude that, while he is rightly acclaimed its inventor, that in no way diminishes the originality of Hughes's independent discovery of the microphone.

The induction balance was yet another of Hughes's home-built instruments which saw many applications. It arose out of his investigation of the problems of interference on telephone lines which he solved by incorporating compensating coils and proposing the twisted pair approach, as later adopted. Hughes found the compensating coils were sensitive to the presence of metal objects in the coils and this prompted him to design an apparatus for investigating the effect more thoroughly. Out of this came his induction balance, a sensitive measuring instrument involving the use of a null detecting telephone. A modified form of the induction balance was used as a device for locating metallic objects in body tissue, a metal detector, and was therefore one of the first devices for 'looking' non-invasively inside the human body before the discovery of X-rays. The induction balance was so sensitive at distinguishing between different metals that it was even used at the Royal Mint for detecting forgeries and other uses.

On the occasion of the attempted assassination of U.S. President Garfield in 1881, David Hughes's induction balance was seized upon as a possible means of locating the bullet. The importance of Hughes's apparatus on this occasion was recognised by a journalist working for Scientific American and also by Alexander Graham Bell. Bell took advice from Hughes on the question of how to modify the equipment to hunt for the president's bullet and then went to the White House to attempt the task. He tried long and hard but eventually the president died from wound infection. But the Hughes induction balance had been given a high profile during the time of the president's illness and, soon after, it certainly demonstrated its capability as a sensitive metal detector for medical and other applications. It was the precursor of the many such devices that followed. One of the devices that grew out of it might even be cited as the precursor of the electric guitar.

The most important scientific outcome of the induction balance was, of course, Hughes's investigation of unusual sounds which he traced to an accidental bad contact. He then chose to investigate the 'loose contact' phenomenon further by first making a clockwork interrupter - a sort of automatic loose-contact machine. This in turn led to the demonstration of his primitive wireless communication along Great Portland Street.

There is such a lot to read about in this book, much of which has simply not been dealt with in any detail previously. The authors have obviously worked very hard to compile all the information required to reconstruct this man's life and the life of his family. I understand the whole project has taken something like ten years to complete and the pages of fine details extracted from contemporary newspapers, record offices and surviving correspondence bear witness to the enormity of the task. The authors are to be congratulated in providing us with such a readable biography of a very remarkable man.

A Transformer Shorted Turns Tester continued from page 37

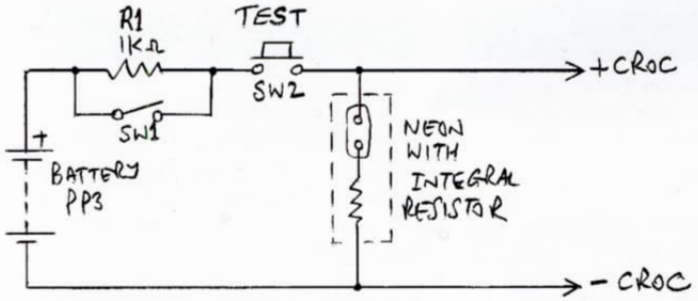


Figure 2: The schematic of my shorted turns tester. By including SW1 I've given the option of having or not having the 1kΩ resistor in series with the battery. The neon and 47kΩ resistor arrangement have been replaced by an easier-to-obtain neon with an integral resistor, typically found in the neon's housing.

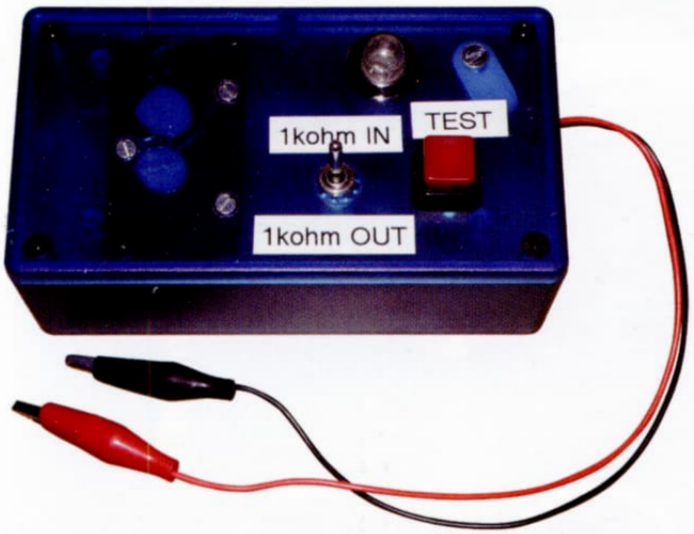


Figure 3: A photo of the tester I built, in a plastic case for safety reasons.

then to starts to flow through the inductor, but this takes time to ramp up as the back-EMF generated in the inductor opposes this flow of current. This build up in current is governed by the same time constant rules as the ramp in voltage across a capacitor. According to my calculation the current through an ideal 15H inductor fed via a 1kΩ resistor builds up to about 63% of its final value (which is the definition of the time constant of the circuit) in 15mS. It gets to more than 99% of its final value in about 4.6 time constants, that is, in about 70mS. The final current value is simple to calculate from Ohm's Law: with a real inductor you should add the DC resistance of the winding to the external series resistor value before dividing this total resistance into the battery voltage to get the final DC current.

So the answer to the question at the heading of this section is 'not very long'. If you press this button for at least half a second before releasing it you can be pretty sure that the inductor is fully 'charged' with magnetic energy.

Conclusions

As far as I can tell this simple tester seems to detect shorted windings on transformers or chokes. With 'good' transformers or chokes the neon flashes brightly when the TEST switch is released, and on 'bad' transformers (or ones with a secondary winding deliberately shorted externally) the neon remains unlit. I don't have a transformer that I know has just one shorted turn, so I can't check that this tester will detect it. I simply have to believe the theory. If anyone has a transformer they suspect of having such a fault, that is it gets hot even when it has no load connected, then I suggest you 'knock up' this simple circuit and give it a try.

I have to admit that I have no direct experience with line output transformers but it would be good if the TV enthusiasts amongst us would build the unit and give it a try. I would advise ensuring that the 1kΩ resistor is switched in circuit as LOPTs typically support only a small DC current. Primary inductances can be very high, in the order of more than 100H, and so they should produce a high voltage from the tester described here.

References

UK Vintage Radio Repair and Restoration forum: www.vintage-radio.net/forum/index.php

www.articlealley.com/article_1268039_45.html

More information on how inductors behave, especially their transient response, can be found at: www.allaboutcircuits.com/vol_1/chpt_16.

A more complex shorted turns tester (offered as a kit), designed to test line output transformers or 'flyback' transformers, whilst they are still in circuit, can be found at: www.mainelectronics.com/pdf/k7205inst.pdf. This circuit counts the 'rings' a 'good' transformer gives in association with the capacitance around the coil when it is 'hit' by a rapidly transitioning pulse.

Letters

Dear Editor

Gordon Bussey

I only met him a few times in person, but we communicated quite often – always by FAX, Gordon's preferred method, since he was not on email. Even though I cannot claim a close relationship existed between us, I will miss him. His groundbreaking 1976 book "Vintage Crystal Sets, 1922-1927" was my bible, since its publication coincided with the beginning of my own interest in the subject. I remember taking that book everywhere with me and marveling at the photographs. I particularly recall a warm Sunday afternoon at Lavernock in South Wales, reading Gordon's book for the hundredth time and staring out to sea dreaming of putting together a collection of 1920s crystal sets. In those days owning an Uncle Tom or a Butler like those on the cover seemed an impossibility.

Of course, Gordon's contribution went far beyond this first book – and he will be remembered for "The Setmakers" and "Marconi's Atlantic Leap" among other works and as an historian of the early days of wireless in the UK. But for me, it will always be his book on crystal sets that made him special. Thank you, Gordon.

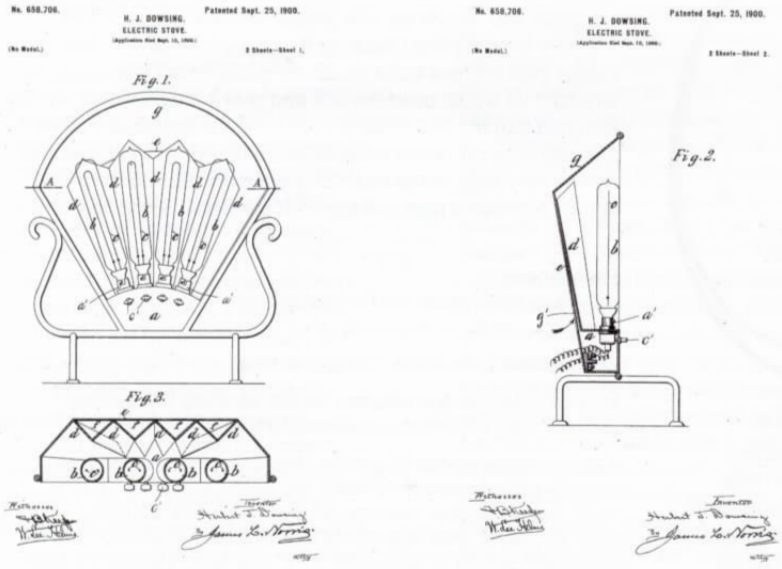
Ian L Sanders

Dear Editor,

Very recently a visitor to my house remarked on the poster that hangs in one of my workshop rooms where amongst other things I have some early radios.

I am sure that many of our members will know that the poster was made in 1973 to commemorate 50 years of German broadcasting. The Berlin museum decided to show a Loewe OE333 radio receiver made to take the 3NF valve in which three triodes and associated passive components are in one vacuum tube. It was the world's first integrated circuit and a triumph of the glassblowers art. However, the museum clearly didn't have an example of an original

Below: HJ Dowsing's patent for electric heaters using carbon filament lamps



UNITED STATES PATENT OFFICE.

HERBERT JOHN DOWSING, OF LONDON, ENGLAND.

ELECTRIC STOVE.

SPECIFICATION forming part of Letters Patent No. 658,706, dated September 25, 1900.

To all whom it may concern:

Be it known that I, HERBERT JOHN DOWSING, a citizen of England, residing at 24 Hodge Row, Cannon street, in the city of London, England, have invented a certain new and useful Electric Stove, (for which I have applied for a patent in Belgium, dated March 13, 1899, No. 141,379; in France, dated March 11, 1899, No. 286,734; in Germany, dated March 11, 1900, No. 113,645, [Gebrauchsmuster,] and in Great Britain, dated February 24, 1899, No. 4,194,) of which the following is a specification.

My invention relates to the construction of an electric stove as I shall describe, referring to the accompanying drawings.

Figure 1 is a front view. Fig. 2 is a central vertical section, and Fig. 3 is a sectional plan on the line A A of Fig. 1.

On a base a, having suitable sockets a' projecting from its upper side, are fixed several electric glow-lamps b. Of these four are shown in the drawings; but obviously there may be a greater or less number. They are preferably of elongated shape, containing long filament-loops c and divergent from the base, as shown. The base a may contain safety-fuses, and it has switches a'', by which any one of the lamps can be extended from the circuit. Behind the range of lamps there are arranged metallic reflectors d, preferably of smooth bright copper, inclined at such angles that the rays from any one of the lamps are not reflected back on that lamp itself, but are distributed in a forward direction. Behind and at the sides of the range of reflectors d there is a back or casing e, which, with the reflectors, forms a number of vertical triangular channels f, which terminate a little below a sloping roof g, forming the top of the casing. Air entering through openings g' at the lower months of these channels becomes heated as it ascends, and issuing from their upper months is deflected in a forward direction by the roof g. Thus while heat is radiated forward from the lamps and from the reflectors also, heated air is directed forward, so that the stove acts as if it were an open fire.

Having now particularly described and ascertained the nature of this invention and the best means I know of carrying the same into practical effect, I claim—

An electric heating-stove consisting of a suitable casing having an open front and a sloping roof, a reflector-plate located within the casing adjacent to the rear wall thereof and terminating at its upper end at a point below said roof, said reflector-plate being of zigzag form and providing a series of elongated air-channels within the casing, the rear wall of the latter having air-openings therethrough leading into said air-channels, and a plurality of vertically-disposed incandescent electric lamps supported within the casing in front of the reflector-plate, one of said lamps being arranged opposite each ridge or projecting portion of the zigzag reflector-plate, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

HERBERT JOHN DOWSING.

Witnesses:
GEO. A. HOWE,
CHAS. L. WOODS.

clear glass 3NF as presented at the 1926 Berlin Radio Exhibition to use for the poster.

My visitor thought that the poster girl holding a Loewe valve had a "saucy" expression on her face. However, I explained that her expression is not what he thought, but one of "surprise" that the Loewe radio was shown with an incorrect valve from a somewhat later period, and with a metallic coating rather than the clear glass of the 3NF. My explanation of her expression was, of course, tongue–in–cheek. At the same time, stimulated by our conversation, I decided to photograph the correct item myself. In addition, and because it has been extremely cold on occasions this winter, I thought the poster girl would appreciate a little warmth and colour to her exposed thighs and knees as provided by a different sort of vacuum tube from a somewhat earlier period.

Footnote:
H. J. Dowsing is credited with patenting and producing the first practical electric heaters, using vacuum tube carbon filament lamps as the radiant elements which are arranged to provide a degree of convection as well. See attached patent specification and drawings. Carbon filament heaters put out much more heat than light. But, apart from this, Dowsing's idea was necessary in the days before Charles Belling began the production of nickel chrome alloy heaters that could glow red hot in the open air without quickly oxidizing. Belling produced Ni-Chrome heaters from the second decade of the 1900s, however, vacuum tube heaters on the Dowsing system remained in use right up to the early 1930s and very decorative they are.

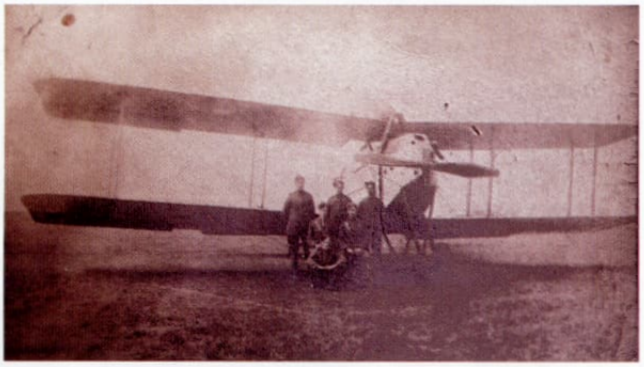
Best wishes, David Read

Dear Editor,
As a member of the BVWS I thought that you might like to see pictures of my WWI crystal set. I think they are very rare now. The first two pictures are of a Long wave tuner, note the low serial number, the rest of the pictures relate to the Short Wave tuner, which is in near-perfect order. The pictures of the aeroplane and crew relate to this set, the pilot being the previous owner before myself, his picture in uniform is included. I am trying to find out more about him. Along with the set came a WWI map which shows part of the western front with the German trenches indicated.

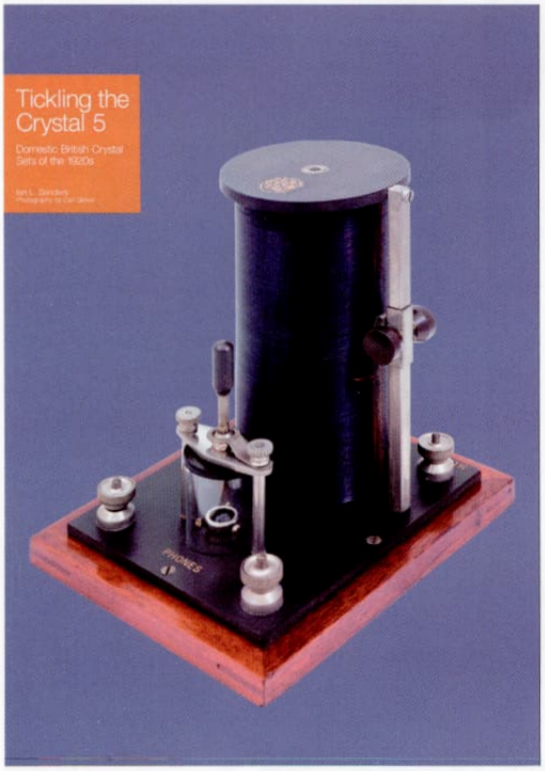
I also have a WWII 16mm film made by the Co-op showing how they can supply all that you need from cradle to grave and starts with a wartime clip regarding careless talk and spies etc. The film shows wireless sets too, and could be of interest to BVWS members if included on the Christmas DVD.

I have another wartime film, this time from Canada, which briefly shows 19 sets being assembled on a production line.

GJ Richardson



BVWS Books



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Funds raised from BVWS calendar sales is used to help run and maintain the British Vintage Wireless and Television Museum in West Dulwich, London.

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Minutes of the BVWS Committee meeting held at Pound Cottage, Coate, Devizes SN10 3LG at 4.00 pm on Friday 4th December 2010.

Present: Mike Barker (Chair), Martyn Bennett (MB2), Jeremy Day, Graham Terry, Guy Peskett, Carl Glover, Terry Martini, Jon Evans, Paul Stenning.

1. Apologies for absence: Ian Higginbottom.
2. The minutes of the meeting held on Friday 13th August 2010 were accepted as a true record.

Matters arising

Item 7: The Chairman reported that the problem with storage of Tickling the Crystal books would be tackled in the New Year.

Item 8: The Chairman reported his experiences with the Society's digital camera (to be used by Committee members when CG can not attend a meeting). He requested further tuition from CG.

3. GT reported that on the day of the meeting the membership stood at 1357 including 59 complimentary and 6 honorary members.
4. The Treasurer (JD) tabled interim accounts for the Society showing that on the day of the meeting the assets of the Society stood at £37,870, and that there was a deficit compared with the same time last year of £2,501. At year end, with subscriptions for 2011 starting to come in, break even is expected for the full year. The Society was holding stock assets (capacitors) valued at about £4,000 (cost). The Treasurer also tabled accounts for the NVCF showing a profit of £2,377 for the 2011 fair. During the year a donation of £3,400 had been made to the BVW&TV museum from the NVCF account which on the day of the meeting stood at £8,680.
5. The Bulletin Editor (CG) Chairman reported that the spring Bulletin was about 50% complete and would be ready for the printers at the beginning of February. Options for increasing the size of the Bulletin were discussed. The Editor will investigate the cost increments for various increases in the number of pages.
6. PS initiated a discussion of alternative methods of renewal of membership and payment. It was agreed that (i) any new arrangement should not place significant extra demands on the Membership Secretary (ii) application/renewal forms would be available on line but for the immediate future all completed forms would continue to be returned by snailmail (iii) a promising option of subscribing using Paypal should be further investigated. The possibilities of moving to a more electronic system were discussed and will continue to be investigated for the longer term.
7. The webmaster (PS) promised that an upgrade of the Society's website would be completed by the middle of 2011. It was planned to incorporate advertisements for additional services offered by the society (e.g. capacitor sales) and any new payment scheme(s) adopted. CG offered to assist.
8. DVDs: TM was complimented on this years Christmas offering, the film "Death at Broadcasting House" giving fascinating insights into the atmosphere and the studio techniques at the BBC in the 30s. TM warned that material was becoming harder and harder to find. Frustratingly the Society has access to some splendid BBC material but we have been unable to find anyone at the BBC who is willing to give permission in writing for us to issue it. The Society is aware that unauthorised issues of BBC material have been made by less scrupulous organisations but this would be a very dangerous path for us to take. Also, DVD plants are increasingly unwilling to take orders without evidence of authorisation from the copyright holder (and may report back to the holder to maintain good relations). There are some possibilities for next Christmas; A Murphy slide show with audio commentary on vinyl disc (TM to read the discs, JE to mix a presentation); a video record of the Day of TV 2011 possibly by the people who made "Valveman"; and TM has been offered some intriguing material about which no more can be said at present.
9. MB(2) reported requests from the French vintage wireless club CHCR to republish articles which have appeared in our Bulletin in exchange for our incorporation of some of theirs. While acknowledging that some of our members might be baffled by articles in French he recommended that we allow the use of several of our articles a year provided authorisation is obtained for each. This would provide good publicity for the Society.
10. Day of TV 2011

The chairman announced that he was seeking a meeting with the Alexandra Palace management to discuss the proposed celebration. Chris Deith, the proprietor of the Warwickshire Exhibition Centre, has negotiated a good price (£3/square metre) for us to use space in the palace's west hall. We are pencilled in for the 13th November.

11. AOB

(i) The Chairman reported that Lorne Clark and Ian Sanders had produced a book on the "General Radio Company" who were making crystal sets which turned out to be very interesting. He will obtain a copy to see if it would make a Society publication.
(ii) The Chairman reported that Lorne Clarks supplement had been greatly appreciated.
(iii) MB(2) drew the Committees attention to an article on DAB in Oct 1991 in the audio press of the time.
(iv) The Chairman proposed that Ian Higginbottom be made an honorary member, approved with enthusiasm.
(v) The Chairman expressed his deep gratitude for all the work done by the Committee in keeping the Society running smoothly. He singled out Graham, Jeremy, Carl, and Terry for their outstanding contributions.

The meeting closed at 6.50 pm. Time and place for the next meeting is TBD.

News and Meetings

GPO registration 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 GU13 8LB
telephone: 01252-613660 e-mail: martyb@globalnet.co.uk

2011 Meetings

June 4th BVWS Garden Party
July 3rd Wootton Bassett
August 12th Museum Music Night
September 11th Table Top Sale at The British Vintage Wireless and Television Museum
September 18th Murphy Day at Mill Green Museum
September 25th Harpenden
October 9th Audiojumble
November 13th NVCF at Alexandra Palace
Celebrating 75 years of the British Electronic Television Service
November 20th Golborne
November 25th Festive Music Night at The British Vintage Wireless and Television Museum
December 4th Wootton Bassett

The British Vintage Wireless and Television Museum:
For location and phone see advert in Bulletin.
Harpenden: Harpenden Public Halls, Southdown Rd. Harpenden. Doors open at 10:00, tickets for sale from 09:30, Auction at 13:30. Contact Vic Williamson, 01582 593102
Audiojumble: The Angel Leisure Centre, Tonbridge, Kent. Enquiries, 01892 540022
NVCF: National Vintage Communications Fair
See advert in Bulletin. www.nvcf.co.uk
Wootton Bassett: The Memorial Hall, Station Rd. Wootton Bassett. Nr. Swindon (J16/M4). Doors open 10:30.
Contact Mike Barker, 01380 860787
Golborne: Golborne: Golborne Parkside Sports & Community Club. Rivington Avenue, Golborne, Warrington. WA3 3HG
contact Mark Ryding 01942 729005
For more details with maps to locations see the BVWS Website:
www.bvws.org.uk/events/locations.htm

THE BVWS SPARES DEPARTMENT

NEW!

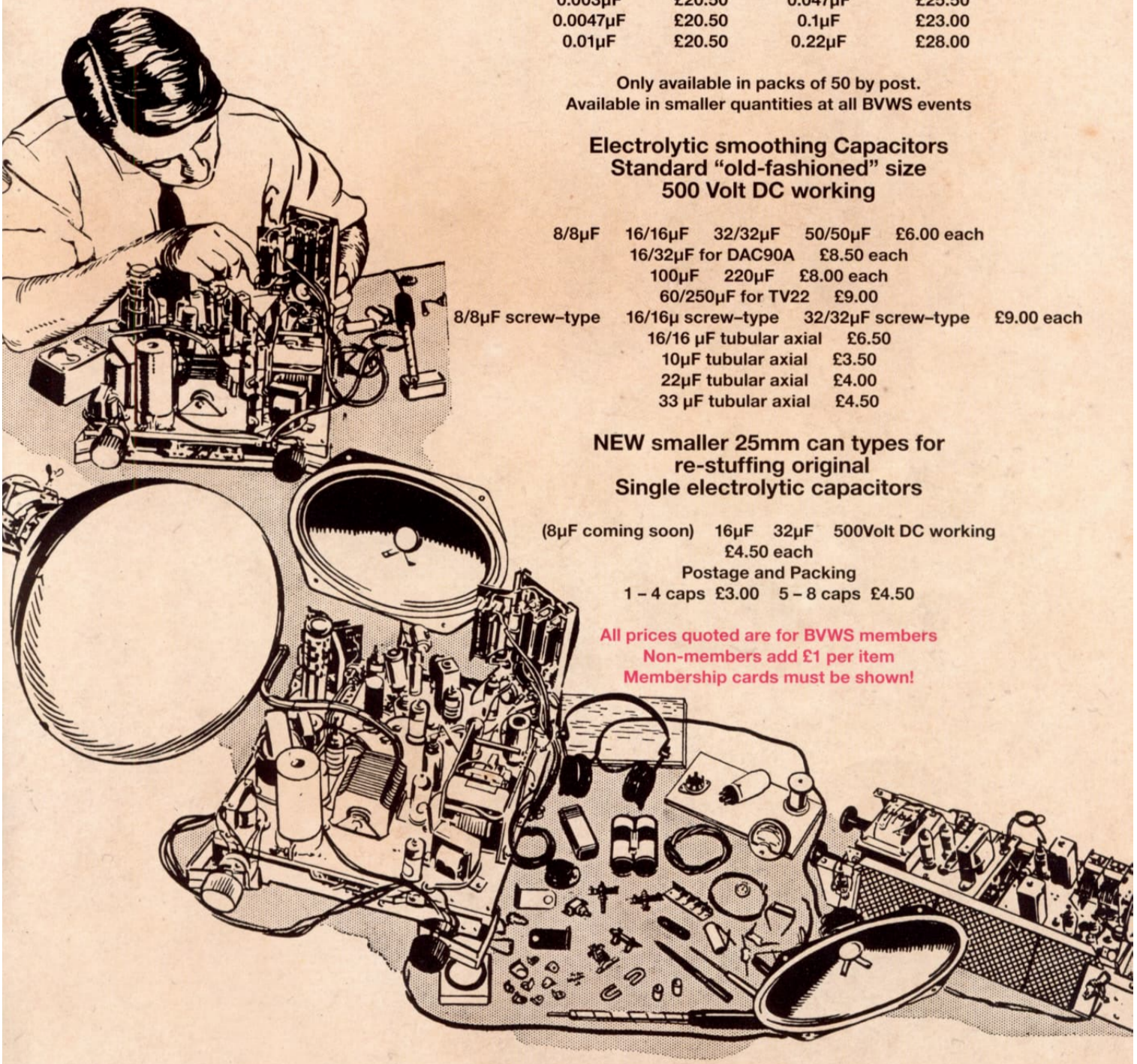
DeoxIT D5 Contact cleaner / Lubricant £15.00 aerosol can
Not cheap – Just the BEST. Available at all BVWS events!

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 includes Postage and Packing

0.001µF	£20.50	0.022µF	£20.50
0.003µF	£20.50	0.047µF	£25.50
0.0047µF	£20.50	0.1µF	£23.00
0.01µF	£20.50	0.22µF	£28.00

Only available in packs of 50 by post.
Available in smaller quantities at all BVWS events



Electrolytic smoothing Capacitors
Standard "old-fashioned" size
500 Volt DC working

8/8µF 16/16µF 32/32µF 50/50µF £6.00 each
16/32µF for DAC90A £8.50 each
100µF 220µF £8.00 each
60/250µF for TV22 £9.00
8/8µF screw-type 16/16µ screw-type 32/32µF screw-type £9.00 each
16/16 µF tubular axial £6.50
10µF tubular axial £3.50
22µF tubular axial £4.00
33 µF tubular axial £4.50

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

(8µF coming soon) 16µF 32µF 500Volt DC working
£4.50 each
Postage and Packing
1 – 4 caps £3.00 5 – 8 caps £4.50

All prices quoted are for BVWS members
Non-members add £1 per item
Membership cards must be shown!

For non UK addresses, please contact Graham Terry for prices, (see below)
All orders should be sent (with payment made out to BVWS) to:
Graham Terry, BVWS, Membership Secretary, 26 Castleton Road, Swindon. SN5 5GD
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
wireless supplies


VATICANO ORAN PARIS LISBOA BRUSELAS
MONTECARLO PARIS ANDORRA RABAT LYON
TIRANA ESTAMBUL RENNES MARSELLA VIENA
LILLE TÁNGER SOTTENS DROITWICH ATHLONE
R. I. TANGER LONDRES HILVERSUM TUNEZ BUDAP.
ONDA ESPAÑOLA
MIRAMAR R. NACION. R. ESPAÑA BARCEL. R. N. CORUÑA R. N. MADRID
VIGO R. E. BARC. R. INTER. SEVILLA R. N. BARCELONA
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