The Bulletin

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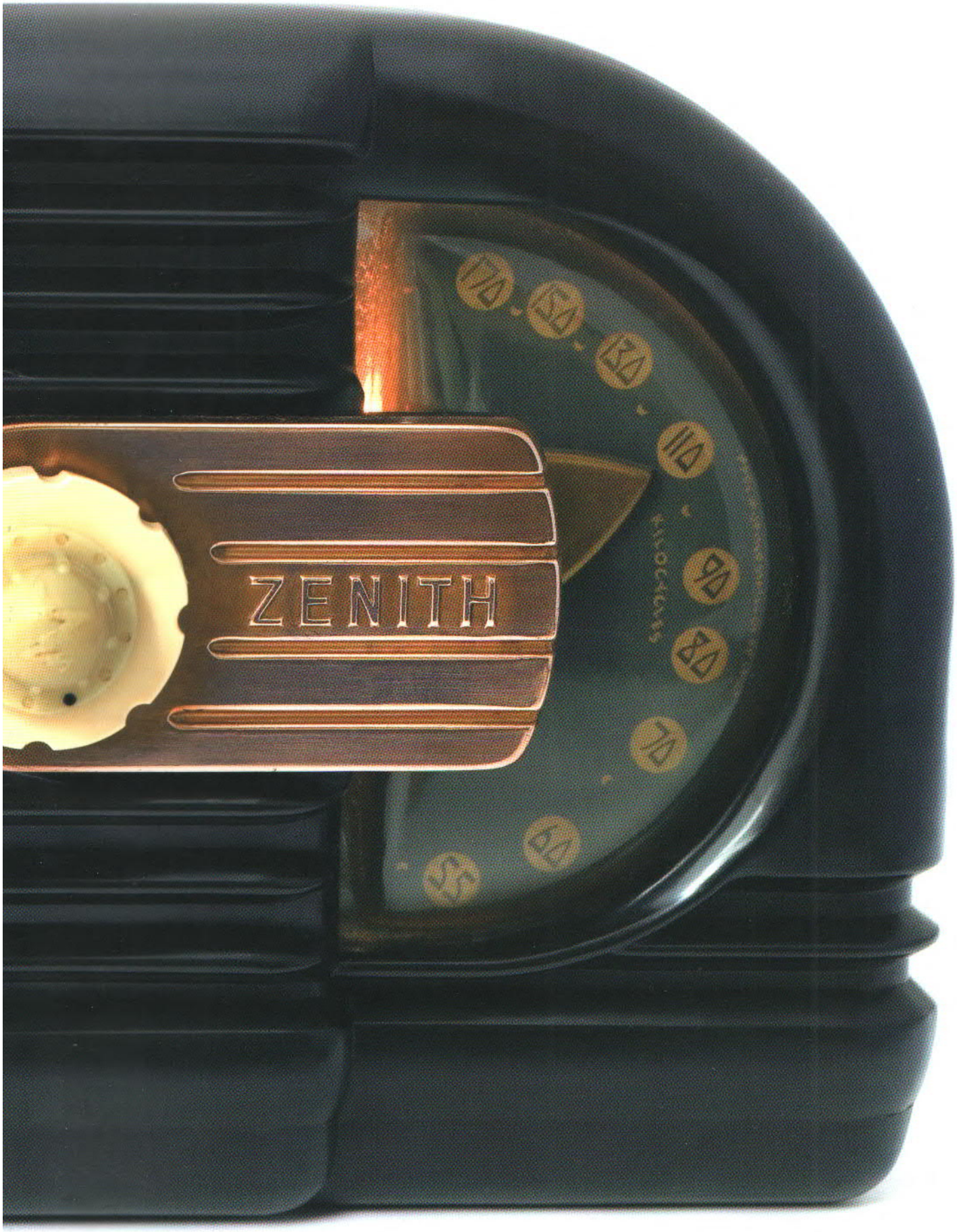

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Bulletin of the British Vintage Wireless Society
Incorporating 405 Alive
Volume 31 No.3 Autumn 2006

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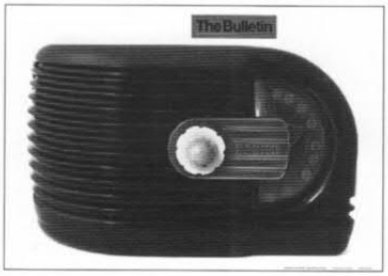

Front cover: Zenith model 6D311, 1938. photographed by Carl Glover

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From the Chair

It's been a very busy summer here in Swindon, with the conversion of the Garage to a new room for displaying even more Murphy's.

Some time ago a fellow collector in Swindon came to me for information on a Murphy A40 Console. Naturally I was interested as to why. He explained that he had been offered the chance to buy one locally. Knowing of only a very few of these in this area I was intrigued as to who it belonged to. The owner was someone I knew from many years prior. When an aged relative had died, the radio had come to him. The interesting thing for me was that I had restored the set when I was about 12 or 13 years old and it was still giving excellent results. This was the first Murphy that I had worked on and it took some time as I remember to get it to work 'properly'. This was prior to my decision to collect Murphy. A deal was struck and I went to help with the radio pickup. About a year later, the A40C 'came home' as part of a series of swaps, and is now added to my collection and in regular use.

In August Guy Peskett and I were invited to be the Wireless Experts at The Museum of the History of Science in Oxford for a Radio Collectables Road Show, as part of their Marconi Celebrations. The day went well with a number of working exhibits. About forty people came with items for us to view and value. One lady brought a home made Crystal set and was very emotional when Guy demonstrated it working on a lash-up aerial. Another person enquired about the Kenmac "Listener by ER Phone" Crystal set that I had taken to show, and then produced another from a carrier bag! It was a very interesting and enjoyable day. I noted that since my last comments on the Exhibition a Perspex panel has been installed to protect the original Marconi Coherer that I was concerned about.

The October Harpenden will host an exhibition of Sound Recording from its earliest forms up to the modern day with lots of working equipment as part of our 30th Birthday Celebrations. The 'Talking about Wireless' will be given by Norman Green. The subject is EMI's contribution to television. This is one not to miss!

I have been regrettably informed that the Leeds Vintage Audio and Radio fair has been cancelled. There are currently no plans to host another event of its type in the North of England. This is due to a lack of stall bookings making the event non-viable.

I have to say, if you don't use it you will lose it, and that is exactly what has happened.

I would like to thank Andy Wilcox for all his help and effort in the past years for running the show. I always enjoyed the event as it gave me a chance to chat to members that did not regularly attend the southern meetings.

We also have to wave farewell to the Southborough radio meeting this October. John Howes and his family have run this meeting for many years, but will now concentrate on Vintage Audio so instead of the annual meeting at Southborough, there will be an extra Audiojumble. This is not as big a loss as it appears because many BVWS members book tables at the Audiojumble.

And now I must return to a hot soldering iron and flux fumes. No Lead free Solder here!

Ye Olde Hurdy–Gurdy Museum of Vintage Radio

Martello Tower, Howth, Co. Dublin, Ireland

The museum of vintage radio, located in the Martello Tower houses a fine collection of exhibits chronicling the history of telecommunications from the 1840s to date.

There are many examples of early Morse equipment, gramophones, crystal sets, valve radios and other pieces of equipment.

Pat Herbert, the curator, is always happy to demonstrate some of the many working exhibits.

Fittingly, the Martello Tower has historic links with Marconi and Lee de Forest, two of the fathers of wireless, who conducted early experiments from the tower in the 1900's. It was also the site of an early cable station.

The Howth Martello is one of a network of towers built as lookouts for an expected Napoleonic invasion, which never materialised.

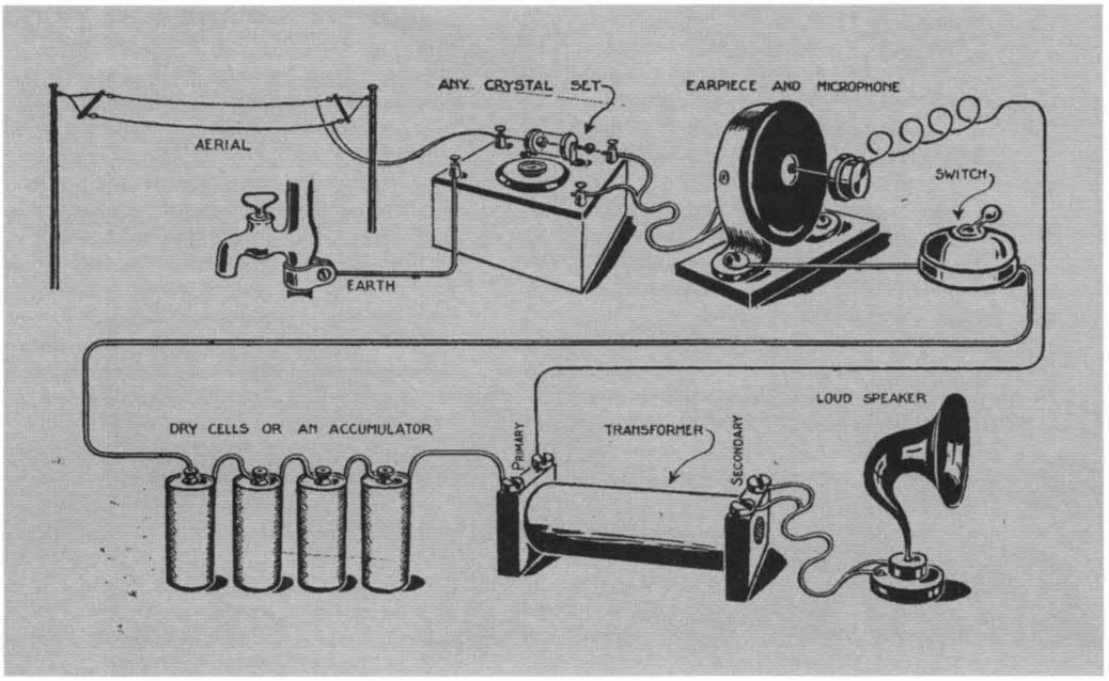
Opening Times: May to October: 11am-5pm daily, November to April: 11am-4pm (weekends only) Admission Prices: 5 Euro, Group Admission Prices: 4 Euro. Minimum group number is 8.

How to Get There:
The entrance is up a slight incline opposite the Abbey Tavern, Abbey Street, Howth. By train: DART to Howth, 10 minute walk to museum. By bus: 31, 31B from Eden Quay in city centre.
Email: hurdygurdymuseum@eircom.net
www.free-webspace.biz/ei5em/museum.html

Amateur Wireless Magazine's Loudspeaker Crystal Set by Ian Sanders

Every crystal user asks the question at some time or other: "Can I work a loudspeaker with my set?" The answer has always been: "You can't." However, after Amateur Wireless has told you "how", the answer will be most emphatically "Yes, you can."

This is the biggest thing yet for all crystal users. *Amateur Wireless and Electrics*, June 7th, 1924.



Layout of the Amateur Wireless crystal loudspeaker system.

The *Loud-Speaker Crystal Set* was the subject of a booklet published in 1925, part of the *Amateur Wireless Half-Crown Series*.

In June 1924 *Amateur Wireless and Electrics* published instructions for building their *Self-Contained Loud-Speaker Crystal Set*. No new concepts were involved – indeed the crystal circuit itself was quite conventional, with a variable condenser plus fixed inductance tuning arrangement. The heart of the receiver, however, was a mechanical amplifier based on the microphone button invented by a Norwegian engineer working in London, Johan Skinderviken, and bearing his name. A British patent (GB120,734 – *Improvements in Telephone Transmitters*) was issued to Skinderviken in November 1919, by which time he was living, and presumably working, in Chicago, Illinois.

Similar in principle of operation to the more well-known mechanical microphone amplifiers produced by S.G. Brown Limited and the New Wilson Electrical Manufacturing Company, the Skinderviken button was basically a sensitive, miniature carbon granule microphone. The earliest devices were housed in a circular brass case about ¾ inch in diameter, while a later design (introduced in 1924) featured an aluminium case with the cap only of brass. Carbon granules were sandwiched between a carbon block back-plate and a second carbon half-sphere (button) attached to a thin, flexible mica diaphragm. This later design, described in detail in *Harmsworth's Wireless Encyclopedia*[1] was lighter and exhibited improved sensitivity, making it more suitable for amplification applications. The *Amateur Wireless* designers stressed the need to use the later type of button if satisfactory loudspeaker results were to be obtained from the crystal set.

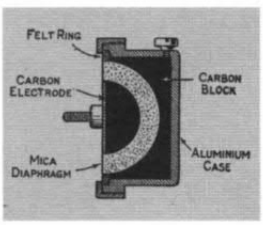
Amplification required that the button be attached to the diaphragm of a headphone earpiece, or more effectively to the reed assembly of a Brown reed-type headphone. Electrically, the button was connected to the primary of an output transformer in series with either four dry-cells or a 6-volt accumulator. A horn loudspeaker was connected to the secondary winding of the transformer.

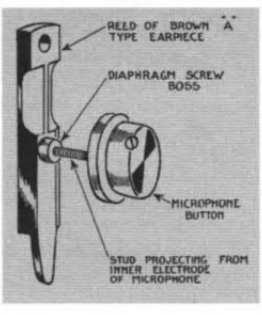
Vibrations of the headphone earpiece diaphragm or reed in response to the received signals were transferred to the mica diaphragm of the microphone button, producing compression and decompression of the carbon granules and corresponding variations in the current flowing through the device. The output signal from the button was applied to the loudspeaker via the step-up transformer.

The quality of the headphone assembly was critically important. The button was connected to the headphone by a small stud projecting from the device's inner electrode attached to a nut soldered to the headphone diaphragm. If an S.G. Brown *"A-Type"* telephone earpiece was used, the button could be screwed directly into the reed after removing the conical-shaped diaphragm, since the two threads were matched[2]. Best results were obtained with a reed-type earpiece since the physical displacement of the reed was considerably larger than that of a typical diaphragm, although if the diaphragm was sufficiently flexible the volume was claimed to be "*enough for a small room*".

In practice, the arrangement seems to have met with only limited success and suffered from at least two serious problems. Under normal use, the button had a tendency to become very warm. Should the device overheat, as it apparently did from time-to-time, the carbon granules would coalesce and cause

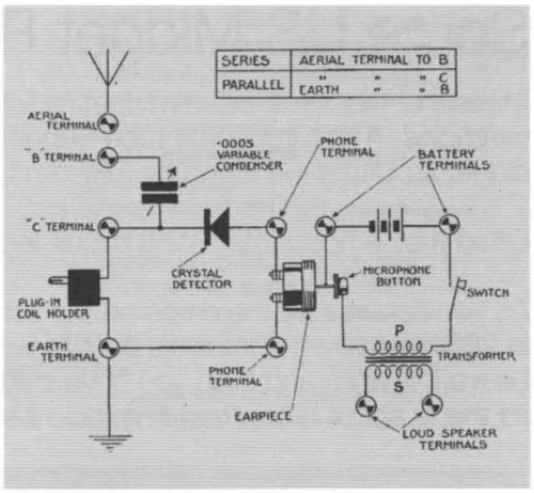
Below: Cross-section through the later Skinderviken button. Bottomt: Button attached to reed of headphone.



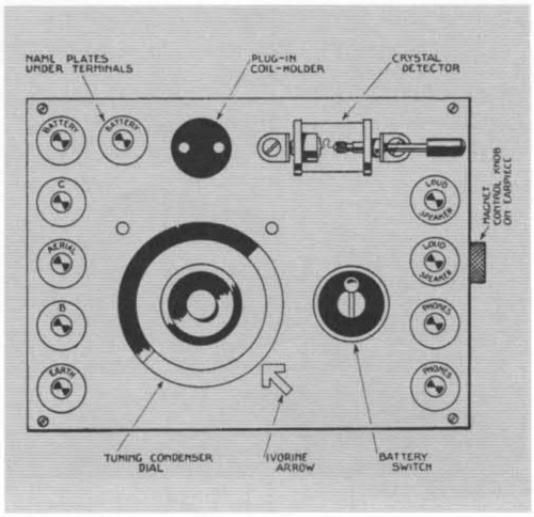


Early brass version of the Skinderviken button microphone, marked "PAT. AUG 13 18" which was probably the application date. The device measured just ¾ inch in diameter.

Above: The Amateur Wireless Loudspeaker Crystal Set.



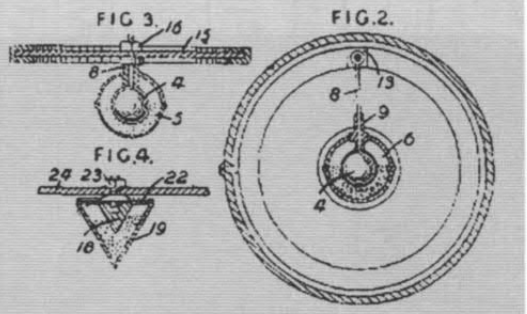
Circuit diagram of receiver and amplifier.



Plan of receiver panel.

Patent Specification 120,374
Improvements in Telephone Transmitters
Skinderviken, J., Nov. 12, 1919

Abstract: The electrodes of a loose-contact transmitter are provided with curved surfaces and are so arranged that the protruding portion of an electrode is contained within the receding portion of the other. The electrodes are both mounted on the diaphragm or the microphone is vibrated directly by sound-waves. In the arrangement shown in Fig.2, a plated spherical electrode 4 is placed within a hollow plated spherical electrode 5 and both electrodes are supported from an insulated ring 13 by a rod 8. The rod 8 is insulated from the electrode 5 by a sleeve 9 and the space 6 between the electrodes 4 and 5 partly filled with carbon granules. In the modification shown in Fig.3, the electrodes 4 and 5 are mounted on a diaphragm 15 and secured thereto by the threaded rod 8 and a nut 16. In the modification shown in Fig.4, a conical electrode 18 is mounted upon a mica disk 22 which closes a hollow conical electrode 19, and the microphone cell is attached to the diaphragm 24 by a threaded rod 23.



...a loud-speaker can be worked to provide sufficient volume to fill a large room. The quality is quite good with instrumental music. With speech, though this is quite understandable, it is apt to be a trifle gramophonic.

distortion and a serious reduction in output. A light tap was often needed to restore its performance, thereby in all likelihood sending the crystal out of adjustment. Another concern was the sensitivity of the earpiece and microphone button to vibration, causing excessive noise in the loudspeaker. To overcome this problem, it was recommended that the inside of the case be lined with some soft material and that the receiver itself be placed on rubber sponges.

Despite any shortcomings, however, full details of the receiver were published in a 1925 booklet entitled *Loud-Speaker Crystal Sets* as part of the *Amateur Wireless Half-Crown Series*. If the would-be constructor had any misgivings about the design, they were no doubt dispelled by the publisher's advice: *"Success with the new crystal loud-speaker system is assured; as to that there cannot be the least doubt. Indifferent results can only be due to some fault in the components or their connections."*

Complete amplifier units incorporating the Skinderviken device were marketed by Mikro Ltd. of Charing Cross during 1924 and 1925, and could be purchased with or without a loudspeaker. Several retailers, such as Will Day of Lisle Street, London advertised Skinderviken buttons only for as little as five shillings, though, in general, they were probably never as widely used as either the higher-priced Brown or New Wilson mechanical amplifiers.

1. *Harmsworth's Wireless Encyclopedia*, Vol. 20, pp.1827-28. Published by The Almagamated Press, London 1924.

2. Sinderviken, J: *Microphones and Wireless Reception*. Pitman's Radio Year Book, 1925. Published by Pitman & Sons, London 1925.

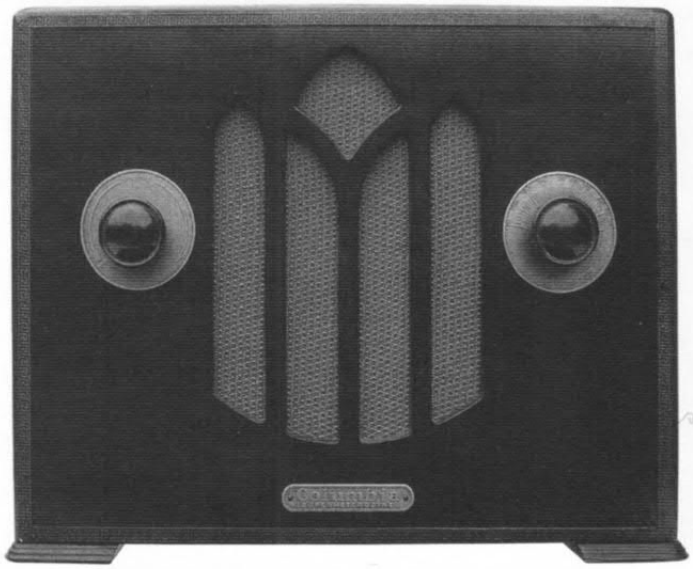
Some US Midget Radios of the 1930's

By Gary Tempest

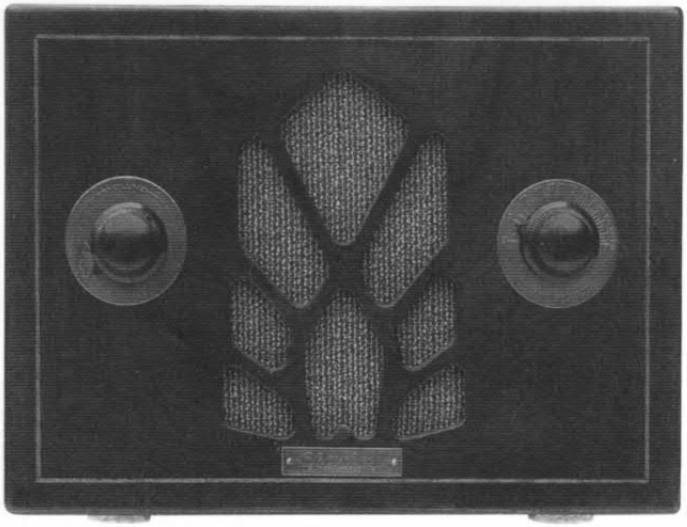
Millions of these attractive midget radios were made during the first half of the 'thirties'. I have four examples: A Columbia five tube Superhet with an IF stage, a Clarion four tube Superhet with no IF stage, an Ultradyne four tube TRF. An Unknown four tube TRF with LW; so it escaped to over here.

Often they employ interesting circuit techniques and are a marvel at cramming a quart into a pint pot!

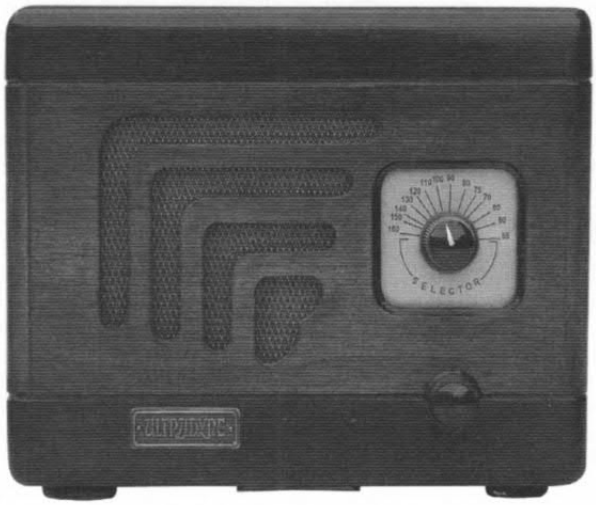
As you can see by the dates on the schematics, I started this article some years ago, back in 2001 actually. It shows it's best to write and finish an article at the same time as the radio. Leave it a while and then you have started another and the inclination is lost. However, as this is about more than one radio it's possibly why it did not get completed.



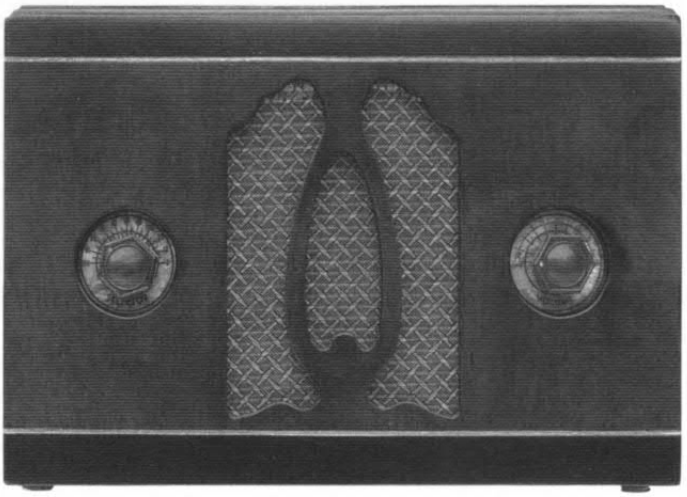
Columbia five tube superhet



Clarion four tube superhet



Ultradyne four tube TRF



Unknown four tube TRF

A little History

I always associate these tiny radios with an excellent small book by Floyd A. Paul. It is entitled Los Angeles Radio Manufacturing 1922-1942 and may now be out of print. Leastwise it is no longer listed by Antique Electronic Supply, in the USA, where I got mine a few years ago. Why I like the book a lot is that it actually conveys the excitement and energy of the time. Maybe it works as it is a compiled series of articles and includes stories from people who were actually there. I'm sure the author won't mind me borrowing a few words.

Prior to the 1929 depression, radios had been large and expensive. Afterwards a few entrepreneurs started manufacturing small table models dubbed "midgets" but also called "mantelpiece radios". A manufacturing explosion began and in about 15 months (last quarter of 1929 and the four quarters of 1930) some 35 new companies had come into existence in the Los Angeles area. So fast had been this growth that it became known as the "Midget Capital of the World". Apparently the East Coast and the Midwest (where I believe my radios came from, as the companies are not listed in the book) did not leap on the bandwagon until the middle of 1930.

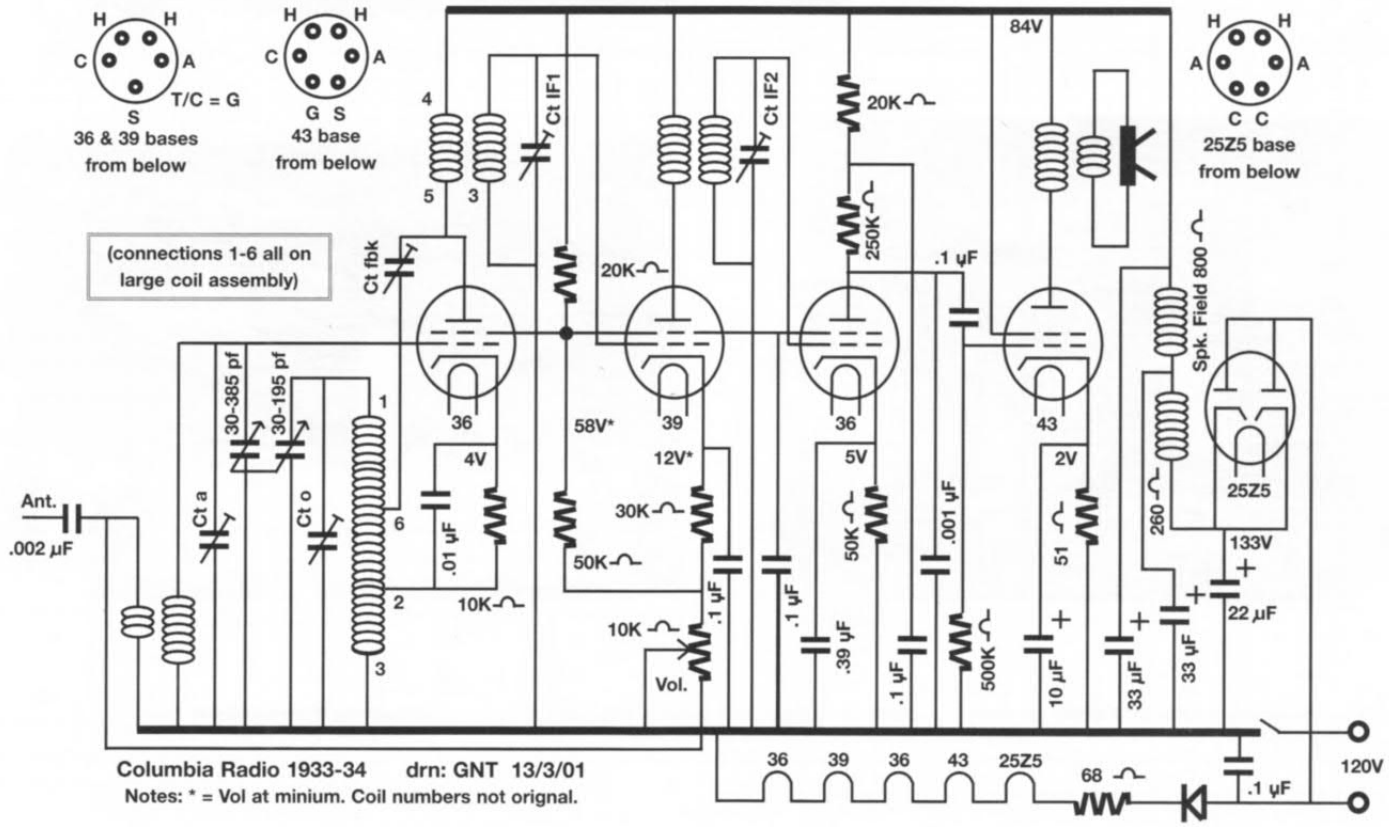
Reading the book, my imagination takes me back to the hustle and

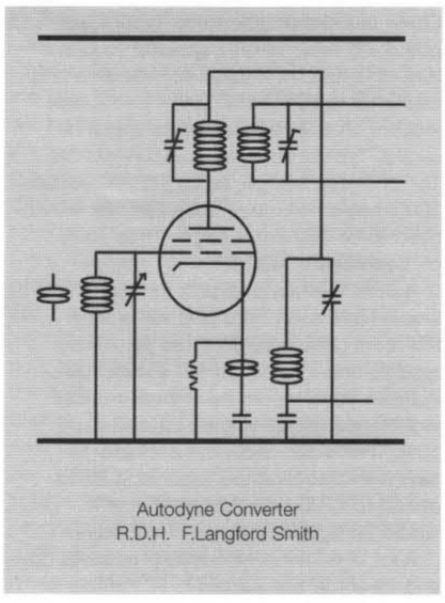
bustle that must have abounded. A radio could be built, tested, aligned and packed ready to go, in about 30 minutes, by a small production line. Some of these paid just a few cents to each operator for each radio made. There could also be a nasty catch that ensured each man did his job right. No payment was made for radios that didn't work due to incorrect assembly. If I think hard and squint my eyes, I can almost see all the small units, up dusty side streets, bending up chassis and others soldering in components. And then all the furniture businesses turning their hand to making cabinets. I bet if you strolled, around the air would have been full of fumes from transport vehicles, plating chemicals, soldering flux and lacquer being sprayed. In 1933 there were 59 known companies but it was a short boom and most of these set makers were out of business by the mid-thirties.

Columbia Midget Radio 1933-1934
Preliminaries

This is a tiny radio and it is a real feat to have crammed five pre-octal valves into it, plus the circuitry to make a Superhet. The chassis had been 'worked on' by someone in the past. There were obvious resistor and capacitor changes that were not neatly done and the inclusion of a diode dropper, for the tube heaters, in lieu of a resistive line cord. All the coils were without screening and apart from the aerial transformer were underneath the diminutive chassis.

To find out what made it tick I decided to strip and rebuild it. As I took it carefully apart I traced out the schematic which was quite easy (but included previous modifications) until I got to the frequency changer. I didn't understand this immediately but it turned out that the first IF transformer and the oscillator coil were made up as one assembly (see picture). Coils are often tricky as wires disappear inside the former or even below the windings. Eventually with the help of an LCR meter all became clear.





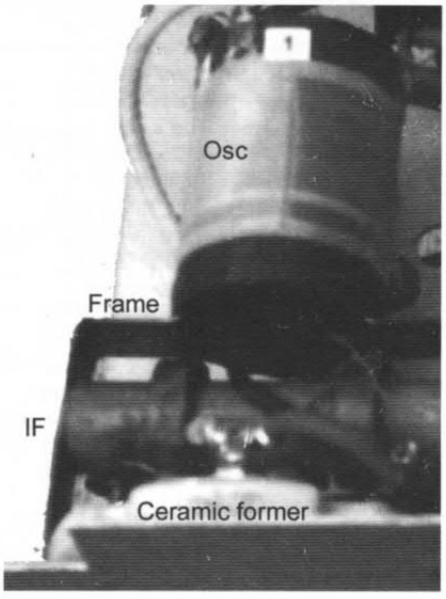
Autodyne Converter
R.D.H. F.Langford Smith

The Autodyne Frequency Changer

The frequency changer was unusual to me, and is an Autodyne, invented by HJ Round in 1913. The name derives from two Greek words, meaning 'self' and 'force' or 'work'. Hence an Autodyne is a self-working Superhet. Langford Smith, in the Radio Designers Handbook, briefly discusses it. He says that it provides good sensitivity and signal to noise ratio, but use is restricted to the Broadcast Band. Further, at higher frequencies it is difficult to maintain oscillation and it can radiate badly due to quite large voltage swings across the tuned circuit.

His circuit was not like mine. It had the primary of the first IF transformer, returning to HT, via an isolated winding on the oscillator transformer and tuned on the anode side, see diagram. In my circuit the tuning was on the cathode side (well, there is only one side!) but feedback was via a

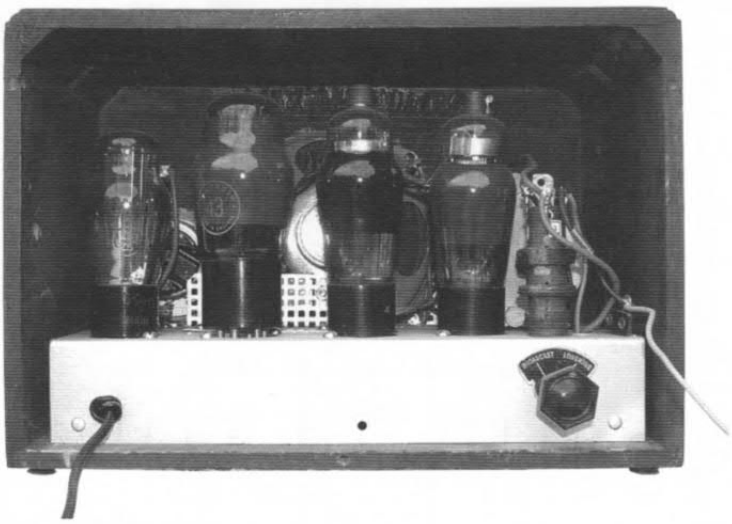
Below: Columbia IF and Oscillator coil



Columbia from rear

Clarion from rear

Ultradyne step chassis



Unknown set from rear

trimmer between anode and a tap on the oscillator coil. The resistor and capacitor in the cathode lead are important components. They serve the purpose of grid capacitor and leak resistor in more conventional circuits and limit the build up of oscillation; the resistor also looks after the valve's DC conditions by providing bias. As far as oscillation (455 Kc/s higher than the tuned frequency) is concerned the valve is working in earthed grid mode, the grid effectively being grounded via the secondary of the aerial transformer. The signal input, which is tuned in conventional manner, is applied between grid and cathode. Thus, the valve is receiving this signal whilst having oscillations in its cathode circuit. The two signals are mixed in the same manner as a standard mixer.

Working Again

Once the chassis was back together it was soon working. The IF transformers peaked up nicely at 455 Kc/s but I could not get the aerial coil to tune. Once 10 turns were removed from its secondary the trimmer peaked it just fine at 1500 Kc/s. As the oscillator tuning gang has shaped vanes there is not much to do for RF alignment. There is just a trimmer to set the frequency correct at one part of the band. The oscillator feedback trimmer was adjusted on a station. It had one place where output was at a maximum and so must optimise the mixer conversion efficiency.

HT Oddities

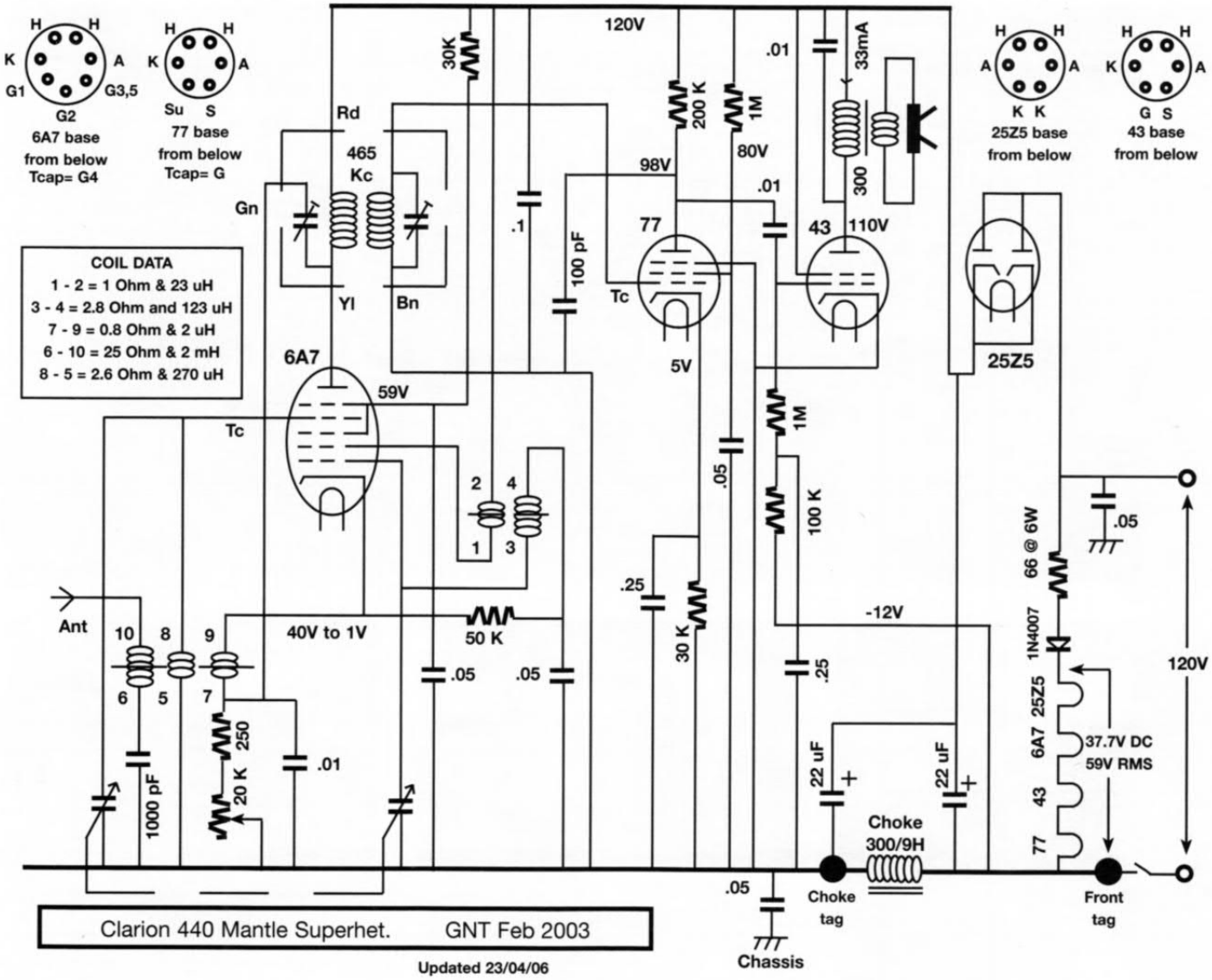
During the rebuild of the radio I sorted out a few strange things. One of these was that the speaker field coil was across the HT supply, but the coil was only 800 Ohms. It alone would take almost all the current that the 25Z5 rectifier could supply and consume 8W into the bargain. Both the choke and the speaker appeared to be original items by the way. The obvious thing was to wire it in series with the choke, which gave an HT voltage of 84V. The 43 output valve had an original looking cathode bias resistor of 50 Ohms that would be about right for this. Further, data on the 36 tube said that for use as an anode bend detector, anode current should be around 100 micro A, which it was. A look at the data for the 39, used as the IF amplifier, confirmed that it was very linear at low voltages and currents.

Designing the Autodyne Frequency Changer

I wondered how you would go about designing the Autodyne oscillator used in this radio. First thing would be to set up DC conditions and as a guess 0.5 mA could be chosen for Ia. Then looking at some old data for a 36 tetrode, about –5V is needed on the grid. So the cathode resistor of 10K Ohms is a reasonable value. Now what about the value of the capacitor across it? Well, if in function it is to operate as a grid capacitor, with the 10K Ohms as its leak resistor, then its time constant might be similar. Typical grid leak components are 1M Ohm and 100 pF, so as the resistor is 100 times smaller then the capacitor would need to be 100 times larger. Thus 100 pF becomes 10,000 pF or .01 micro-F.

A commercially available tuning gang would have been used and the one on the radio goes from 30 – 195 pF. A little algebra and a calculator (or a slide rule in those days) would have given the coil inductance as 120 micro-H (I measured 138). This would allow the oscillator to tune the radio over the Broadcast Band, of 550 to 1700 Kc/s, but of course it would be higher by the IF of 455 Kc/s.

A lot was known about coils in those days and so actual coil dimensions, number of



turns etc would have just been a matter of consulting available data. Now where to put the taps for the anode and cathode connections? Clearly a tap is needed for the cathode connection, as it will be relatively low impedance. Because of the auto transformer connection it will be multiplied by the square of the turns ratio. This ratio will be the number of turns of the whole coil to the number of turns below the tap. To convince myself that this is so, I think of a situation where the tap is at the middle of the coil. Now clearly the voltage at the tap will be half that across the whole coil. So, if it were a conventional transformer, then the primary would have twice the number of turns as the secondary and so the turns ratio would be 2:1. For the auto transformer then, the turns ratio will be the number of turns of the whole coil divided by the number of turns to the tap and again be 2:1. For the actual situation of the oscillator coil, the turns ratio of the windings, from the bottom up, was 1 : 1 : 3. That is 1 from chassis to the cathode tap, then 1 to the next tap and 3 from here to the top of the coil. I reckoned this simply upon measuring resistances. The number of turns should be proportional to this for a straight winding.

Of course you can be fooled if you measure layered windings, say on a centre tapped HT winding of a mains transformer. Clearly the number of turns either side of the tap must be the same but the resistances won't be. This is because for the half winding nearest the outside, the length of wire per turn, will be greater and so the resistance quite a bit higher. For a 350-0-350 transformer that I just happen to have sitting on the bench, the resistances were 468 Ohms and 493 Ohms.

Now for my oscillator coil the cathode impedance would reflect across the whole coil but be some 25 times higher in value. Also, the cathode circuit impedance would reflect across the primary of the first IF multiplied by 4 but have the reactance of the feedback capacitor in series with it. For me, I couldn't calculate where the taps should be and probably the original designer didn't either. I can imagine taking a reasonable guess and then getting the coil-shop to make up some coils with a range of taps and arriving empirically at the best.

What feedback capacitor or trimmer to use? I measured 200 pF, as a maximum, and it would not have been hard to guess at something around that value. A little bit of circuit testing, on a few examples, would have shown whether that was a suitable value to optimise the conversion efficiency.

Clarion Model 440 1933.
Clarion was a trade name for the Transformer Corp. of America

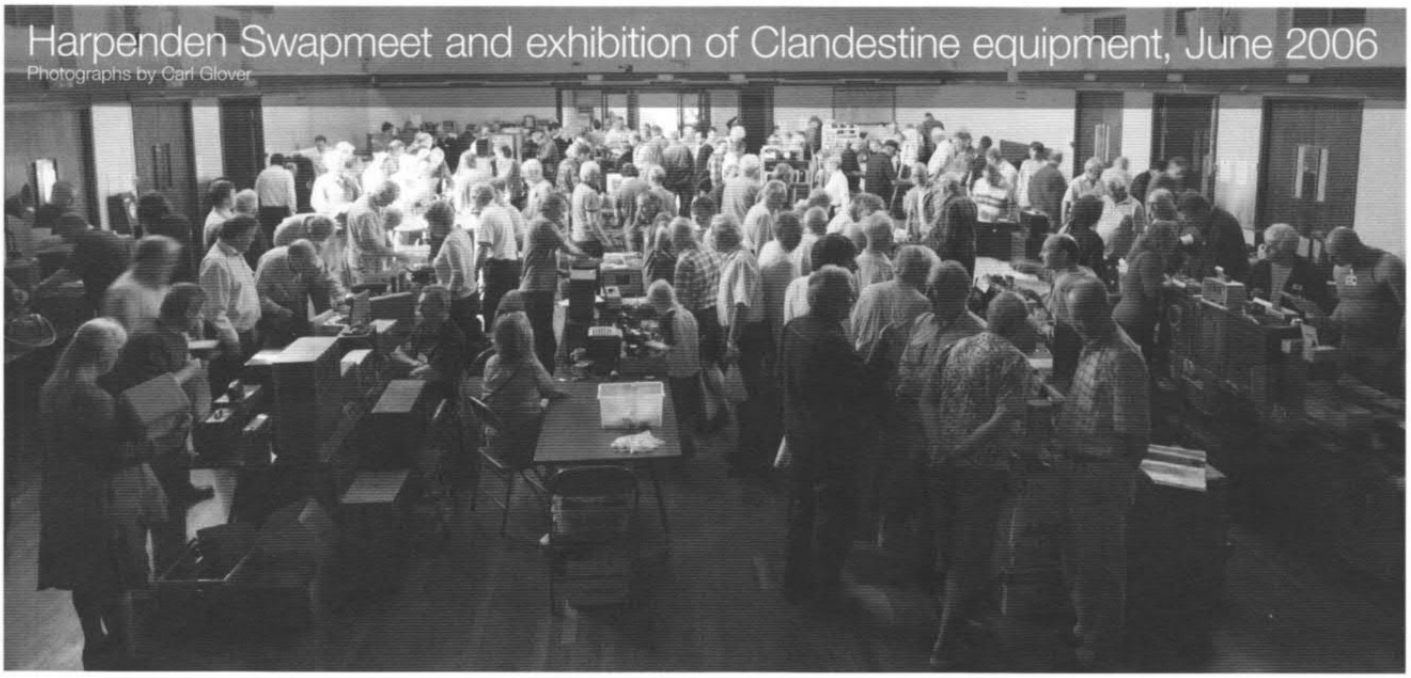
Finding out the Model number
Before going 'to press' with this article I e-mailed member Alan Douglas, in the USA, asking if he knew any history of these companies. For this one he surprised me by not only identifying the model number but in finding circuit data in Riders. My circuit traced and drawn back in 2003 is far easier to read but I did find a mistake in it!

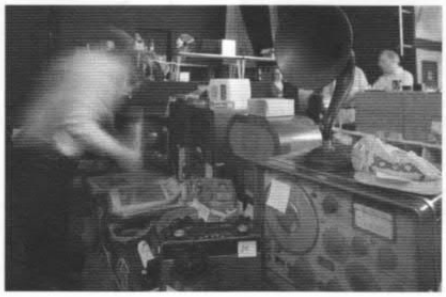
The Pentagrid Frequency Changer
This one uses a seemingly easy to understand Pentagrid frequency changer but I did wonder what the 50 K Ohm resistor did between the cathode and the bottom of the oscillator grid coil. In fact it makes the grid approximately track the changing cathode voltage as the volume control goes from minimum to maximum. Cunningly this makes conditions almost constant for the oscillator whilst affecting the bias of the mixer and controlling its conversion efficiency.

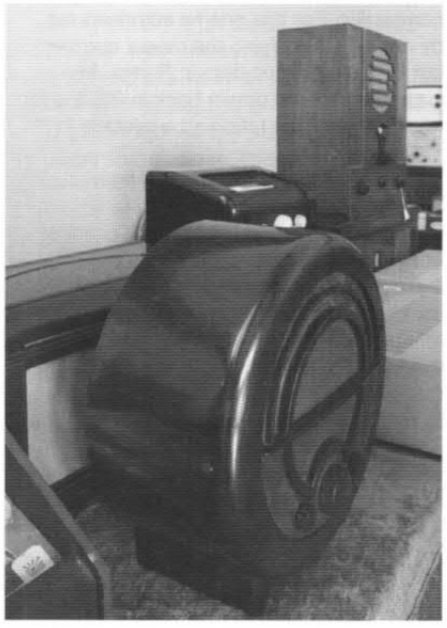
article continued on page 27

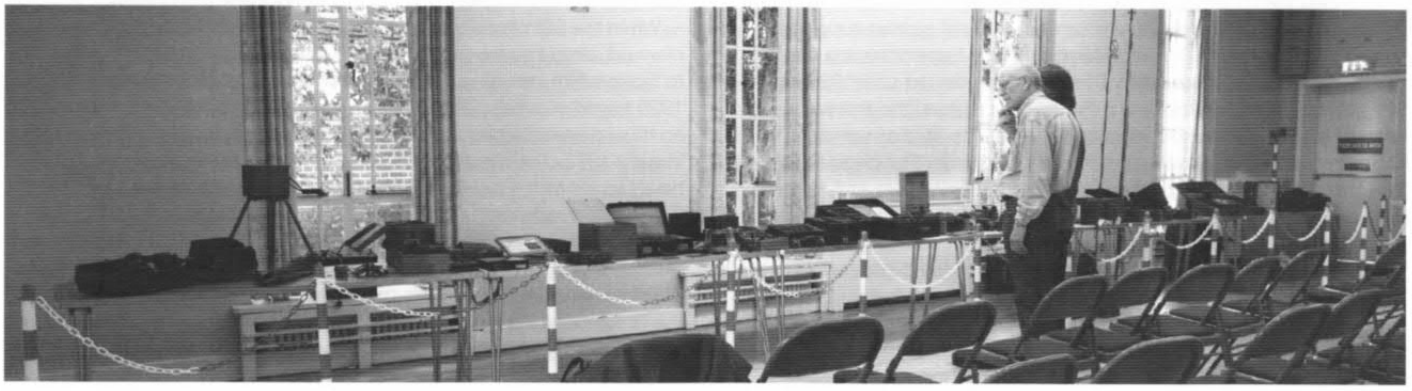
Harpenden Swapmeet and exhibition of Clandestine equipment, June 2006

Photographs by Carl Glover









The 2LO story

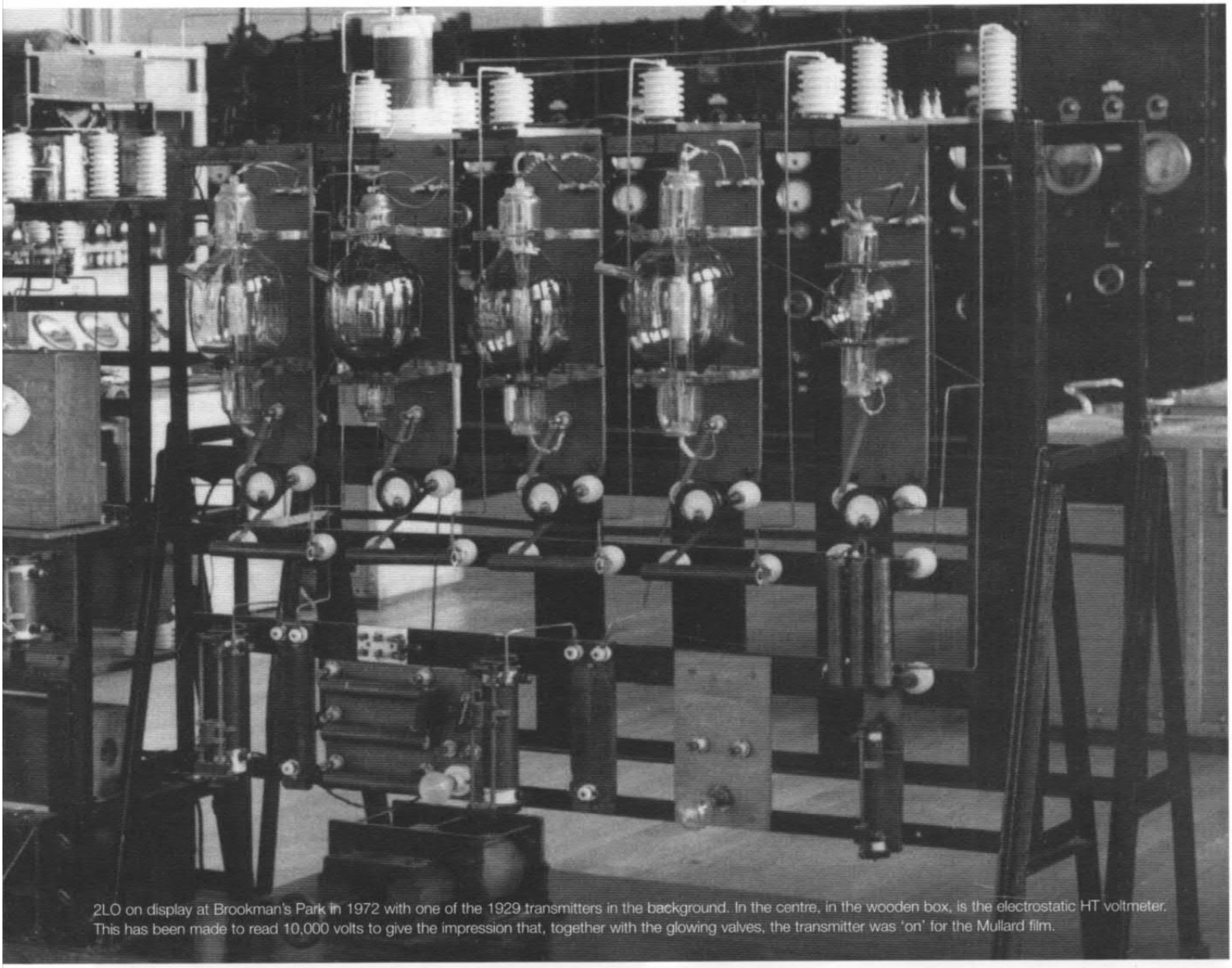
by Rod Viveash

The first 2LO transmitter was designed by HJ Round and built in May 1922 in the laboratory of CS Franklin, both men being respected engineers of the Marconi Company. The transmitter was installed in a room on the top floor of Marconi House in The Strand, London. Another room was converted into a studio and a third became the battery room, both also on the top floor. The generator was eight floors below in the basement and an aerial on the roof completed the installation. Marconi's began broadcasts from 2LO until, in November 1922, the British Broadcasting Corporation was formed and took over operation of the station. The fledgling BBC soon outgrew the facilities at Marconi House and moved to new premises at Savoy Hill Mansions. 2LO remained at Marconi House as the BBC's first transmitter until 1925 when a new 2LO was installed in purpose built huts on the roof of Selfridges department store in Oxford Street. This consisted of two HJ Round designed Marconi Q type transmitters of 1.5 Kw each, twice the power of the original and with a much larger aerial system supported by two 125 feet masts. The old Marconi House transmitter, the star of this story, became the standby. This set–up continued until 1929 when the station moved to Brookmans Park, Hertfordshire; the first twin channel station of the BBC regional scheme. The studios remained at Savoy Hill feeding Brookmans Park by land lines. The original 2LO transmitter also went to the new station as a display item and at some unknown point was later dismantled into individual components and put into an outside hut under one of the aerial support towers.

In the early 1950s 2LO's remains were rediscovered and restored by Ray Milligan and Charlie Sutton, helped by many others, all of whom were members of Brookmans Park staff at the time. I arrived at Brookmans Park in the Autumn of 1968 as a shift engineer. I'll never forget the moment when the dust covers were removed and the restored 2LO stood in all its glory. It was love at first sight! After the rebuild 2LO was put on display in a large room on the first floor – 'The Studio'. Now it was relegated to the ground floor motor generator room for the 1929 transmitters. These were still maintained in working order with the diesel generators in case of failure of one of the service Radio 1 and 2 transmitters or the mains electricity supply.

Over the next couple of years I took it upon myself to carry out minor repairs to 2LO during odd spare moments. At the time we were required to record the readings of all the meters on the station twice per shift and work on 2LO became a pleasant relief from this chore. Over the years various insulators and minor components had become broken. These were plundered from the 1929 transmitter stores, being 'of the period'. The original restoration had used some of these components to complete the project.

When the 50th anniversary celebrations of the BBC were being planned, a resurgence of interest in 2LO occurred and Mullard were to make a film including the transmitter displayed at Brookmans in the 1929 transmitter hall. Charlie Sutton was still working at the station, so he and I refurbished 2LO and polished her up, ready for filming in early 1972. The powers that be decreed that the valve filaments be lit, so we found a suitable transformer and set about the task. A circuit diagram for 2LO was obtained from Marconi's; it was in poor condition and somewhat incomplete. My friend and colleague George Morley and I re–drew it based on the tatty drawing and the physical remains; this became the accepted circuit that went into the Brookmans Park filing system and is generally available today on the internet. During my research into making the drawing I got



2LO on display at Brookman's Park in 1972 with one of the 1929 transmitters in the background. In the centre, in the wooden box, is the electrostatic HT voltmeter. This has been made to read 10,000 volts to give the impression that, together with the glowing valves, the transmitter was 'on' for the Mullard film.

to know 2LO very well. The film was to include George and myself as 'students' being shown the transmitter by BN McLarty, a former Marconi chief engineer. Mr McLarty admitted he knew nothing about 2LO as his involvement came later. George and I had to explain its workings to him so that he could then tell us on the film! After all this exposure 2LO went under the dust covers until the next major upheaval in 1979 when it was decided to scrap all the transmitters, including the 1929 units, to re–engineer Brookmans Park.

All the old gear at Brookmans Park became invaded by a gang of scrap merchants. For those of us left it was heartbreaking. The engine room became a dangerous place, flywheels weighing several tons were being pulled off by a dumper truck and everything was being torched. Engine No.4 with its dynamo was left intact for a while as the Lincolnshire Museum was interested as it was a Ruston Hornsby product. Unfortunately the bid failed and it too came under the torch. On a brighter note, I believe some of the 1929 components were distributed amongst BVWS members at the time. The few remaining staff also had some bits. I had a water–cooled valve and jacket, the Colchester Triumph lathe from the old workshop (weighing half a ton, this took some getting out) and also a small relic of 2LO – a double element wirewound rheostat that was not used in the restoration. My valve later went to a small valve museum we started at Brookmans Park and later to the Science Museum. For safe keeping we put 2LO in an outbuilding, brick built and background heated, transporting the five units one at a time in a handcart. There it remained until after I said goodbye when I moved with my family to Daventry transmitting station in 1988.

I thought that I had seen the last of 2LO, until a few years later the old girl followed me and arrived at Daventry. It was to be on display for the short wave closure on the 29th March 1992. I spent a glorious couple of weeks refurbishing and cleaning. Again, against my better judgement, the valve filaments were required to be lit. I obtained a transformer from a short wave transmitter, but this time I screwed a large variable resistance to a back panel so that I could control the current to the filaments to reduce failures.

On the day of the closure all went well, Professor Stanley Unwin, a former Daventry engineer, performing the closing ceremony. Later that year 2LO went to Broadcasting House to be displayed for the BBC's and 2LO's 70th anniversary. I left the BBC in 1995 and again bade farewell to 2LO. In 1997 the BBC transmitters were privatised and passed to Crown Castle International; 2LO became jointly owned by the two organisations and in 2002 it was offered to the Science Museum.

On 7th November 2002 my wife and I were invited to Birmingham Symphony Hall for the BBC 80th anniversary concert where 2LO was to be officially handed over. A few days before, I returned to Daventry station to help collect everything together and assist the museum staff bubble–wrap 2LO ready for transfer to Birmingham. On the evening, 2LO stood at Symphony Hall polished to perfection. In his acceptance speech, Lord Puttnam, trustee of the Science Museum, spoke of 2LO as an 'icon of broadcast history' and thanked us all for saving it for the nation. My wirewound filament dimming resistance was still screwed to the back (I didn't tell anyone).

And so that's how, quite by chance, I came to be involved with the BBC's first transmitter. A roller coaster ride that lasted the best part of 30 years. Unfortunately we are again at a low point as 2LO is in store; let us hope space is found to display it for future generations to share my fascination.

Hacker Sovereign II RP25 Serial 20756 by Mike Phelan

An initial look at this set revealed that the bass knob was missing, there were a few paint spots on the cabinet, the foam padding under the rexine was gone and the pads for the battery on the cabinet back interior were long gone – you could just see where they would have been. I opened the cover, and found that it did not look too bad; the battery connectors were connected in parallel and had flex soldered to them, presumably to use some sort of a power supply.

The internals looked untouched except that the volume control/on-off switch was loose, poorly soldered and the flat area on the spindle had been filed too much, so the knob was very loose.

The scale and other knobs looked excellent – they needed cleaning, of course, and one or more felt washers were missing. The alloy trims needed polishing. The serial number under the turntable was missing. Time to connect a supply to it now! All bands were working, but the sound was very distorted and also crackling, AM was weak, and FM was humming and hissing; IF instability? The coils on the ferrite aerial did not look as if they were in the correct place. All presets on the audio panel looked as if they had been moved.

I decided to sort out the audio amp first, in case anything was likely to cause damage. The first thing was to set the quiescent current correctly – it had been turned down to virtually zero, and the mid-point voltage was about 3, instead of 8.5. With these set, the audio sounded almost as it should, rather than the distortion when it was trying to emulate a Class-C amplifier!

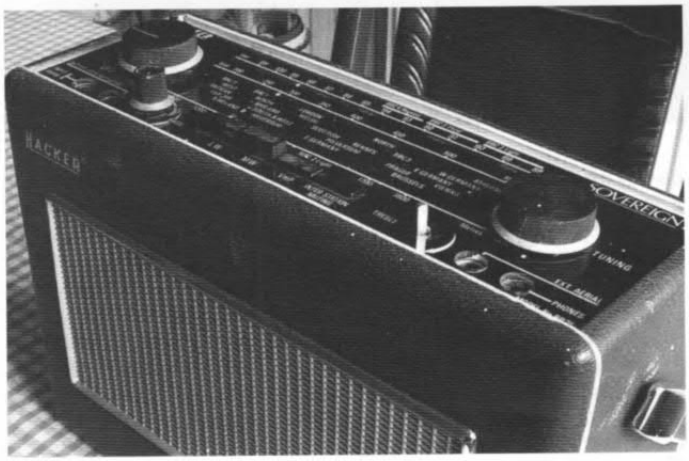
The AF quality is probably one of the best on a set of this type. This one was not quite there yet... there is still a bit of a crackle – the BC148 in the first stage was the culprit. A couple of capacitors were o/c – C10 speaker coupling and C9 feedback. C2, the supply decoupler was weeping, and I changed C5 from 40mfd to 10mfd as per the official mod to prevent thump on switch-on.

It now really sounded superb. I dismantled the rest of the chassis and spotted that the AM rejection preset (R28) in the ratio detector had lost its wiper – a replacement cured what I thought sounded like instability. Realignment of the ferrite coils and RF AM trimmers sorted the poor AM, so just needed a new volume control of 47k and reconnection the melted leads, and the chassis was complete.

Now for the cabinet, which was completely dismantled first. I tend to put all woodscrews, knob springs and self-tappers in a screwtop jar, shake them round in white spirit, and spray cooking oil on them whilst the distaff side is distracted! This is more effective than mineral oil as it eventually becomes hard.

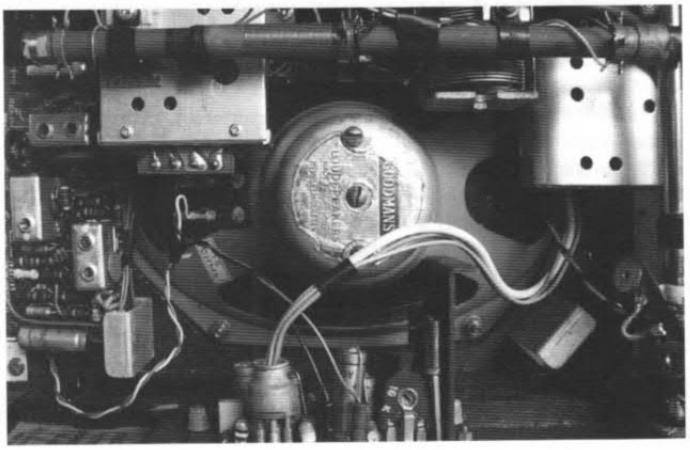
The first problem was that the rexine had a lot of white paint spots on it – the worst ones I managed to remove with the low-tech method of using a fingernail. A scrub in warm water with some washing powder cleaned all the muck off, so it was then, with some trepidation, that I decided to replace the foam on the front; the back fared better, so I left that. The front seemed to be quite baggy; it had obviously lost its foam padding.

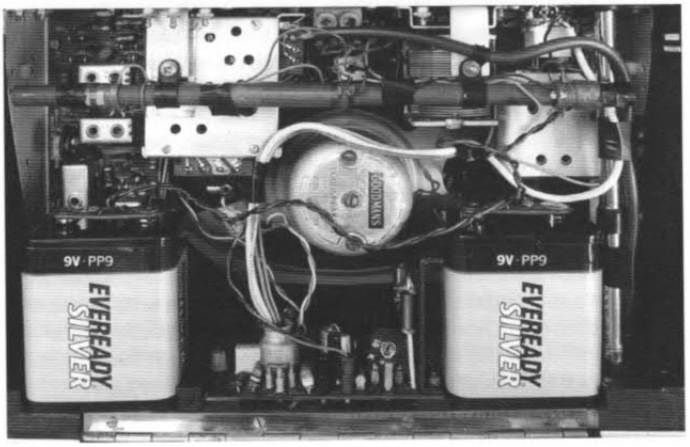
The white plastic trim came off easily – the adhesive seemed to peel off so the remains did not adhere to either the trim or the rexine. It was scrubbed and left for later replacement, as were the grill and Hacker logo, which had unfortunately lost one of its pegs (more on this later).



Above: The Hacker Sovereign 'before'. Below: The chassis 'before'.

Above: The Hacker Sovereign 'after'. Below: The chassis 'after'.





The serial number label also fell out, so this was saved to glue to the turntable later.

Some careful work allowed me to pull the rexine off to reveal the foam padding, leaving the rexine still attached around the edge of the speaker opening, as it was decided that it would not be a good idea to pull it off entirely.

The foam had become powdery, so it was easily removed with a stiff brush. The inside of the front board was sprayed with matt black, and it was now ready to replace the foam. I managed to find some thin foam so I cut a rectangular window for the speaker aperture. The rexine was gathered with clothes-pegs to keep it out of the way of this operation. I managed to find some foam of what I thought was the right thickness – about 4mm, and a fairly soft consistency. I think it was the sort of foam used to pad door cards on cars.

PVA glue was applied to the innermost and outermost edges of the wood, and the foam attached and left to dry. It could then be trimmed on its outside edge, cutting it at a slight bevel. To refix the rexine, we needed the foam padding to be under compression with no wrinkles. The front was laid down on an old magazine (Radio Times, of course!) and weight applied with a wooden block and my CT160 standing on it to compress the foam, so it could expand and fill the rexine when dried. Some solvent glue and a box of drawing pins, and it was left overnight. The next day revealed an excellent result!

The Hacker badge had lost one of its pegs, so I devised a way to repair it. The peg was about 2.5mm in diameter, so it would leave an ugly hole if I drilled the logo to this size.

It was useful that I also repair clocks, so have an assortment of taper pins and fine brass tube called 'bushing wire' – these can be improvised.

You need a pin-vice as well – many available for a couple of pounds and useful for all sorts of things.

I selected a drill of about 0.5mm and drilled where the old peg was – the hole came out just inside where the 'E' was, on the black part.

Do not do this under power! If no such drill is available, a spear drill can be made easily with a sewing needle, flattening it to a spade shape whilst red hot. I looked for a steel clock pin that entered the hole almost all the way. The large end of pin was then put in a pin-vice and tapped with a small hammer to give a sort of a rivet head.

It could then be tapped into the hole in the badge, leaving the end on the inside. A piece of bushing wire was cut the same length as the original peg, and filed flat. It is useful, but not essential, to make a slight countersink at the remote end.

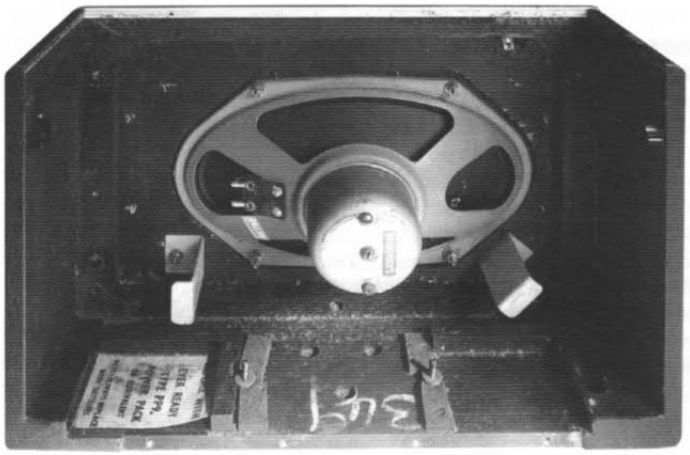
All that remained to be done was to slide the brass over the pin, and solder them together. After trimming the pin, it was almost an invisible repair. A tiny speck of black paint where the 'rivet head' was under the 'E' completed the job, so it could be replaced on the cabinet front.

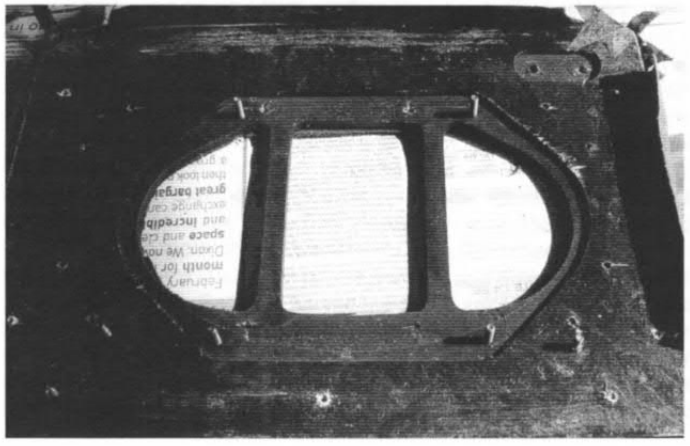
The hinge and handle were chrome plated, and some Solvol Autosol brought them up like new. The two springs in the ends of the handle needed retensioning.

I glued the white trim on to the edge of the front panel, replaced the grille and speaker, and screwed the front to the rest of the cabinet. All that was left to do was to give the rexine a final clean and buff it up with black shoe polish. The black underside of the scale was sprayed with matt black and the scale polished on the top surface only. I found some screws to replace the missing ones. I thought it was worth a spot of clock oil on the drive pulleys, and the jockey arm needed readjusting. All the knobs were scrubbed with a nailbrush and the alloy trims polished using more Solvol Autosol. Doing this will get polish into the plastic parts of the knobs, so they need cleaning again. Some new felt washers were made with a wad punch.

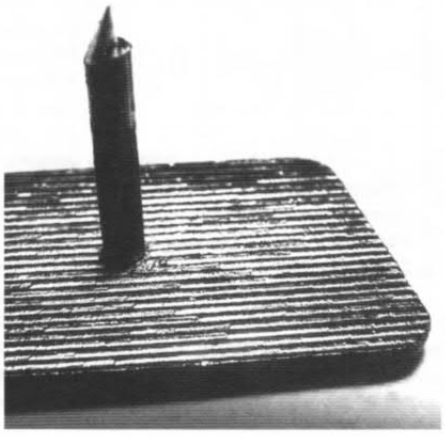
Finally, reassembly of the chassis to the cabinet and a buff up with Meltonian shoe cream left me a very nice addition to our household sets – it is in regular use, and will probably stay so.

In my humble opinion, these are a nicer looking and better performing set than the Roberts R707 which I also have.





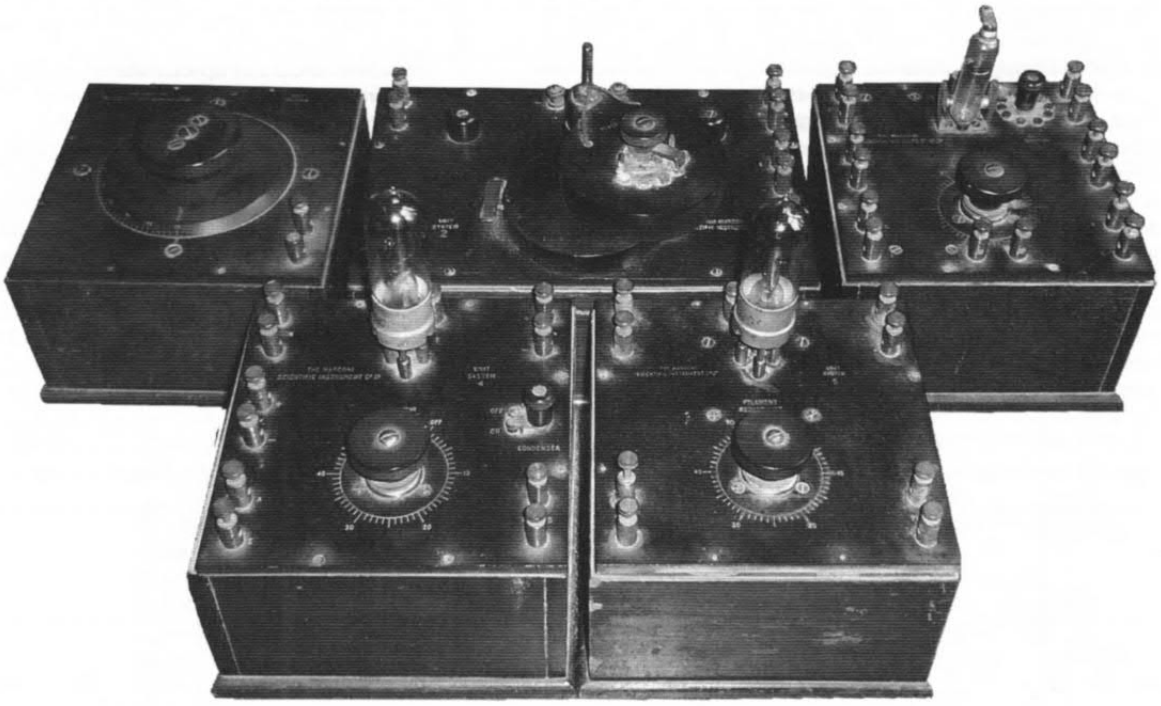
Above: inside the cabinet. Below: The speaker opening.



Above: working with the foam rubber. Below: the repaired rear of the Hacker badge.

The Marconi Scientific Instrument Co. Twice! by Albert Noble

At the end of the first world war (1918), The Marconi Scientific Instrument Co., whose works were at 21/24, St. Anne's Court, Dean St., Soho, London, made non–industrial wireless apparatus for the richer amateur domestic experimenter who could afford the prices. Because of this and also that it was soon to be succeeded by the newly formed Marconiphone Co. at the end of 1922, very few examples made by this scientific company seemed to have survived. The majority of early surviving Marconi equipment seen in museums and collections was made by The Marconi Wireless and Telegraph Co., because they manufactured in larger quantities for both industry and the services.



A search of The Marconi Collection at Oxford University, housing 626 items, reveals only 4 items in the collection made by the Scientific company (one item is just a potentiometer and two others are identical 5 valve receivers) whereas there are 142 items made by The Marconi Wireless and Telegraph Co., 20 items by the Marconi International Marine Communication Co. and 14 by the later Marconiphone Co. Marconiphone in 1922, which was a newly formed department of MWT and by 1923 a separately formed company taking over all of Marconi's domestic production, such as the V1 and V2 models etc.

Interestingly, a study of the types of wood used in just the Marconi items in this collection at Oxford reveals that teak was used in the cabinet construction in 59 pieces, mahogany in 45 and oak in 1. So teak was the most common wood used and oak the least. Plastic is used in 45 items although this is queried in some cases and in others is just the base of a valve. Ebonite is high up the list as would be expected. Teak is impervious to insect attack and does not float in water when first cut down.

H. M. Dowsett in his book, *"Wireless Telephony and Broadcasting."* (vol.1 page 58), reports that the first transmission given by The Marconi Scientific Instrument Co. from their Writtle station took place on 14th. Feb. 1922. This was, of course, 2MT (Two-Emma-Toc) using 250 watts.

These boots were made for walking!

I began searching for old wireless before the BVWS was formed. Each Saturday evening I slept in an armchair fully clothed so that I would not disturb my wife! At 2.30am I would rise and travel to the Club Row area in the East End of London arriving at about 3am. In olden days it was told that you could have your watch and chain stolen at one end of Club Row and buy it back later at the other end.

For some 5(!) hours I would tramp up and down, up and down Sclater St. and Hare St., rushing up to each totter's car or lorry that arrived with its goodies on board. Old chairs, tables, electric fires, clothing, pictures, books, bookcases, pianos ,old carpets etc and yes, old wireless. Using a torch to try and see those giveaway black and dirty ebonite panels or cathedral outlines before the vehicles had ever stopped. Asking the driver how much before he had time to get out his car in case someone else snapped up a wireless treasure. The houses each side of the road were mostly derelict in this old part of London, left over from the blitz and neglect. Some had old totters on the ground floors selling junk and trying to fight the leaking roof at the same time. Old bits of carpet festooned many rotting floors and one 'trod the boards' in trepidation at times thinking that one might finish up in the basement if the flooring ever gave way.

By 8am I was exhausted and made my way home just as the public arrived, who never found that old wireless because it was either in the back of my car or the car of another collector, who found the wireless before me. One such fellow collector was known to the totters as, 'Mr.Wireless.' It was all a question of luck really as to who was at which end of the street as and when an early wireless of interest arrived in the back of a car or lorry. When we passed by each other we would enquire what the other had found. Sometimes I was envious of his finds and sometimes he of mine. Doing this for about 5 years resulted in my acquiring

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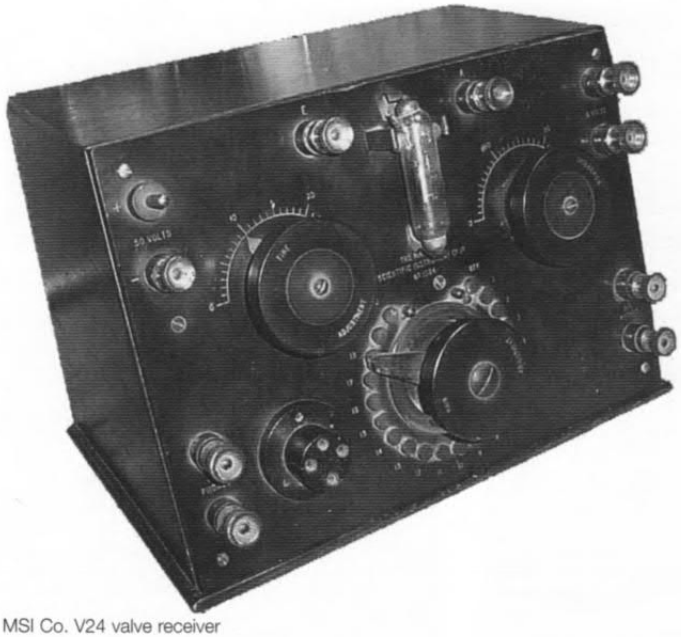
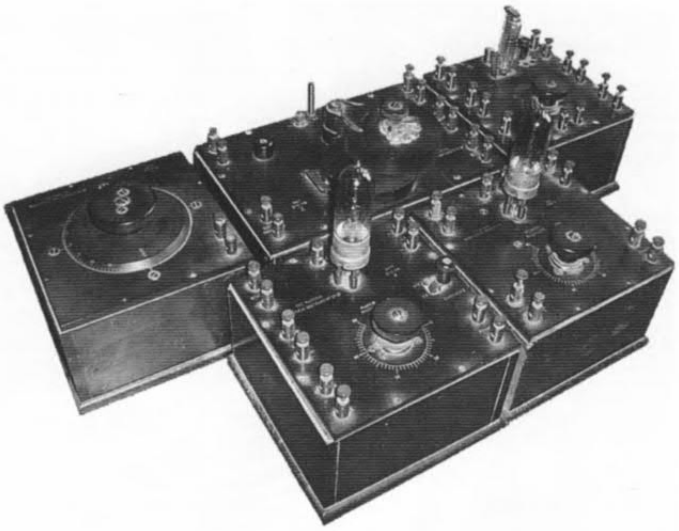
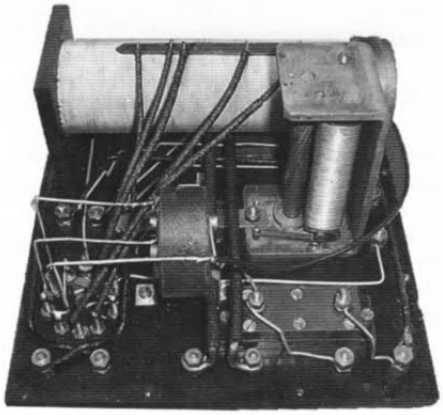
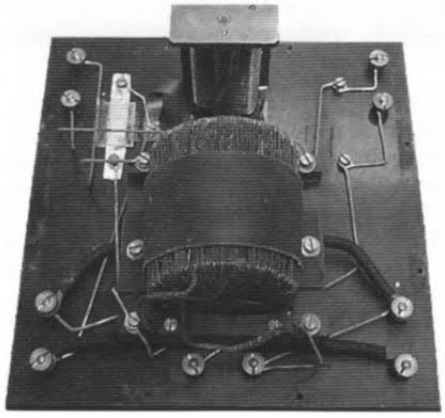




MSI Co. V24 valve receiver



HF Unit internal view



LF Unit internal view

my present collection, although much of it has been disposed of since then. It also resulted in my acquiring a few corns!

The prices I paid then were mouthwateringly low compared with today's prices. Somewhere between £5-£15 could buy from the old Cockney totter's house clearance goodies, wireless dating from the 1920's onwards. All the most popular makes from the 30s were to be seen most weeks, but very early 1920's were much scarcer to find as would be expected, but bright emitters were to be found too. I recall an old box tossed from the back of a car with gay abandon, containing - "Have the two for ten bob, guv." I did!

The middle classes getting married in the 1920's and buying an expensive wireless for their home meant that by the 1970's many had died, their houses, sheds and lofts cleared, so most old quality wireless was getting scarcer to find from the old London Street markets as the last few decades of the 20th.cent. passed. Hence prices began to move up. This, together with the big wireless exhibition at the V and A in London in 1977, and the many others that it seeded, made dealers aware that early wireless was getting as scarce as Georgian furniture had become in previous years, so prices were adjusted accordingly from then on. The days of finding an old vintage wireless just for a few quid had sadly gone forever.

The find of a lifetime.

During this hectic period I had always visited other London markets too such as Walworth, Bermondsey etc and even Antique shops where I did find the occasional set. For example an Emerson, 'Snow White and the Seven Dwarfs,' children's radio in one shop in South Wimbledon, London. One sold recently at Christies for over $3000 so that was a nice early shop find. Many other wireless collectors too will have similar tales to tell.

I have always considered that any wireless collector will eventually have, with some luck, what he may call, 'My find of a lifetime' – that rare item which few others ever find, it being a reward, as it were, for all the effort that he has put into searching for early wireless.

So it was that in an Antique shop, this time in Norbury, South London, I had mine. The shop was run by an Irishman of imposing build, who travelled back to Ireland, dealing each side of the Irish sea.

There was nothing in his windows on this particular occasion so I wandered in looking around, but didn't spot anything of interest. Just as I was about to depart from the shop the owner came out from the depths of the furniture and asked me what I was looking for. I told him, old radios. He said that he had something that an old sailor had brought in recently, and he dragged out a large, dirty, sack covered cardboard box from the back. Yes, an old sailor he said who had been hard up so wished to sell his old radio.

"It's in 5 pieces," he said as he dragged the box forward and I began immediately to lose interest in a radio that was in five bits! An empty, badly scratched, woodworm embellished cabinet with torn fret. A rusting chassis, a loose grotty loudspeaker with a bashed in cone, frayed line cord and a few sad looking wobbly valves were all pictured by me as being a 5 piece radio!

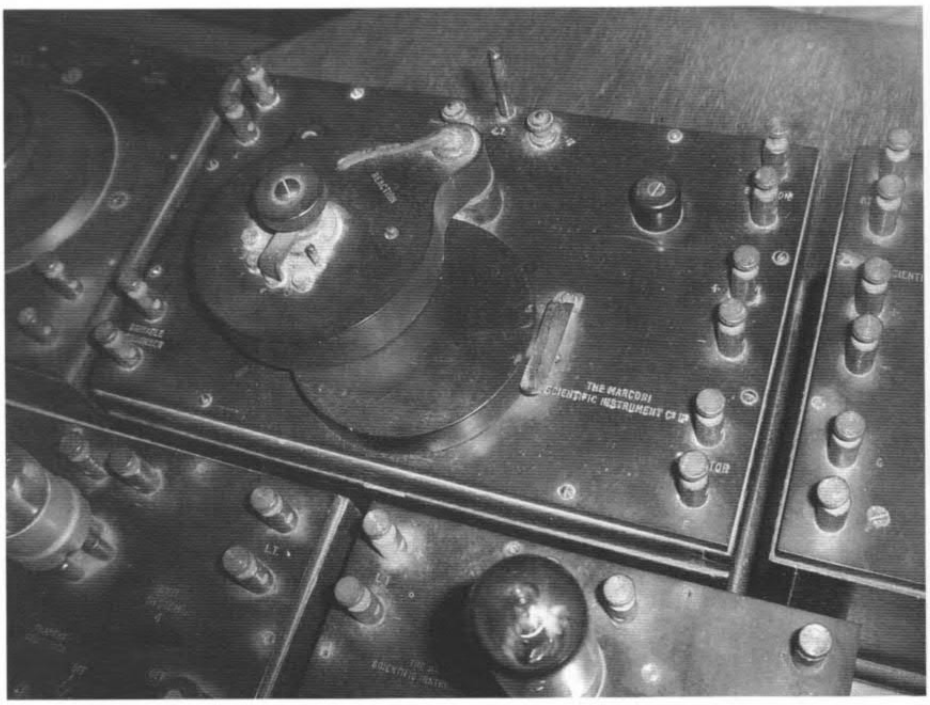
But to my amazement on examining what was under the sacking, I realised that this was a very early example of a unit constructed wireless. Maybe home made, I thought, as this method of unit construction had been used by wireless experimenters up until about 1924.

But engraved on the panels of each of the five units were the magic words, which made me check that I had a wallet on me, "The Marconi Scientific Instrument Co," at that time a company that was unknown to me.

"How much," I asked, trying to hide my excitement. "Saaay 35 quid. OK?" Yes that was certainly OK. Into the back of my car went the old cardboard box and its contents. So this was my, "Find of a lifetime."

Unit Construction.

This 5 unit 3 valve receiver used, as the HF amplifying valve in one of the units, the early V24 Marconi triode, which has



Retroaction Unit detail view


MESSRS. W. G. PYE & Co. beg to announce that they have opened a Wireless Dept. at their works. For considerable time past experiments have been carried out and new types of receiving apparatus have been evolved. Among these may be mentioned the following:—

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A design of LF. Intervalve Transformer in which the iron yoke is a continuous fine iron wire ensuring perfect reproduction of speech and music.

Unit system of Valve panels so as each connection is clearly marked on the ebonite boards enabling auxiliary apparatus to be connected at will.

The above illustration represents a receiving set incorporating one receiving and two L.F. amplifying Valve panels. With this set music and speech may be clearly heard over a long range. One or two valve panels only may be used if desired, other panels being added at will. This system is EASY to MANIPULATE, MODERATE in COST and CERTAIN in ACTION.

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Pye unit receiver

the filament connections brought out each end with the grid and anode each side, a very early example of low inter electrode capacitance and low loss construction. This small valve is similar, in that the electrode connections were brought straight out of the glass envelopes, to that which helped win WW2, namely the famous EF50. Timely then that the V24 helped in WW1 and the EF50 in WW2 in radar.

These Marconi Scientific Instruments were made before the BBC was formed so had no Post Office marks on them. Made about the same time as Capt. Eckersley of 2LO fame had invented the quietest volume control ever designed by moving the microphone nearer or further from the performers! It was just a few months after the start of regular broadcasting from 2MT that an advert for these receivers was placed in Wireless World in July 1922, probably as sales of all wireless equipment would have been given a big boost by the start of this regular broadcasting.

These units were sold in any combination as and when money was available. A 6th unit which could also be added contained a low impedance telephone transformer, but this last unit was missing on the example I found. Well, what do you expect for 35 quid?!

The system consists of one unit as a 'retroactive' unit containing the tuning coil and swinging retroaction assembly with a compartment to hold 6 push in coils for the tuning ranges. These extended the range up to 26,000 metres reflecting the experimental nature of these early pre BBC receivers. Because of the large range covered, the retroactive coil is tapped by a stud switch mounted on the moving coil. A range coil, on being pushed into position, engages a button which switches the LT on for the rest of the units. So for retroaction one had to "swing and switch."

Unfortunately, some of my coils are missing. Maybe the old sailor dropped them overboard one stormy night!

The retroactive unit with 6 coils in 1922 was priced at £13. Retroaction, or Regeneration (later called reaction), was first patented in the UK in June,1913 jointly by C. S. Franklin and Marconi (Patent No 13636).

But to form even a single valve receiver one would also have needed in addition, the large Marconi variable condenser tuning unit priced at £4 together with a detector valve unit at £6. Thus a complete single valve Marconi receiver of this unit construction would have cost £23 in 1922.

For a longer reception range another £6 was required in order to buy an additional HF amplifying unit using the V24 valve (see internal photo). So the three valve installation as illustrated, which also includes a LF note magnifier stage (see internal photo), which I bought for £35 would have cost a grand total of £34 in 1922. It seems then that I was overcharged by £1 on the original retail price! Shall I take it back?

During the inter–war period the farm labourer earned on average just over £1 per week and a middle class white collar worker about £5 per week.

So the middle class would have had to pay over 6 times their weekly salary to buy this three valve receiver and a farm labourer about 30 times his. At today's minimum wage (relative to the farm worker in 1920s on £1 per week), that is equivalent to approximately £6,000 today and for this one can buy a top of the range PC, a colour TV, a digital camera, and a GPS and still have change for a pint of beer!

Of course, the PC and TV etc.(and the beer!) are mass produced whereas the Marconi units were not, but it is a great tribute to the advance of technology how the power of money has changed and what it can now purchase in spite of the huge inflationary increases in the intervening 80 odd years.

Other manufacturers of this early period also made these unit type receivers, Pye, Sterling, Tingey, Halcyon and others. Home built construction by unit system was popular too as it enabled additions to a wireless without having to alter the existing set. Just build or buy and reconnect a few terminals for extra HF or LF stages. The *Boy's Book of Wireless* in 1924 also described a unit receiver for home construction as does, *Harmsworth Wireless Encyclopedia.* There are a total of 50 terminals to be connected on this 5 unit Marconi. Quite a good chance then for noises off due to terminals not being screwed down tightly.

To restore or not to restore?
That is the question.

This receiver, although in very good condition as found, has never been restored by me and never will be as I consider that any wireless over 80 years old should not look as though it had been made yesterday. I would also like to think that the very last signals to pass through it were from 2LO rather than the voice of Terry Wogan or even worse, modern 'thump thump' noises which pass for music these days.

Over–restoration now is something for which future generations of historians will have to pay the price. Why collectors wish to make a wireless, much older than they may be, look gleamingly as though it has just been manufactured, is beyond my understanding. Furthermore, if a very old wireless has been slightly modified back in the early days I do not see why that should not be of equal interest as part of its history and be left as it is for future enthusiasts to see the types of modifications which were carried out in the early days. The history of wireless is littered with extra valves being added etc. prior to the 1930's to increase reception range by many who could not afford to purchase bigger receivers to start with.

The editor of the BVWS magazine in Sept 1978 said, and I quote, "Restoring and researching a piece of equipment alone can be no easy matter and all collectors are reminded that the third aim of our society


THE IDEAL WIRELESS SET
CAN BE BUILT UP ON
THE MARCONI
SCIENTIFIC UNIT SYSTEM

THE FULL SYSTEM.

THE MARCONI SCIENTIFIC INSTRUMENT CO., LTD.
40 DEAN STREET SOHO, W.1

MSI Co. Unit adverts

is the preservation not renovation."
The underlining is not mine.

No more boots. Just slippers now!
However, that is not the end of this Marconi scientific story, for the 'find of a lifetime' can be repeated.

The Marconi Scientic Instrument Co. Twice!
These days most wireless collectors have either sold or bought wireless on eBay, the very early items fetching large sums, (even if you ever see them listed!). Simply because, unlike a personal search in the old London Street Markets, it is open to all the world's collectors who can now easily find wireless and bid.
The world's collectors don't have to tramp the many, many weary, but exciting miles that I did to find early wireless. They can all bid against each other from the comfort of their armchairs and the prices climb higher and higher. £700-£1000 is a not too uncommon price range for standard 1930/40 models in good condition, especially round Ekcos! Great to be the seller but not too good trying to buy these days if the wife needs a new hat!

A few weeks ago I came across a rather nice wireless catalogue for sale on eBay. The seller quoted PayPal as the only form of payment. I don't use this method and wrote to the seller asking if he would accept a cheque if I were the successsful bidder which he said he would do. In our exchanges the seller turned out to be a wireless collector I had once known, who years ago had made me an offer on my Marconi. I therefore joked to him that maybe one day another very early Marconi scientific might come up for sale on eBay and that we could bid against each other for it! That was the end of our communication as I was outbid on the catalogue he had up for auction.

Another one!
Two weeks after my exchange with the catalogue seller, I found on eBay a one valve wireless made by, yes, The Marconi Scientific Instrument Co.!

It had a starting price of £4.99 with no reserve. So I put in a bid to start the ball rolling, for this old and very rare, Marconi. Next day someone in France made a bid. The bid didn't go sky high to outbid me, but leaped up to £6.50! Unbelievable that someone only thought this item was worth that paltry sum.

But then, maybe this was a rich Frenchman just testing my water? Would he wait in the undergrowth, as many do on eBay, for the 9 days to pass and seconds before the bidding ended, leap on his broadband connection and put in his huge bid and knock me for six in the closing seconds?

On the fifth day the very same person who had outbid me on the catalogue two weeks previously made two smallish bids for this Marconi and left it at that. Rather odd amounts to bid I thought but I was still the highest bidder and "The game was now afoot," as Sherlock Holmes used to say!

On eBay, it's not only, "Let the buyer beware," but "Let the seller beware." Beware that he gets some advice on what he is selling before committing the items without reserve (or badly described as this Marconi was).

The seller had described it as being possibly some voltage divider and he could be forgiven for that description because the large studded central tapped switch was engraved as 'Main adjustment.' No reference to wireless or tuning was engraved anywhere the front panel, other than A and E. Just Main and fine adjustment, Strengthen and Intensifier, the latter being the reaction control by variometer.

In the last 7 seconds of bidding three more put in what I considered to be modest bids, so I am glad to report that this particular little Marconi stays in the UK.

I was of two minds about this receiver at first (dated c1922) for in addition to the V24 valve holder there is a 4 pin valve holder. First thoughts were that someone had converted it to a 2 valve set but the 4 pin base is wired in parallel with the V24. Anodes to anodes, grids to grids. On careful examination the fading systoflex wiring on this 4 pin holder seem as old as the original. Marconi used a yellowish systoflex on their early receivers and this 4 pin holder is wired in the same type/joints as in my 5 unit receiver, which is completely original in all respects. So, quite a puzzle. As an alternative to using the V24 valve, just plug in a R type instead!

Another interesting feature is that there is very little height under the large tapped tuning coil to mount an air spaced condenser for fine tuning, so a low profile disc condenser made by the Radio Communications Co., is used. (Patent No.25621. applied for in 1922).

RC Co. was one of the original 6 companies together with Marconi which formed the British Broadcasting Company in 1922. They also made spark transmitters. RC Co. had over 60 patents taken out in the early 1920's, some jointly with John Scott Taggart who in 1920, was head of their patent office.

So that is the story of The Marconi Scientific Instrument Co. Twice! Maybe, one day back in that old Antique shop in Norbury (if it is still there), or in an old street market I might have yet another lucky 'Find of a lifetime.' Somehow I doubt it, as my slippers these days are far more comfortable than my old walking boots ever were. But then again, there is always eBay to make it, The Marconi Scientific Instrument Co. Thrice!!

email: Animation@btopenworld.com
web site: www.retinascope.co.uk
(has my early wireless section)

References

"Wireless Telephony and Broadcasting".
by H.M.Dowsett.1923. published by Gresham.

"The Thermionic Valve and its Developments in Radio Telegraphy and Telephony".
by J.A.Flemming 1924. published by The Wireless World.

"Harmsworth's Wireless Encyclopedia."
c1924. published by Harmsworth Encyclopedias.

"The Boy's Book of Wireless."
by E.H. Robinson. 1924 published by Cassell and Co.

VandA exhibition leaflet 1977
"Marconi Cavalcade" booklet. BVWS.
"The Construction of Amateur Valve Stations." booklet.
by Alan Douglas 1922. published by the Wireless Press.

Marconi
http://www.marconicalling.com

Marconi collection at Oxford University
http://www.mhs.ox.ac.uk/marconi/collection/

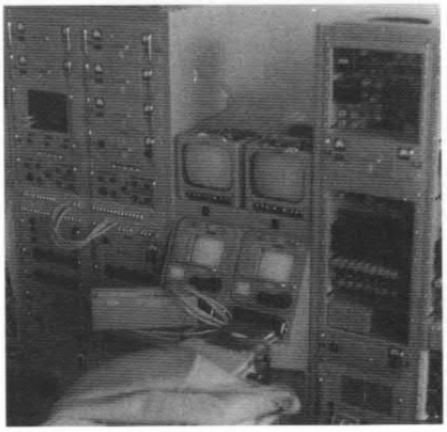
Patent Office
http://ep.espacenet.com

Marconi Scientific Instrument Co area in Dean St, Soho, London.
http://www.british-history.ac.uk/report.asp?compid=41070#s4

Relative value of money at early dates
http://privatewww.essex.ac.uk/~alan/family/N-Money.html

Eurovision, the beginnings of global television

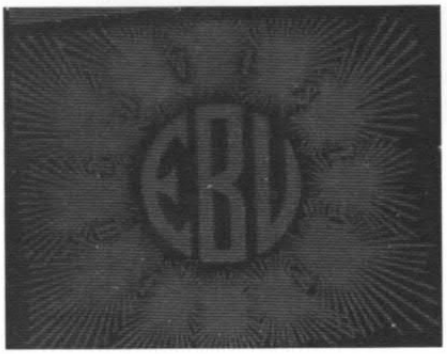
by John Holloway



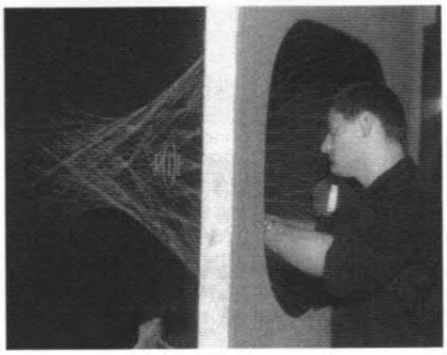
Control area, Tolsford Hill

Control area, Swingate

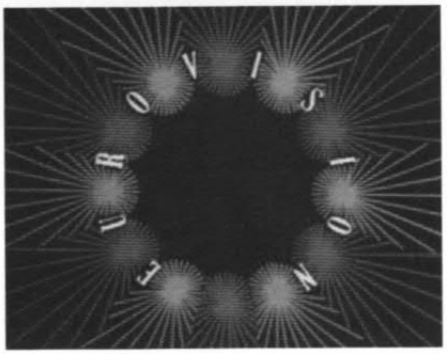
819 image orthicon looking out across Paris



Early Eurovision logo taken off screen



Pre computer generated logo



Eurovision logo

Those readers who fought their way through 'An Unofficial History of Television' are probably thinking 'Good grief! Does he never stop?' And to be fair, after nearly 20,000 words you would think that a rest might be in order, but no. No sooner does the ink dry than some other project presents itself and I'm off finding sources of information and pictures and where possible talking to people who were involved. To some extent the student notes which were a source for the previous series are part of the basis for this one–off article but also the fact that our own Ralph Barrett was heavily involved in those first experimental transmissions and the development of a permanent service over the next few years made it imperative that the story be told and I'm grateful to him for his notes and pictures which form the background to this article.

I suspect that in line with the various experiments in long distance television transmission before and after the war, a cross channel link was very much in the minds of those at the BBC and in the radio and television services of many of the European countries that were getting back on their feet after the hostilities. To be fair, mainland Europe had suffered massive destruction and the BBC, unlike its European counterparts, was building on a well established base and with a tremendous amount of goodwill gained from its service to the nation and the people of Europe and beyond during the war. Television transmission was being rolled out from London and by the 1950's a regular schedule of programming was becoming part of the growing number of viewers' way of life.

Co-operation between Britain and Europe began with the establishment of an Anglo-French TV Liaison Committee in November 1950. This move followed a couple of outside broadcasts carried out by the BBC from Calais. It was the first time pictures from another country had been brought live to viewers in their homes from a point outside the UK, crossing an international boundary. However these programmes were only seen in the UK as France was yet to develop its TV network. Its only transmitters were in Paris and to link Calais to Paris as well as London would have been beyond the joint resources of both RTF and the BBC. Also, at that time, both organisations were operating at different line standards, with the French running at 819 lines and, unlike now, there was no direct technical means of converting the vision signals from one standard to another.

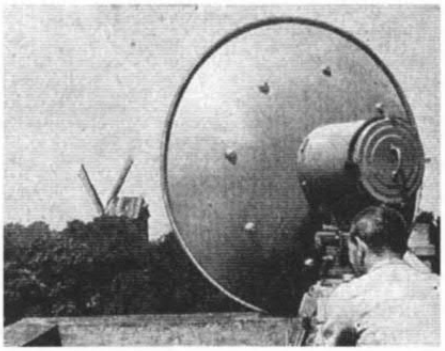
From the BBC's point of view even this early link from Calais was a most ambitious project. It meant despatching a large Outside Broadcast team with all its equipment to Calais and setting up a series of point to point radio links between Calais and London. BVWS member Ralph Barrett was part of the team at the start of the link which was located at the Hotel de Ville at Calais. The other end of the cross channel link was one of the radar towers on top of the cliffs at Swingate near Dover. The link used a frequency of 4,500MHz. The dish can just about be seen in the photo on the left hand tower. The link from Swingate to London required three links in tandem and these operated at 6,800 MHz, 64.75 MHz and 4,500MHz respectively. In order to avoid moving hum bars in picture, a telephone circuit between Dover and Calais carried a signal derived from the British electricity mains supply and this was used to lock the waveform generators in the OB units located at Calais. The results were very encouraging and it was as a result of the success of these transmissions that the liaison committee decided to go ahead with a previously suggested project entitled a 'Week in Paris'.

Although July 1951 was proposed originally, it was decided that sometime in July 1952 would be more sensible and allow time to complete the development and evaluation of the British and French standards converters. The French system had begun to move out from Paris with its first permanent circuit to Lille and in order to exchange programmes it would therefore be necessary to convert from 405 to 819 and 819 to 405 line operation simultaneously. The only viable method was by utilising a flat screen CRT with standard persistence characteristics displaying pictures of one standard being viewed by a Cathode Potential Stabilised (CPS) camera fitted with a mosaic target working at the other line standard. Needless to say, the process required that both the display and pick up tubes be free of any blemishes.

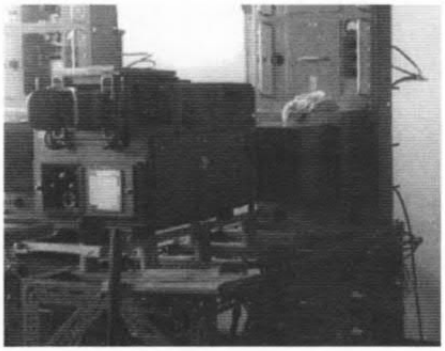
Readers will now have to bear with me as my technical abilities are limited and though a writer and director working in television and with an interest in such matters, I am working from notes written over thirty years ago by people much more knowledgeable than I. But here goes!

The CRT acts as a means of light storage as normally the camera would act as a

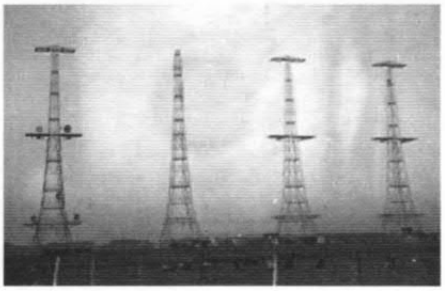
Microwave tower at Cassel



Marconi dish at Cassel

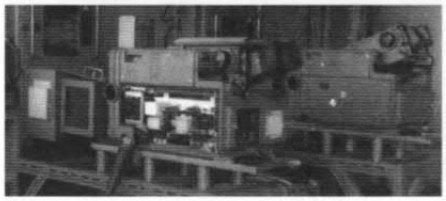


Standards converter rig at Tolsford Hill



Dishes at Swingate

STC Dish at Senate House, London University



Twin standards converters at Tolsford Hill

Technical control at Winter Olympics, 1956

simple light cell and would give an output corresponding to the intensity of the CRT spot. Assuming conversion of 819 to 405, one has a replica of an 819 picture but inherently of an 819 structure. This signal on the camera target beats with the camera scanning spot and produces in and out of phase amplitude effects which are superimposed on the 405 line signal from the camera which shows itself as a horizontal intensity bar. Luminosity will affect this and so if the persistence is controlled at just less than the vertical scan time the average brightness of the CRT is maintained at some absolute value over the whole area of the scan or picture. The same problems would also apply to the 625 system which came to be adopted as standard across Europe in the years to come.

It is also essential that both scans cover the picture in step or else the camera scan looks at the CRT scan slower or faster with a consequent fluctuation in camera brightness due to the pick up of more or less energy over those parts of the picture which the camera scan lags or leads. This effect looks like a semi transparent blind drifting up or down the picture. A way round this would be to lock the vertical scans together but since here in the UK and several of the countries in Europe the vertical scan was not tied to the 50c/s mains supply grid it was not a viable method. The problem was mainly overcome by making the camera storage 1/25th sec. This allowed sufficient energy to be built up on the camera target such that the reading scan would be 1c/s in 50c/s different from the writing scan before the change in amplitude due to 'double reading' or 'double writing' is noticeable. However, an exposure time of 1/25th sec affects smearing and camera noise but applying pre-emphasis to the upper frequencies corrects aperture distortion of the reading and writing scans. As the contrast characteristic is linear throughout the conversion it does not interfere with the usual camera pick up and CRT relationship.

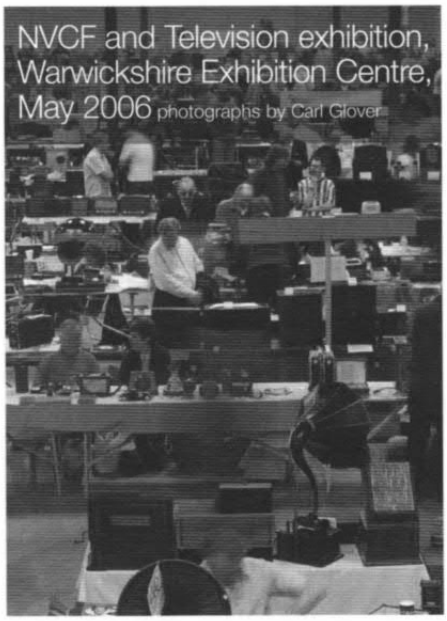
Well that's the hard bit over so like a typical creative type let me get back to telling the story.

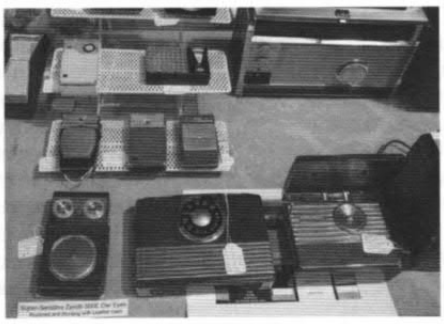
Radiodiffusion television Francaise's facilities in Paris provided coverage and they also took responsibility for the 819 line standard link from Lille to Cassel, a high point on the way to Calais. At Cassel the BBC standards converter was installed and they then took over the on-going 405 line signal. The route chosen was Cassel to Alembon which then beamed across the channel to dishes mounted on the old radar towers at Swingate near Dover, thence to Wrotham and on to London. This great event took place between the 8th and 14th of July 1952 and resulted in a tremendous interest, pushing forward the idea of a Europe-wide, two way interchange of facilities and programming, reinforcing the BBC motto 'Nation Shall Speak Peace unto Nation'.

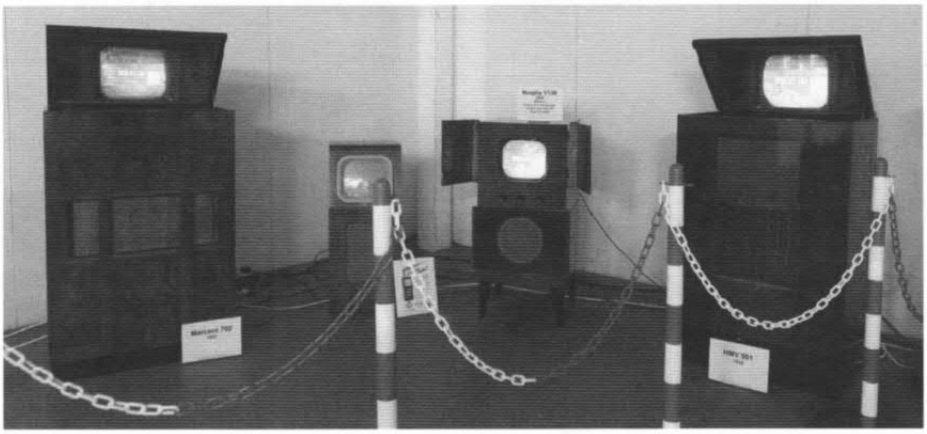
At a meeting in London in December 1952 it was decided that the Queen's Coronation in the following year could and should be covered and relayed by the Eurovision network. Following the decision and through a prodigious effort by all the countries concerned, the necessary circuits were established and the BBC Coronation broadcast was relayed by a total of 12 transmitters located in France, the Netherlands and Western Germany including Berlin. The operation was again a great success and prompted the development of international relays by the fast growing number of TV services in other countries. In Paris in January 1954 plans for a much more ambitious service were outlined with a series of daily programmes involving 8 nations' TV services in June of that same year. The idea was that each country should contribute one or more programmes to be relayed by all the others. An international co-ordination centre was set up in Lille where initial tests threw up a number of quite serious problems. Incidentally, following his involvement with the original relay and subsequent large scale operations, in particular standards conversion, Ralph decided to learn French. It was to prove a wise decision as this added skill helped win him a permanent position at the Lille centre where he stayed until the operation was moved to Brussels some years later. These initial tests showed that many of the systems in use were improvised, in some cases equipment was being pushed to extreme limits of its operation. However, most of these problems were solved and the Lille experiment began on the appointed day and the pictures obtained over far longer links were, on average, surprisingly good. In comparison with the earlier BBC experiment from Calais the signal was now travelling 500Km instead of a mere 150km and coverage was in both directions. The period chosen was 6th June to 4th July to coincide with the World Football Cup matches held in Switzerland.

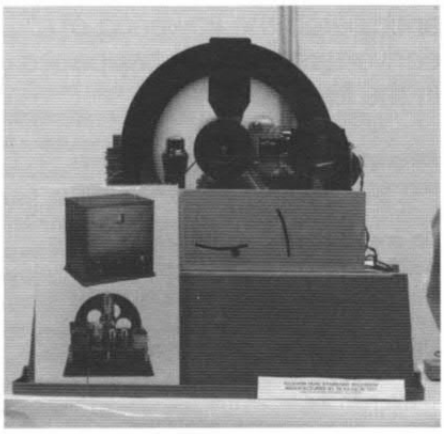
article continued on page 39

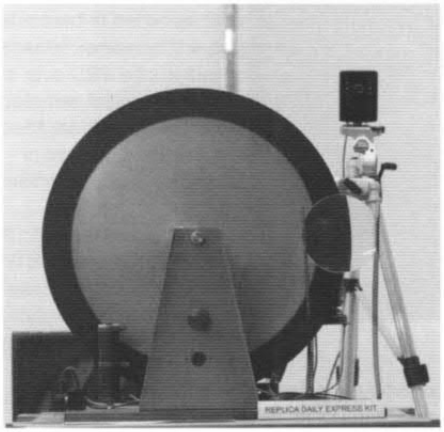
NVCF and Television exhibition, Warwickshire Exhibition Centre, May 2006 photographs by Carl Glover







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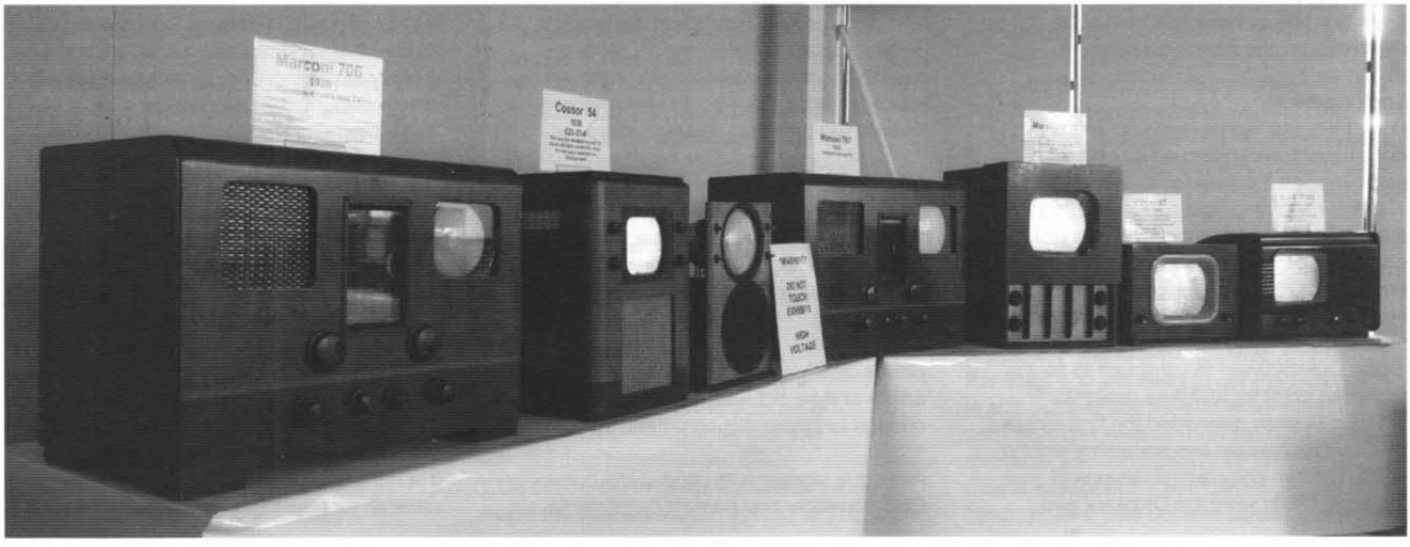
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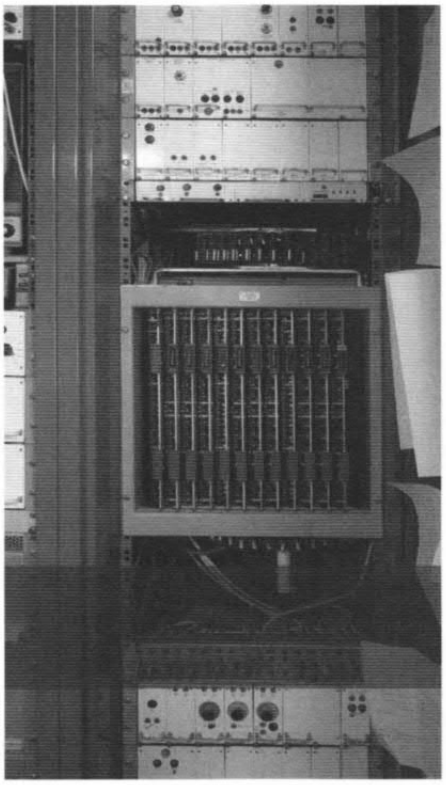
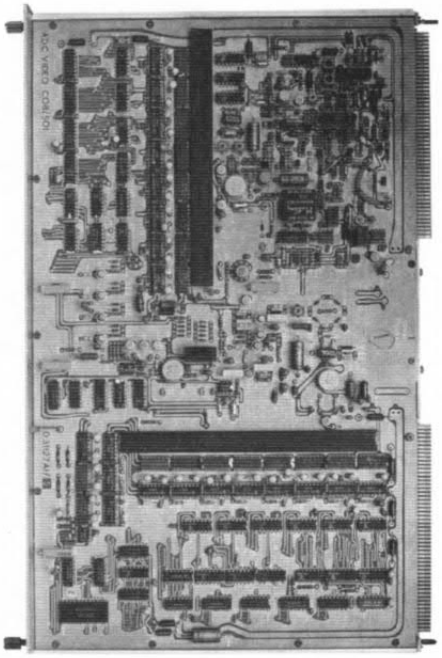
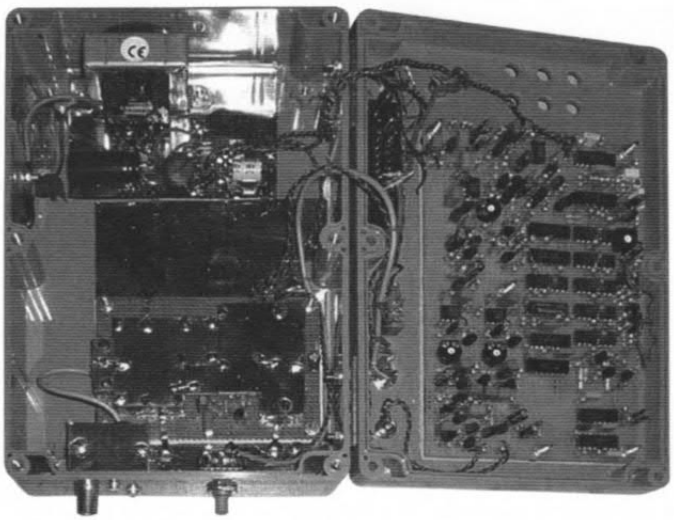
So you want to build a standards converter revisited

Some further thoughts and reflections on generating 405 line signals. By Jeffrey Borinsky







When I wrote my original article in 2002 I couldn't have anticipated the flowering of converters that has happened in the last four years.

Although it's a lot easier now than ever before I still stand by my initial comment:

No-one who ever tried it said that making a 625 to 405 converter was easy. That privilege is reserved for armchair designers.

I have also had the pleasure of having had some of my claims proven wrong. This is in line with the belief that if an expert says something is possible, then he is usually right but if he says that something is impossible then he's probably wrong. I will point out the errors of my ways as they arise.

Hall of Fame

The hall of fame has grown considerably since I wrote in 2002. Obviously there are no new professional designs since there is no current professional requirement. However some of the new designs have been done by electronics design professionals.

While there has been a lot of work on converters themselves we mustn't neglect modulators. Simple modulators have always been within the scope of the reasonably keen enthusiast and David Looser's design was published way back in 1984. Most modulators since then have followed his basic design but there have been two new approaches, one quite conventional, the other very different.

Looking back

I don't want to repeat my 2002 article but it's worth recapping a few of the most important converter milestones.

In the beginning was optical conversion, a camera pointed at a monitor. The first electronic converter, dating from 1963, was the BBC CO6/501. The signal path was entirely analogue and there was hardly a chip in sight. It was superseded by the digital CO6/509 which continues to be the reference point for all future designs.

David Boynes developed the first amateur built unit for his own use sometime around 1990. The two commercial designs of the early 1990s were the Dinosaur and Pineapple. Both have been extinct for some time and have been known to change hands at quite high prices. The Domino converter of 2002 included a modulator. It was an excellent design and did much to enhance interest in 405 line TV. With the availability of other converters, some at much lower prices, I doubt that Malcolm Everiss will make any more of them.

Newcomers

There are four newcomers to the hall of fame. Two have followed conventional digital approaches while the other two are strikingly different.

Darius

Darius clearly didn't read my 2002 article or if he did read it, he was wise enough to ignore this comment:

Analogue storage was used in the first BBC converter and it might be possible to build a modern equivalent with charge coupled delay lines if they are still available. Not a practical option.

He has used CCD (Charge Coupled Device) analogue delays, normally used for dropout compensation in VCRs, to make a relatively simple design. The design uses a simplified 2 line interpolator which can either pass a line or take the average of 2 adjacent lines. The results are proof that even the simplest interpolation is vastly better than none at all. Darius's skills are clearly in analogue and particularly in RF design. He has designed and built beautifully engineered modulators and VSB filters. Unlike most designs, his modulator doesn't use the 1496 balanced modulator chip. The VSB filter is a nice refinement since all but the very earliest TV transmissions suppressed most of one sideband in order to conserve bandwidth. It is not important for closed circuit use since all receivers can handle the full double

sideband signal without difficulty. The earliest version of the converter rather lacked bandwidth due to a low clock frequency on the CCD delays. Later versions improved this and it is now entirely adequate. Darius has always been happy to publish his designs and at least one enthusiast has built one in the UK. Until recently Darius's converter was built on pinboard and was subject to many modifications. Darius has produced PCBs for the design which should now be available. This will make it much easier to build. The total build cost is likely to be between £100 and £130, depending heavily on the cost of the CCD delays.

Darryl Hock

Darryl has designed and marketed not one but two converters, both under the name Aurora. Darryl is a design engineer working in the video industry and has much knowledge of modern design techniques. In particular he is a skilled and inventive user of FPGAs. (Field Programmable Logic Array) Both his designs use Xilinx Spartan FPGAs to provide all the logic. They are both fully professional designs with multilayer PCBs and fine pitch surface mount devices. Both converters use 3 line interpolation and give excellent results. According to BBC research, confirmed by Darryl's own simulations, extra lines beyond 3 contribute very little to picture quality.

The first Aurora converter, dating from 2004, could take PAL or NTSC input and convert to any output standard from French 819 all the way down to 30 line mechanical taking in just about every possible vintage standard in between. Darryl also did a special version of the programmable logic to give CBS sequential colour. Conversion between frame rates was possible because this design used a framestore.

In my 2002 article I thought about methods of generating NTSC 405:

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.

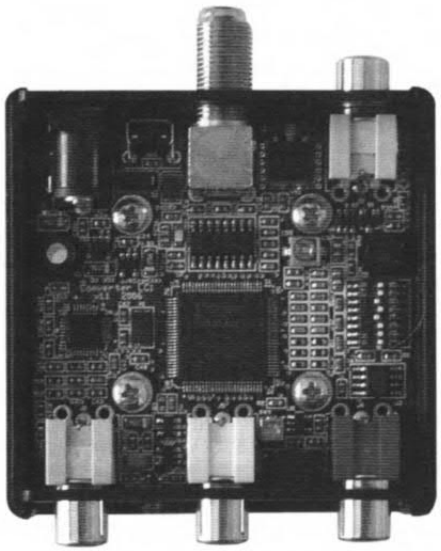
Darryl and I discussed this possibility in some detail and we think it feasible but he has not explored it in practice. For once I was right and we were sure that the coder would consume a lot of FPGA resources. There would be no hardware changes, purely new code for the FPGA. This would be a demonstration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

The new Aurora was released in April 2006. Unlike its predecessor it is not inherently multistandard and does not contain a framestore. It is available in several different versions including 405, 819 and older French, German and US standards. There is almost no hardware difference between these versions, another demonstration of the flexibility of FPGAs.

In my 2002 article I said:

Converting digits to analogue is much easier than the other direction. A discrete DAC is nothing like as scary as a discrete ADC but I'm still glad we don't have to do it that way now.

Darryl was unaware of my wisdom and designed a novel discrete DAC for the new Aurora. This 10 bit DAC combines a conventional R/2R ladder with pulse width modulation for the lower order bits. It saved a few dollars and contributed to the very low price of that unit. Darryl has achieved what I previously believed to be impossible and is selling the new Aurora at $260 (around £150) which is truly a bargain. Affordable high quality conversion is now a reality. I have reviewed all the commercially available converters in 405 Alive and later in the BVWS Bulletin. Until now I have always felt the need to justify the relatively high prices but now there is no need.



The new Aurora also has a multichannel modulator using a pair of MC44BS373CA devices. This approach to System A modulation was pioneered by David Robinson and adapted by Darryl to make a fully flexible modulator for all vintage standards from 343 up to 819 lines.

Darryl's converters include other useful facilities, in particular they can capture still images to use as test patterns. Aurora user manuals contain a lot of technical detail and are a good introduction to the technology. They can be freely downloaded from his web site.

David Robinson

David has made several important contributions to the art of standards conversion. His design has four line interpolation based on the BBC CO6/509. Most importantly he has made the only converter capable of producing NTSC colour on 405. While the original Aurora might be able to be reprogrammed to do this it has not been.

In my 2002 article I said:

Annoyingly, standard colour encoder chips could easily do the strange subcarrier frequency needed but not the 405 syncs.

In my own conversion experiments I attempted to force an Analog Devices ADV7171 encoder to produce 405 line monochrome. I never managed to solve the problems but, much to his credit, David has made it produce 405 NTSC. In fact the colour is the easy bit since the ADV7171 contains a fully programmable digital oscillator to generate subcarrier. The hard part is sorting out the sync timings and avoiding spurious blanking where you don't want it. He still has to make 405 syncs separately and add them to the rest of the signal.

David also proposed the Freescale (was Motorola) MC44BS373CA as a System A modulator. This is a programmable modulator that covers all the VHF and UHF bands. It is capable of both AM and FM sound but cannot do the System A specification of 3.5MHz sound to vision spacing with the sound carrier 6dB below vision. This meant that two devices had to be used, one each for sound and vision.

The digital technology is thoroughly modern, using an Altera Cyclone FPGA with SDRAM for a framestore. He took the decision to scale the picture by 23:15 since this correctly converts the number of active lines. If you multiply the 576 active lines of PAL by 15/23 you get 376 which is within the theoretical range of 374 to 379 lines of the 405 line system. Most other designs use 125:81 which converts the total number of lines or even 3:2 which is within 2% of correct. The difference is of no practical importance as it only affects the aspect ratio by a tiny amount but indicates the amount of thought that has gone into the design.

David made his converter out of interest and has no plans to publish the design or make it commercially available.

Katharine Manton

In 2006 Kat Manton achieved conversion using standard PC hardware running Linux. There was a minimal amount of external hardware needed to complete the design. She ignored all the people who said that you can't do it with a PC. These people included me:

Some have suggested using computers or digital signal processors (DSP). Conceptually there is no problem. I'm a pretty lousy programmer and I could write you the conversion algorithms in a few lines of a high level language such as BASIC. These would take a 625 line image, already in the computer, and convert it to a 405 line image, also within the computer. And there's the snag. You still need to get the picture in and out and you have to ensure that the computer can keep up with the data. Video comes at you continuously so real time means exactly that – you cannot put your hand up, take time out and catch up later.

So when you say you have built a converter with a cast off 486 PC I won't believe you.

I still believe that you can't do it with an old 486 but Kat has used the low cost and great processing power of modern PC hardware to devise a largely software solution. If you had to buy all new hardware the result would not be financially viable but if you can use a PC that's normally doing other things, or possibly an old PC, then it can make economic sense.

Kat's original concept was not actually a standards converter but a means of putting pictures on the screen of a vintage TV. Moving pictures are now widely handled by PCs. DVD replay, digital TV and streamed internet video are all digital sources of pictures. The main problem that Kat has solved is using a PC to provide a 405 line output from these pictures.

Her starting point was the MythTV Personal Video Recorder (PVR). This is open source software for use with Linux. The scaling needed for 405 line output (or any other number of lines) is an inherent part of MythTV so her main task was making a PC graphics card give a 405 line output.

Linux has a lot of flexibility when it comes to setting up a PC graphics card to give a custom resolution. There is no fundamental reason why it shouldn't do 405, 441 or 819. The important thing is to use the ordinary VGA RGB outputs. The CVBS and YC outputs that are often available from graphics cards are not useful since they cannot be programmed to do other than PAL 625 or NTSC 525. Graphics cards are not really designed for such low resolutions as 405. Kat used a dot clock of 12.07MHz which rather higher than you would expect for 405 and gives a resolution of 968x378 with near perfect 405 timings. The sync combiner is very simple. The separate horizontal and vertical syncs from the VGA output are combined with an exclusive OR gate to make a simplified mixed sync waveform. This does not have the proper half line information during the field sync so it's possible that some receivers will suffer from poor interlace or horizontal pulling at the top of the screen. Kat has proposed using a simple phase locked loop and additional logic to generate correct field syncs. The RGB signals are added with suitably weighted resistors to make monochrome and the sync is added too.

If you want the PC to do the traditional work of a standards converter you will need an analogue capture card or TV tuner in the PC. This can impose a much greater processing load which might result in freeze frames and other artefacts. The remedy is a more powerful PC.

Kat had to face the problem that you can't really see what you are doing on the PC. The VGA output is 405 line and standard computer monitors will not display this. If you have a reliable 405 line monitor you can see the PC's output but Kat's solution during development has been to control the PC remotely from another one. It may be possible to use a dual output graphics card with one output as 405 and the other as VGA.

The great power of a software based solution is that it is easy to change after you have done the initial design. Kat is currently looking for alternative solutions to MythTV. As a PVR, this software is actually overkill for the application and uses more PC resources than are strictly necessary. She hopes to make her software solution freely available in a form that is very simple to install on a PC, even if you don't have much knowledge of Linux.

At the time of writing, at least one other enthusiast has successfully implemented Kat Manton's design.

New Technology

In my 2002 article I discussed a design for a hypothetical standards converter. It wasn't quite hypothetical as I actually started to implement the design using some old hardware that was available from a project I had done for a client. Like so many projects it worked up to a point and delivered 405 line pictures after a fashion but I got distracted and never returned to fully debug the design. The methods I described were the conventional digital techniques that a professional designer might use to provide a commercial solution. Kat Manton and Darius have taken very different paths which bear no resemblance to my ideas and I have covered these in the hall of fame above. The Aurora and David Robinson's design all use conventional digital approaches so let's take a look at how they compare with each other and with my hypothetical design.

Input

Great minds must think alike for surely we are not all fools. There's definite unanimity here. I proposed several methods but my favourite was an integrated decoder such as the SAA7113 by Philips. This approach fixes the input sample rate at the industry standard frequency of 13.5MHz. The first Aurora used the SAA7113 though I can assure you that Darryl's decision was independent of mine. He programmed it using code executing within the Xilinx thus avoiding the need for a microcontroller. The new Aurora uses a newer and better chip, the Texas Instruments TVP5150A. This incorporates a multiline comb filter which can extract all the available luminance bandwidth from a signal. David Robinson used the Analog Devices ADV7183A which also has a comb filter.

Output

There was a lot more scope for invention here. I suggested a rather outdated 8 bit DAC which in retrospect was a mediocre choice. Integrated coders such as the ADV7171 are readily available and have the potential to provide 405 line NTSC. David Robinson succeeded where I had failed and made an ADV7171 deliver 405 line NTSC. Darryl used a much newer 10 bit DAC chip in the first Aurora and a novel low cost discrete design in the new Aurora. Both these 10 bit DACs have sufficient resolution to allow the sync to be generated as part of the video data coming out of the FPGA. This saves adding the syncs in the analogue domain.

Modulators

I barely touched on modulators in 2002. I suppose I thought that the problem was largely solved with several designs all using the conventional approach of 1496 balanced modulator chips. Most needed custom made crystals for their oscillators though you could use LC tuned circuits. All had separate sound and vision modulators. This approach was fine for channel 1 and usable on channel 4 but the 1496 is not suitable for Band 3 and switching the channel was difficult or impossible.

There have been two distinct developments since then. Darius has devised and published a simple modulator using only discrete devices and this is very suitable for home construction. David Robinson pioneered the MC44BS373CA for System A. It can synthesise any VHF or UHF output frequency from a standard crystal but the penalty is the need for external control, typically from a microcontroller. Also its surface mount package makes it much harder for the enthusiast to use. Darryl showed that with some ingenuity it is possible for a single device to come close to the System A specification but a pair of devices, one each for vision and sound, provides a much more accurate and flexible solution. Darryl used them on the new Aurora with control from code in the FPGA. The result is an exceptionally flexible modulator which can be made to work on any standard and channel, both historic and modern.

The digital bits

Again we are unanimous about the logic. There is now no sensible alternative to an FPGA. Xilinx and Altera are the leading manufacturers but there are others and the choice really boils down to cost, availability and prejudice. You normally get most performance for your money with the newest parts and Darryl has used the Spartan 3 and 3E series. The latter is very new and very low cost. Darryl has incorporated all the control system in the FPGA while David has used a separate microcontroller.

All standards converters need memory. At least a few lines for any design and at least a whole frame if you want a framestore based design. There is no overriding reason to use a framestore unless you also want to do a frame rate conversion such as 60Hz NTSC to 50Hz 405. Other less important reasons for using a framestore are the absolute guarantee of rock solid output syncs at all times and the ease of including full frame test patterns. There were several different approaches to memory. I proposed specialised frame memory such as the Averlogic AL422. This is very simple to control and was successfully used in the Domino. David Robinson went for standard SDRAM, an approach that I would now use, while Darryl used large SRAMs for the framestore in the first Aurora. Large fast SRAM is relatively costly but much easier to manage than SDRAM. I can speak from personal experience, sometimes bitter, of the problems of SDRAM for video framestores in professional applications. The new Aurora does not have a framestore and holds up to 11 lines of video in the internal RAM blocks that are a feature of most modern FPGAs. This is value engineering at its best, using the latest

technology to minimise the parts count and cost while not compromising performance.

Additional Information
There is much that I have had to leave out of this article. These web sites should help to fill some of the gaps:

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
There are many useful articles on this site as well as a very active discussion forum. All the people in the Hall of Fame are regular contributors to the discussion forum and have posted a lot of information about their standards converters.

www.auroravideosys.com/converter
The site for the Aurora converters. You can also download the manuals here.

www.mythtv.org/
Lots of information on the MythTV Personal Video Recorder

www.fothtv.org.uk/
Kat Manton's site for her PC based 405 systems. Under development at the time of writing.

Data on the various FPGAs and other chips can readily be found on their manufacturers web sites. A useful tip is to enter the part number into a search engine such as Google. This will often take you directly to the relevant part of the manufacturers web site.

I have made frequent references to my 2002 article. If you don't have the relevant issue of the BVWS Bulletin I have posted the text (without pictures) in the UK Vintage Radio discussion forum mentioned above. Look for the thread PC as a standard converter in the Standards Converters, modulators etc section.

Final Thoughts
Designing converters is still only for the knowledgeable or the brave but it's no longer the route to madness. There is no true commercial market – you couldn't make a living out of converters so all are labours of love to a greater or lesser extent.

I continue to salute all those who have tried and succeeded in the wonderful world of standards conversion.

Pictures and captions. All captions as original articles except as noted.

CO6/501, as used on first page of 2002 article.
ADC from CO6/509, as used in 2002 article
Original Aurora (1 or more pictures from 2004 review)
New Aurora (1 or more pictures from review in Summer 2006)
darius_converter.jpg (Caption: A version of Darius's converter. Note the careful shielding in the RF section)

'Some US Midget Radios' of the 1930's continued from page 9

Loudspeaker and Choke in the Negative HT line
The radio, as shown by the Riders schematic, would have had an energised loudspeaker separately powered by one half of the 25Z5. This had been replaced with a permanent magnet type.

It's surprising when components are arranged differently from the norm: it can make you scratch your head. This set uses the smoothing choke in the negative power lead. Obviously it works as a filter just the same. The choke impedance limits the flow of ripple current and less ripple voltage will occur across the reactance of the smoothing capacitor and the HT line. It takes a little thought as to why you would want to do it though. It is the same as placing a resistor in the negative HT line to obtain bias for the output valve. Here the choke resistance does the job. To the 43 cathode the choke input is 12V negative and if its grid resistor is returned to it, with some smoothing, then the valve will have that amount of bias. It saves having to use a large and expensive (at the time) electrolytic to decouple a cathode bias resistor. Also, the anode to cathode volts will be higher by not having the drop across this resistor, although that would not have been an issue here.

Ultradyne and Unknown (probably similar dates, around the mid thirties)
Nothing unusual in the circuits of these simple TRF radios.

The Ultradyne is certainly tiny and even has a stepped chassis to make enough headroom for the tubes. Unusually the resistive line cord still works and seems in reasonable condition, but I certainly would not leave the radio in unattended operation!

The Unknown was bought at a boot sale for less than a 'fiver'. It was complete but in poor condition. There is a switch on the rear for Broadcast and LW. Presumably, it too would have had large Ohms, in a resistive mains cable, to make it work on 220-230V. I think it's safer to 'convert' it to 110-120V, using an internal mains dropper, as the chassis has room. Both celluloid dials have dial lights so it looks quite pretty in the evening.

It's hard to imagine whether you would have been pleased with your purchase all those years ago. They were bad times and I suppose if that's all you could afford for entertainment then you probably were.

Performance and Conclusions
To wrap this up I did a group test of these radios. All need a good aerial (over 30ft) to pick up many stations. The Clarion did pick up several continentals well with this. I had expected the Columbia, with its IF amplifier, to be the best but it was much less sensitive than the Clarion. Both radios only have two IF tuned circuits and that in the Clarion looks more sophisticated, being screened and wound with Litz wire (I don't know what's used in the Columbia). Also, perhaps the Pentagrid frequency changer is more efficient and then the higher HT voltage may squeeze more gain. Of course I may still not have got the Columbia correct and working to its best!

As for the TRF's,about what you would expect in picking up Local stations reasonably well with little selectivity. I was surprised by the "Unknown" on LW Radio 4. It really was quite pleasant to listen to with no heterodyne whistle that seems common on many low quality Superhets.

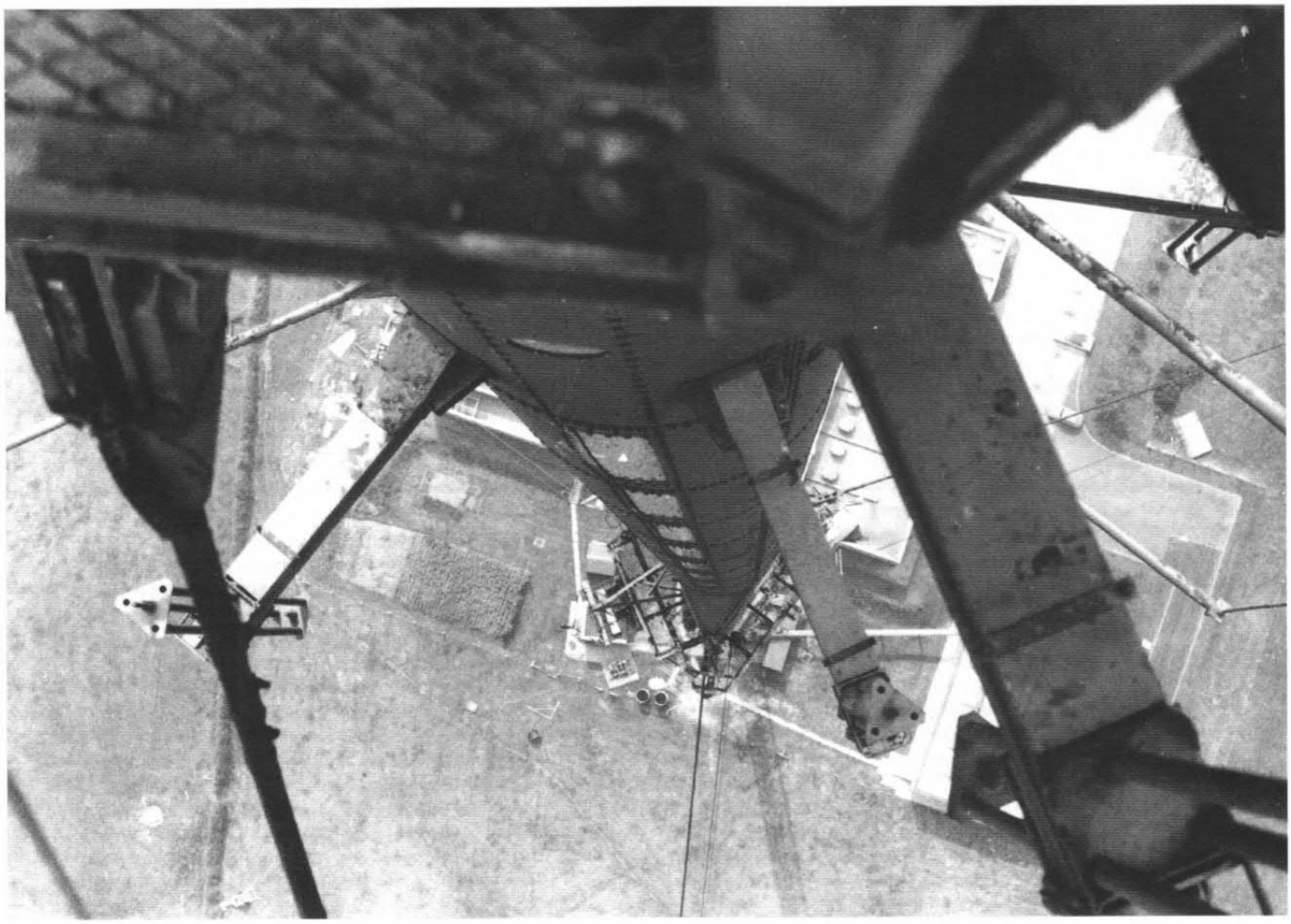
So interesting radios to work on and not quite as simple to understand as you might initially think.

It's hard to imagine whether you would have been pleased with your purchase all those years ago. They were bad times and I suppose if that's all you could afford for entertainment then you probably were. But no doubt when things picked up they were replaced within a couple of years. Now they are a pleasing curiosity (like us 'ole' radio men according to my wife!) and not something you will power up often.

Fables from a Cold Field part one

Being fairy-stories told to the Author as a young engineer

by Ray Cooper with further amendments and amplifications by Norman Green. Illustrations selected and sourced by Phil Marrison.



Looking down on later style BI aerials with BII slots

In the Beginning...

Historians are agreed that Oral Tradition is a tricky thing to handle. Stories get passed by word of mouth, and rarely lose any substance in the retelling - rather the contrary. Consider the Arthurian and Trojan legends – they were written down hundreds of years after they were supposed to have happened. Distortions are inevitable, and readers often have no way of distinguishing hard fact from pure embellishment.

The Oral Tradition holds a special place in the hearts of BBC transmitter engineers: just as their forebears did, they will gather at the end of a hard day, and warm themselves before the flickering embers of a dying transmitter with mug of cocoa in hand, ruminating on just where they went wrong. They also inevitably hearken back to disasters of an earlier time.

I know all this, since I was there, a young lad: keeping well back in the shadows, for I had little to contribute, but with my ears flapping frantically, and making copious mental notes.

All this came back to me last year, as I attended the funeral of K-, a former workmate. It was quite a good funeral as these affairs go, and brought the opportunity to meet old-time colleagues that I hadn't seen in years. It also brought the realisation that many of the tales that I had learned had been from his mouth, and those of others since departed. I don't suppose that any of them had written any of this stuff down, so I felt that I had better do just that before either i forgot it all, or the old Gentleman with the Scythe got me too.

Upon reviewing the material, it was evident that a lot of it was potentially too libellous to be recorded. On the other hand, there are some happenings that are just too good to miss and so, with the proviso that no names are going to be named herein, here they are. All of the incidents relate to the years between 1949, when the new Television Station at Sutton Coldfield opened, and 1985, when 405-line television closed there for good. During those years many new services started, and those will be covered too.

I am afraid that in the following work, I may occasionally become rather discursive and wander off into side alleys to inspect related issues. Age does that to you, and I can only apologise in advance for this.

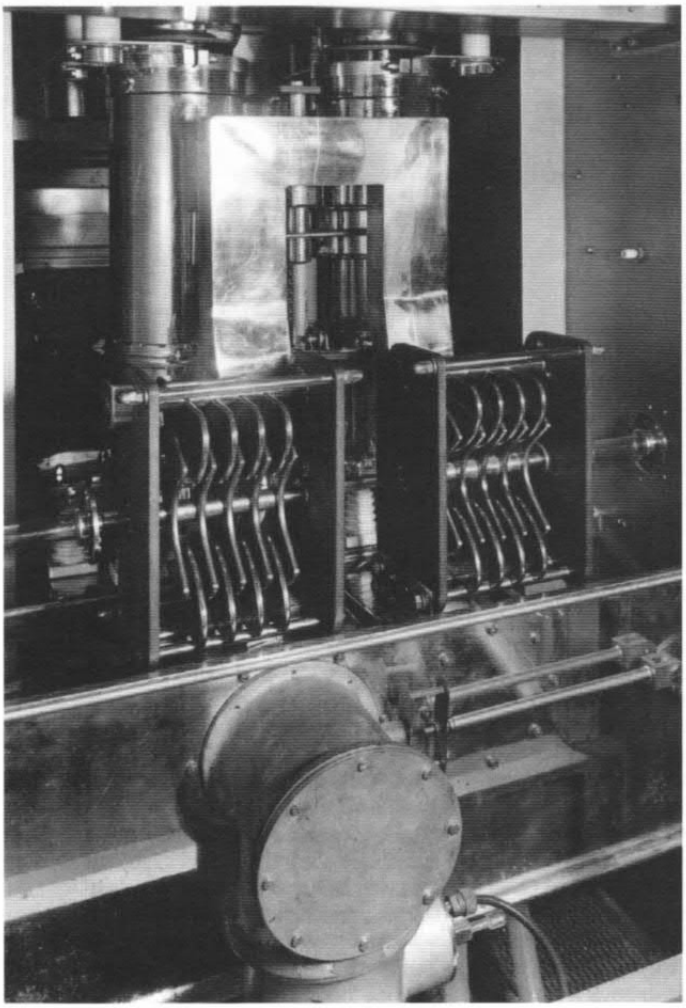
What I cannot apologize for is the prevalence of initialised abbreviations. This is an ancient BBC tradition, and the system would probably collapse without them. The best I can do is to explain them as I go along.

To set the scene, it is necessary to give a little factual description of how Sutton Coldfield was arranged in those far-off days of 1949, when the station came on the air for the first time and brought the curse of television upon the Midlands. Although it will break up the time sequence somewhat, I'll start off by concentrating on the 405-line television story...

To begin, you may be puzzled by the total lack of reference to reserve transmitters. This is because, in the beginning, there weren't any. In those very early days nobody was making medium power TV transmitters suitable for standby use, and it was clearly an uneconomic proposition to install a complete duplicate high power transmitter system. This absence was occasionally to have dire consequences, as we shall see.

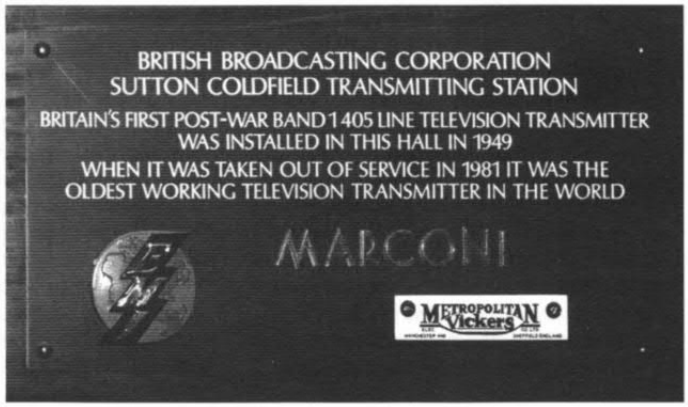
Let us begin as we mean to go on...

The opening ceremony, a most lavish affair, was scheduled to take place at 8 p.m. on the evening of Saturday, the 17th of December 1949. The opening speeches



Nov 1949, rear view of modulated output stage

Control Room 1970's Style with Standards Convertors on



Plaque in Old Band I Hall

were given by the Postmaster General (the Right Hon. Wilfred Paling, P.C., M.P.) and the Vice-Chairman of the B.B.C. (the Dowager Marchioness of Reading, G.B.E.)., with other local notables such as the Mayor in attendance. Fur coats and Mayoral regalia were much in evidence. After such a build-up, it was a great shame that immediately before the ceremony, one of the main HT rectifier valves (which were all mercury-vapour in those days, and therefore temperamental) expired, and put the transmitter off the air for twenty minutes or so. This event seemed to set the tone for the following few years.

Take five, Chaps...

In the very earliest days, there occurred a minor incident, which revealed quite conclusively that all possible eventualities had not been foreseen. Picture the scene: the desk TA had settled down for the evening, and was about halfway through watching a nice costume drama. (Quality monitoring was taken very seriously in those days). Suddenly an unintelligible strangulated voice issued from the loudspeaker beside him. The performers in the costume drama had evidently heard it and understood, for it had an immediate effect on them. Most of them immediately shambled off the set, fumbling for concealed packets of cigarettes. One of them was heard to pass a distinctly non-period remark. A few moments later, all of the lighting on the set went down, leaving the scene in semi-darkness.

The TA was rather uneasy about all this, but concluded that this might be the work of a modern and therefore trendy producer. After a minute or more had passed in total silence, however, he felt impelled to ring up the Palace and find out what was going on.

"Ah... there doesn't seem to be much action going on in this play, does there?"

"It's all right, old boy. The transmitter's broke, so the cast have all pushed off to the canteen 'til it's fixed."

"Ah, so you're off. But the problem here seems to be that we aren't...."

"Um... Get back to you on this one, old boy..."

This was the way things had always been done at the Palace, up to that time. There was no viable system of telerecording in existence, so all performances, even the repeats, were done live. With only one transmitter in service, if it broke there just wasn't any point in going on with a performance. After it had been fixed, the control room would presumably send someone out to round up the cast, whereupon they would all troop quietly back, and the production would resume from where it had left off, in a gentlemanly way.

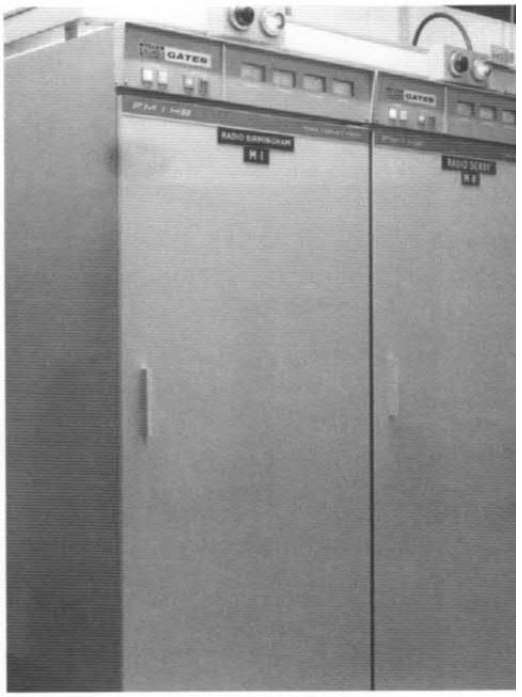
A new memo detailing breakdown action was issued shortly after this incident.

The "Robinsons" Complain

The powers-that-were obviously entertained the belief that the main vision programme feed, provided by the (then) Post Office, was going to be unreliable, and to cope with this, two monoscope installations had been provided, one producing Test Card C, the other the now famous legend "Normal Service will be Resumed as soon as Possible", in lovely curly lettering. There were also 78rpm turntable desks, and a suitable selection of pre-recorded apologetic messages by a BBC announcer.

But in addition to all this, there was a complete 35mm film telecine channel - probably the only one ever installed at a BBC transmitting site. To feed this machine, there were copies of the Trade (Demonstration) films that were all the rage in those days. To those who have never met these films, it must be said that programme hours in those days were relatively low, and those mostly in the evening. To assist the

March 1957, band II hall



Local radios Birmingham and Derby FM

trade, demonstration films interleaved with a test card were radiated in the mornings, usually between the hours of ten and twelve, and sometimes in the afternoons if there was no programme material to be had. If the P.O. link broke, or required maintenance, Sutton could radiate its own trade programme using its monoscope and film channel.

The Trade film was however not of much use when the link broke on programme. Accordingly, a complete copy of the film "Swiss Family Robinson" had been provided. This was left laced-up on the telecine machine - in the event of the incoming programme failing, the bod on the desk would get on the blower to the P.O. and find out how long it was likely to stay off. If the report was discouraging, the telecine machine would then grind into action.

Unfortunately, failures of this kind always put the P.O. on their mettle, and they usually succeeded in getting the link back well before the film ended. The rule governing this circumstance was quite plain - "the advertised programme will be radiated" - so the "Robinsons" would have to be unceremoniously chopped, and the original programme reverted to. This, of course, meant that further complaints from people who were getting quite interested in the film replacement would be added to the volume of 'phone calls complaining of loss of the advertised programme. This was very much a no-win situation.

I don't think that "Robinson" was ever screened in its entirety.

The Infamous Space-warp Incident.

This is a tricky one to deal with, since it involves personalities.

It is necessary to be aware that, at this time there was something of a personality clash evident between two senior members of staff on site. They had no time for one another, and the usual communications between them seemed to amount to no more than an exchange of insults in the corridors. I shall refer to them, anonymously, as A and B. At the time, the station had been going through a bad patch in respect of equipment breakdowns. Scarcely a day had passed without a lengthy outage of some sort or another.

The incident, which entered the annals of Sutton folklore, was one of two halves. It apparently began on the evening-shift of one day, and proceeded downhill over the following morning. The evening's events were always somewhat shrouded in mystery: those participating were unusually tight-lipped about exactly what happened, for reasons that will become apparent.

There had been the usual sickening bang, followed by the alarm bell ringing. Usually, when the bell goes, the admin boys wisely left the shift to it. Messrs. A and B, in different parts of the building, decided simultaneously that some extra input was going to be needed, on this occasion. By the time they reached the transmitter hall, from different directions, the shift had localised the problem to the vision Modulated Amplifier (where else?), the doors of which were by now open.

Both taking command simultaneously, A piled into the front of the cubicle while B attacked it from the rear. A general exchange of strong language ensued, but in spite of all this the fault was eventually detected, and rectified. The cubicle doors were closed, everybody stood back, and the transmitter was repowered.

Success! No bangs, and everything powered up quite sweetly. There was just one fly in the ointment - there was hardly any RF output from the transmitter. Meter readings were scanned anxiously, but everything else appeared to be quite normal. There was just a minor thickening of the trace on the RF envelope monitor, where there should have been a nice fat screen full.

It is said that someone produced a slide-rule, and did a few quick calculations.

"Let's see now: A.C. power into the transmitter... um, 120 kW."

"And the RF output from the transmitter is... rather less than 500 watts. Oh dear."

Legend states that at this point A flipped his lid, and made an announcement that listeners thought was distinctly odd. We will never know what exactly was said, but Sutton tradition suggests that it was along the following lines:

"I always KNEW that this sort of thing was going to happen. There are just too many megacycles in too small a space."

"Somebody go and get me a long rope."

Well of course A's word was law, so somebody obliged, wondering perhaps if he was about to witness the first lynching in the station's history.

When the rope appeared, the transmitter was switched off, all the doors closed, the rope looped from handle to handle around the equipment, and knotted at its ends. A notice was affixed to the front of the machine, warning everybody off.

"Nobody is to touch this transmitter. I'm off to ring up London."

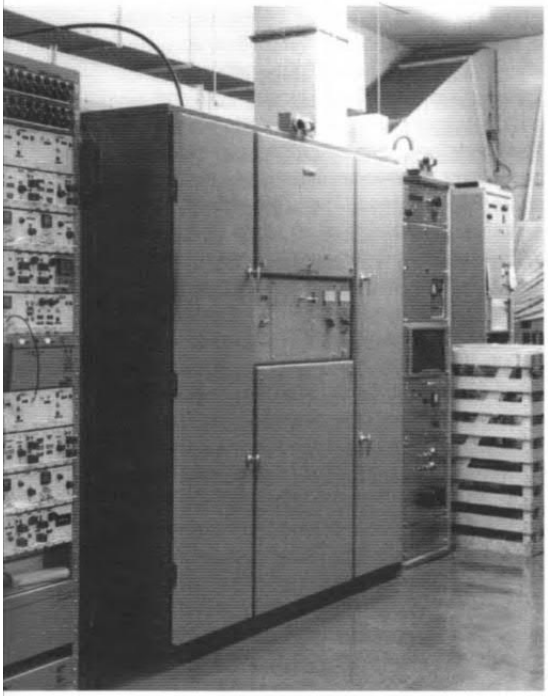
He disappeared. And that was that. Transmissions were completely abandoned for the rest of the evening.

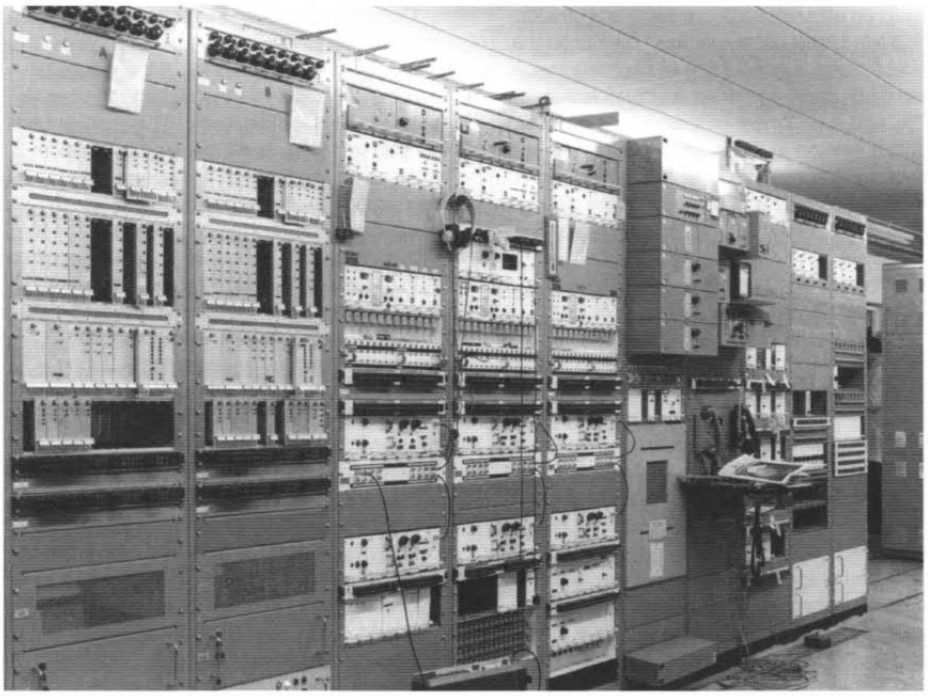
We are on much stronger ground about the happenings of the following day, since there is still a living witness to what happened. When the day shift arrived, they were somewhat bemused by the presence of the enveloping rope, and were not allowed to investigate. They were all kept at a distance whilst events unfolded.

Shortly afterwards, a procession of large black cars wound its way down the station drive. They stopped, and disgorged a collection of distinct Suits, plus a few nondescript hangers-on. These all filed into the building, and so into the transmitter hall.

The device was put through its paces, with results identical to those of the previous day. The Suits looked at one another. Nobody said very much.

At this point, a distinctly shabby character in a 'mac, who had been hanging about at the back of the crowd and to whom nobody had paid much attention, elbowed his way to the





1970's Band II TIE with the 13 channel PCM decoders on

front, and murmuring, "Excuse me..." started flicking through various meter readings. Then he turned and made a strange gesture at the man on the control desk. Evidently he desired the transmitter to be depowered. This being done, he opened the interlocks and disappeared round the back. There was a sound of a door being opened. There were various "humph" and "so" noises. Then his head popped back round the side of the unit.

"Anybody got a match?"

In silence one was produced. He disappeared again.

Followed a succession of scraping and grunting noises, then silence. After a while, the sound of the rear door being carefully closed. He reappeared.

"O.K. Power her up."

The transmitter sprang to life. A marvel - buckets of output power. The Saviour Mac explained just what had happened - to which, nobody said a word. All of the Suits filed out in silence. Moments later a procession of cars swept its way back up the drive, London bound. The incident was over.

All that is necessary is to explain what had happened. Person B, in the course of his ascent into the back of the cubicle, had made use of a convenient object as a step. That object was the output coupling capacitor, a substantial article, the central vanes of which were controlled by an insulated rod of glass. This rod had broken, and the vanes had been kicked round into a position of minimum coupling. Nobody had noticed this the previous evening (they must all have been pretty exhausted by this time) and nobody had subsequently been given the opportunity to go in and have a good look round. Repositioning the vanes, and wedging them in position with a matchstick, restored the unit to its former glory.

Steps were taken, however, to prevent a recurrence. A few days later, either A or B (and I really can't remember which it was) suddenly found himself promoted to a new post, a good long way from Sutton.

Shaving Seconds

This one also involves the activities of an individual: a Senior Maintenance Engineer whom we shall call C. He was a very good engineer, thoroughly knowledgeable, highly competent and all that (he had been at Alexandra Palace before the War), but hasty.

I found out about this haste myself as a young TA on the desk. With just minutes to go to the start of the evening programmes (no all-day broadcasting then) his head suddenly popped over the control desk, and with a quick "just going to change a valve..." he switched off the vision transmitter and beetled off back into the hall. He certainly was an exponent of high-speed valve changing. Within a minute he had returned, re-powering the transmitter. It creaked back onto the air just as the continuity announcer was getting into her stride.

I discovered later that he had been going on like this for years, although not always with such happy results. There was always the distant spectre of that terrible evening so many years ago...

What had happened was, he had been researching ways of shaving seconds off his personal valve-changing record time. His reasoning went like this:

After he had diagnosed a valve problem, he would of course have been standing in front of the affected unit. Seconds would therefore be wasted in walking across to the control room, announcing his intentions, and de-powering the transmitter. There must be a quicker way, and he was sure that he had found it. His eyes had alighted on the interlock handle.

You must understand what happened when this handle was wound when the transmitter was under power. The sequence of operations goes like this:

- a switch opens, breaking the 50V DC supplies to the control circuits. All of the supply contactors fall open, removing A.C. power from the power supplies. Then:
- another switch opens, isolating the units to be worked on from the D.C. outputs of their power supply. Then:
- an earthing switch closes, connecting the supply rails within the units to ground. And, finally:
- the door-locks to the units are released.

It all seemed so easy. All he had to do was wind the interlock handle slowly, till he heard the supply contactors fall out. The desk TA would be sure to wake up at that point. Then wind the handle like fury, get in there and change the valve, and close up again. The desk TA, by now considerably alarmed, would then re-power the transmitter.

One evening, a few minutes as usual before the programme start, and without announcing his intentions, he gave it a try.

It is reported that the lights in most of the houses in the northern half of Sutton Coldfield dipped perceptibly. Inside the station, there had been the most almighty bang. People tumbled out into the transmitter hall with their ears ringing.

It was at this point that C. discovered that the interlock handle had frozen into position, and couldn't be moved in either direction. Something appalling had evidently happened inside the interlock cubicle.

Someone was despatched to get a ladder. By the time he had done this, the unit had been completely isolated. It was then short work to climb onto the roof of the cubicle and remove the top cover (this was the only way in). When the cover was pulled back, eyewitness reports say that a rectangular column of dense black smoke rose slowly from the unit and mushroomed off the ceiling. All of the earthing switch contacts had been welded shut.

It didn't take long to diagnose the problem. The sequence of events as mentioned must have been what the manufacturer intended, and to what the system was eventually restored: but it certainly wasn't what happened that evening. It seems that the earthing switch was the first to close,

onto an otherwise fully powered transmitter.

Well, it took quite a while to dismantle the mechanism, a good while to hacksaw the contacts apart and dress them up with a file, and even longer to reassemble it all so that it worked in the manner intended. In the end, the transmitters were repowered just in time to catch the closing bars of the National Anthem at the end of the evening's broadcast.

Marmite to the Rescue

This time, by way of a change, it was the sound transmitter that was the offender. Programme start time was fast approaching, and the thing simply wouldn't power up. The run-up sequence got to a certain point and then just stalled. There was no apparent reason for this; no overloads, nothing.

A logical approach to the problem led to the power supply cubicle. A certain contactor was not coming in. There didn't seem to be any reason for this: there may have been a dodgy connection somewhere, or a burnt relay contact perhaps. It needed time to sort it out, and time was what they didn't have, since there was no reserve transmitter.

Suddenly, the S.M.E. (it was our old friend C. again) remarked,

"Somebody go and get me a broom with a wooden handle." When this arrived, he insisted on being locked inside the supply cubicle. "You go and power the transmitter, quick. I'll work this ruddy contactor." Which he did: he spent the entire evening in there, holding the contactor in with the end of the broom handle and with the broom head against his chest. At intervals, glasses of water and Marmite sandwiches were passed in to him via a hole in the roof. They didn't want him fainting in there.

At the end of the evening, with the pressure off, the fault was found in a matter of moments, of course.

It should by now be apparent that the lack of a reserve transmitter was causing severe embarrassment, and the manufacturers were little nearer producing a suitable product. However, help was at hand in the shape of a curious 'Caravan Transmitter' that appeared on site one day. This seems to have been the pilot transmitter that toured the Birmingham area before Sutton opened, giving demonstrations to the trade, and which turned up at some later sites in a temporary capacity whilst their permanent buildings were being erected. (There is a slight possibility that it may have been the same vehicle that was used pre-war as an Outside Broadcast link. This unit was reported to work in the 60 - 70 MHz band, at about 1kW power. It would obviously have been of less use by this time, since Sutton was now occupying its frequency, and by then much superior OB links were available. On the other hand, archive film footage shows this vehicle in use for the experimental first Calais Outside Broadcast in 1950, in which just about every available item of link gear was pressed into service, making this possibility less likely). Even though 1kW is a bit of a comedown after 35kW, it was still a lot better than totally blank screens and probably gave a usable service to Birmingham, though not much further afield. It was evidently regarded as a Godsend by the beleaguered staff.

Despite this, the caravan still had its own contribution to make to the general chaos. It was parked round the back of the building, and coaxial cables connected it to the feeder changeover switches inside. The caravan had its own test load, and it became the custom to leave it connected to this: the reserve transmitters would be tested every day, to keep the valves conditioned and reassure the staff that it would in fact work if called upon.

In the event of a main transmitter failure, the first step would be to see if it would re-power, and then if not somebody would run post-haste to the van to crank up the reserve. The test-load was selected by moving the connector on the end of a flexible co-ax cable from one socket to another, so while the reserve was running up this connector would have to be moved back. The sockets were mounted on a bracket at ceiling height, and the plug had a screwed retaining collar with a very fine thread.

One day there was the customary bang, and bells, and it was soon decided that the reserve would be needed. Two bods, who we will call D and E, (there must have been plenty of staff about that day) nipped round the back, and started doing the necessary. While D was running up the transmitter, E dealt with the connector.

After a short while, D remarked: "It's ready to power. You got that connector done yet?" "Erm... yes..." At which point D powered the reserve: no problems. "Right, I'm off to lend a hand with the fault," said D, who then disappeared.

Well, it wasn't too bad a fault, and was fixed in a quarter of an hour or so. At the end of this time the main transmitter was running peaceably into its own test load.

"We'll leave it like that, to soak for awhile. We can switch back at the end of the programme. I think we've all earned a cup of tea."

There was no dissent to that view. After the second cup, and by the time the fault had been thoroughly dissected, somebody suddenly remarked,

"I haven't seen E. for a while. It's not like him to miss tea. Anybody know where he is?"

"Last I saw of him was nearly an hour ago, in the 'van. Oh dear, perhaps we'd better..."

They all trooped round to the van, to find E. standing on tiptoe in a frozen attitude with his hands clasped round the connector. When he had fitted it, he'd got the fine thread well and truly crossed and could neither do it up, nor undo it. Nor, from where he was standing, could he reach the 'Off' switch. For the previous three-quarters of an hour he had been holding the connector together, to prevent it from arcing.

Well, he was promptly rescued of course, though it took a while before he could lower his arms below shoulder height, and longer still before his fingers would straighten out from their claw-like appearance.

With the presence of a reserve transmitter, no matter how capricious, some of the heat went out of operations at Sutton, and cock-ups of the majesty of the few just described became more infrequent. Pre-reserve, the one priority in the event of a fault was to get some sort of a picture back for the punters - time could not be spared for a close analysis of causes. Post-reserve, the staff could afford to relax a little and gaze critically at the problem through half-closed eyes and a haze of recently lighted cigarette smoke. There was now time for puzzling features of an incident to be investigated, and suitable strategies advanced. The pulse rate of most engineers returned to more reasonable levels.

Eventually a properly engineered reserve installation became available and the whole system became, as a result, fairly usable. This installation was a Marconi 5kW unit, of the type used as main transmitter on medium-power sites such as Rowridge or Pontop Pike (incidentally, a parallel installation of these units was used as the main transmitter at Crystal Palace – this site of course had much more aerial gain than the other high-power sites, so didn't need as much engine power). For use at Sutton, the 5kW vision unit was narrow-banded a little and by this means its output power could be screwed up to about 6.5kW. Similarly, the sound unit was run at 2kW rather than its nominal 1.25kW.

There followed a breathing space, until the introduction of FM broadcasting in the mid to late 'fifties.

The Quieter Years

As time passed, the reliability of the old 405-line installation improved somewhat, as its dodgier aspects were weeded out and various subtle and not-so-subtle modifications performed. By the time the early 'seventies came, it was possible to turn your back on the thing for maybe hours at a time: the only fly in the ointment was, it was still a manually operated transmitter that needed a TA on the control desk to work it. But about this time, attention was given to the possibility of automating it. This was done as a purely local project.

The big problem was of course the control system: but various keen types on site devised and produced a replacement automatic solid-state control system, using Mullard Norbit modules. These devices were hardly state-of-the-art (they were actually made from discrete components potted into an epoxy package) but had the overwhelming advantage of a colossal noise immunity – a good point in a transmitter bristling with transients. This control system would automatically power up and de-power the system, and handle any overload trips on a three-shot basis. It worked well.

The only other thing that was a bit of a problem was the transmitter's black-level stability, which was poor, and needed an operator to keep it in line – previously, the desk TA would give an occasional tweak to a nice large knob on the control desk to do this. Fortunately, at this time there were a few of the earlier UHF installations that were being re-engineered, and we were lucky enough to scrounge a complete black-level controller chassis from an old Pye Mk I site. This didn't work in quite the way needed (in it, black level was maintained by a motor-driven piston attenuator in the drive output) but all the bits were there and it was easy enough to make the motor drive the required variable resistor instead.

The monitoring functions of the old TA were usurped by another scrounged unit, a 'comparator monitor'. This also came from a re-engineered UHF site, and again needed the odd alteration to make it work on 405-lines, but work it did, and became the latest in a line of contraptions known generically as 'tin TAs'.

So by this point, the transmitter was on its own, and the desk TA redeployed to more rewarding activities. In general terms, it all worked well: there would still be bangs from time to time, and bells would still ring (though automatically, now). It was just that people now had further to run when they did ring. Kept us all fit (I used to reckon that on an average day, I would walk about five miles back and forth through the corridors of Sutton. It was not an ergonomically designed site).

The Writing on the Wall

About the mid 'seventies were probably the most reliable ones for this installation. After that, things started to worsen. The problem was, that when the vision transmitter had been built, it had been largely wired with rubber-insulated cable, and this was now starting to rot with age. There was no question of ever completely rewiring the thing; it would not have been economic and the unit would have been out of commission for months. Worst of all were the heavy-current supply cables to the power transformers: rubber-insulated, these also had lead sheathing. Unfortunately, over the years transformer oil seeped from the transformers into the junction boxes, thence into the cable insulation. This oil converted the rubber into something resembling black cherry jam – it still insulated, but if you accidentally displaced the cable during maintenance, the lead outer sheath would move but the copper conductor within it wouldn't..... The result was an almighty bang when the unit was repowered, and the transmitter would probably be off for a day or so whilst the jammy cable was cut back to firmer material, and a new length spliced in. Since most of this cabling was in underfloor ducts, this could be a ticklish job, since your prime desire whilst doing it was to avoid disturbing any further cables....

Around 1980 or so, the decision was made that enough was enough. From that date on, programmes would be carried by the reserve transmitters, with the old high-power transmitter relegated to use as a standby. This meant of course that if a service transmitter failed, it would take over five minutes to power up the old fellow, and no guarantee that it would work when powered (it was the custom to run the old setup into load every few days, just to keep the damp out of the works).

Not long after, everything started to change. Both the original FM radio and the original BBC1/BBC2 UHF installations were becoming due for re-engineering. Since you cannot just wheel a new transmitter in through the door and plug it into a wall socket, some room was going to be needed. The scheme was to install a complete new FM installation into an emptied former Band I TV hall (this re-engineering was going to require a new mast as well) and after this was up and running, to strip out the old FM installation and use the space for a new UHF TV one. The old 405-line high power transmitter, by this point easily the oldest surviving in the world, was going to have to go.

Station staff undertook all of the dismantling, with the spoils being taken away by a local scrap merchant. Many of the staff were happy to see it all go – one could see people working off old grudges against the gear as they sailed into it with hacksaws and oxy-acetylene cutters – though personally I felt a little regret – it was, after all, a historic artefact and parts of it, at least, should have been preserved. The problem was, the thing was simply too damned big for any museum to display more than a passing interest.

Turning Down the Wick

With the old high-power unit gone, there was now no standby for the medium-power units that were carrying the service. In order to give some sort of a standby, provisions were made that had a slightly farcical flavour.

Somebody produced an antique S.T.&C. CG1 Band I TV transmitter, which had been used for training purposes at Wood Norton, the BBC's Engineering and Training Department. These units were rated at a modest 500-Watts peak white power output – a bit of a comedown after 40 kilowatts! Our specimen was tuned up for Band I channel 4, and the unit installed in an extra-wide corridor (an area always known in Sutton parlance as the 'Zoo', for some inscrutable reason). Initially, the thing really was plugged into a 13-amp wall socket, and was used only as a standby for the medium-power transmitters.

The odd thing was that, when in use and giving its mighty output of not much more than one-hundredth of the original output power, there were few viewer complaints. Maybe there were just very few viewers left on 405 lines in those days, and maybe those viewers blamed their sets rather than the broadcasters ("Well, it's old, innit, it doesn't owe me nothink"). The public were never told that these power reductions were taking place, so saw no need to complain. Or maybe the setup really did give usable results: after all, sets of that period were greatly more sensitive than those of 1949. Perhaps a slightly more discriminating user of the output was the Band I television relay at Hereford, which re-radiated pictures from Sutton – although over 50 miles away, it continued to radiate satisfactory pictures even when Sutton was using the low-power setup.

The final ignominy followed – the low-power transmitter became the preferred one, with the medium-power one as standby. In order to do this, it was 'automated' – namely, switched on and off with a time switch. If programmes over-ran, they were simply chopped (unless somebody remembered to press the over-ride button). Again, there were no complaints. Serious thought was given to eliminating the medium power transmitters, and another antique CG1 was located and pressed into service as a standby. Once this became available, the medium-power transmitters were scrapped. The space vacated by these was not immediately required, but ultimately all entries to the space from within the building were bricked up, an exterior door provided, and the space rented to NTL, who used it for their Classic FM service.

Ultimately the 405-line service came to an end in January 1985. The CG1 transmitter, believed to have been the last 405-line transmitter to close down, was offered to and accepted by the Birmingham Science Museum in Steelhouse Lane. There it was for a while on public display, along with other broadcast items such as a pre-war Marconi-Stille magnetic recorder, and a BBC-designed and built analogue standards converter. Shortage of space eventually caused it to be withdrawn and put into storage – the museum has since moved site, and it is not known if the transmitter survives.

The other CG1 was dismantled by BVWS members Phil Marrison & Tim Wander for preservation at the Vintage Wireless Museum at Dulwich.

'In eighteen months, medium-wave broadcasting will be dead...'

Well, that was one remark passed when FM broadcasting started in earnest. Like many such comments it perhaps contained an element of wishful thinking: most of the medium-wave transmitting stations were pre-war and needed refurbishing if not downright re-engineering: why not replace it all with modern FM stuff? Automatic gear, much more efficient, no large aerial arrays to blow down....

With hindsight of course one can see why it didn't happen. The 'transistor portable' boom that effectively saved medium wave had not then started. FM wasn't much use for the car radios of that period. Consumer resistance to rushing out and spending good money on a new receiver had never been higher. The early FM sets were not easy to tune, compared with their MW counterparts.

So FM in those days was a minority sport, indulged in only by those who couldn't bear to listen to the cacophony that the medium-wave band was becoming during the evening.

At this time, the Sutton buildings were subjected to a massive expansion. A new FM hall was built in the space between the building and mast, and a new massive 'Band III' hall alongside it. In those pre-ITV days, it was felt that when the second BBC TV service came along, Band III was where it would be going. Wrong, of course. The hall stayed empty, apart from junk storage, until BBC 2 came along in the 'sixties. However if you looked carefully at the lighting supply switch and fuse boards, you would see items labelled 'Band III Hall' even as late as the 'nineties.

This expansion explains one or two architectural oddities about the building interior – for example, if you walk along a certain interior corridor you will see, on one wall, bricked-up exterior windows, complete with windowsills and drips.

The FM Transmitters

The new transmitters were supplied by S.T.&C. and were, in some respects, eccentric devices and so fitting in fairly well with the ethos of the site. It was a parallel-pair installation: two transmitters per service, nominally 10kW per transmitter, and in those days of course labelled 'Home', 'Light' and 'Third'.

One transmitter for a service was combined with the corresponding units for the other services, and fed to one-half of the aerial array. The other units had their own separate

combiner feeding the other half of the array. The system thus had redundancy, a transmitter could fail and the remaining unit would carry the service, albeit at reduced power (quarter power, in fact: half the transmitter power was lost, as well as half of the aerial gain).

The transmitters were originally specified for unattended operation, but never proved to be quite reliable enough for that: the best that was achieved was a period quaintly known as the 'UGH' (UnGuarded Hour) which ran for the short period during which programmes were still being broadcast and there was no staff presence (some programmes could start at 7 a.m. – others might run until 1 a.m.) During these periods, transmitters were run by remote control from a staffed Medium-wave site – Droitwich, in the case of Sutton. There was only limited control; units could be switched off if misbehaving, or programme feeds or drives could be changed over. It was accepted that anything in the nature of a major fault would simply have to wait until the shift staff arrived at 08:00 before being rectified.

The Coming of Stereo

Early experiments with stereo were made, of course, in the late 'fifties. They consisted of transmitting one channel using the TV sound channel, and the other channel on one of the radio services. Programme material mostly seemed to consist of ping-pong matches, and trains running across your mantelpiece. The entertainment value of this being low, and the shortcomings of the method apparent to all, it was something of a relief when the BBC announced in the early 'sixties that further experiments would be made using the Zenith-GE system (which is what the rest of the world were starting to use) on one of the FM services.

Mostly these experiments were made from the Wrotham transmitter. The advantage of doing this was that distances were short – both for engineers commuting between specialist London departments and the station site, and for the programme signals themselves.

It became apparent quite quickly that the system was a worker, but that programme distribution was going to be somewhat of a problem. The Post Office had provided a pair of programme landlines from Broadcasting House to Wrotham, guaranteed balanced both for frequency and phase response. (If the phase response of the two lines is not matched, mysterious shifts of stereo image result for listeners). The problem was that keeping the lines matched was likely to prove an expensive business: bearable for lines to Wrotham, but not so for a national network of programme distribution. The first step towards this network was announced in the mid 'sixties, when regular programmes were announced for Radio 3 only, initially from three stations, Wrotham, Sutton Coldfield and Holme Moss.

The ultimate solution to the programme distribution problem was to go digital, with the first 13-channel PCM system. But this was still a fair way ahead, with much development work to be completed first. Some stopgap system would have to be devised, and at minimum expense (a normal BBC criterion).

The slightly weird stopgap that resulted was made possible by an experimental VHF-FM receiver that had been devised by some department or other (Research?). This receiver used a pulse-counting discriminator rather than the more normal Foster-Seeley or Ratio Discriminator. In order to make a pulse-counter work efficiently, a low value of intermediate frequency is needed, and this unit used 1MHz. How would it be, somebody thought, if we sawed this receiver apart in the IF strip, moved the two halves miles apart, and joined them with a microwave link?

Well it wasn't quite as simple as that, of course, but the final solution consisted of a receiver site at Whipsnade, where the output of Wrotham was received off-air by the front half of this sundered receiver. This gave a 1MHz frequency-modulated sine wave output, which was fed into a Pye M715 microwave link. Its 7GHz output signal was beamed northwards to an intermediate site at Whichford Hill, where the SHF signal was transposed to a new frequency, amplified and shot on its way to Sutton Coldfield. Here the latter half of the receiver lay in wait to demodulate the output from a Pye link receiver. The onward path from Sutton to Holme Moss was accomplished in a similar manner.

It all worked surprisingly well. The only fly in the ointment was the intermediate site at Whichford Hill: in order to get an unobstructed path to Sutton, the receive dish at the latter had to be sited at a good height: halfway up the mast. The other snag was that one of the paths at Whichford passed through a belt of trees; no problem in the winter months, but this caused severe fading in the summer if the leaves got wet. Unfortunately the trees had a Preservation Order on them, and could not be lopped. Ultimately, when this link was re-engineered to handle the PCM distribution chain, Whichford had to go, and the link became four hops: Swains Lane (North London, where the PCM signal was modulated onto an SHF carrier) to Whipsnade, to Thorpe Lodge (north-east of Banbury), to Meriden (a Gas-board site, later used for BBC CWR local radio also) and so to Sutton. With this arrangement the receive dish at Sutton could be lowered to a more reasonable height.

Sutton was fortunate in its choice of the S.T. & C. FM drive. This unit proved very simple to modify for stereo operation: all that was involved being provision of an extra unbalanced 75ohm input for the stereo multiplex signal, and a changeover relay to select either that input or the original mono 600ohm balanced input. Hum was always more of a problem on an unbalanced input, but this was mostly removed by passing the signal through a massive Post-Office stop coil (basically, an inductor wound with co-ax cable around a magnetic core).

Stations that did not use the S.T. &C. drive were less fortunate. The Marconi FMQ drives that were used at some other stations proved quite impossible to modify for satisfactory operation. These stations had to be re-engineered with new drives – in the earlier days, BBC designed and built VRFM drives (Variable-Resistance Frequency Modulation) although these were less than totally satisfactory themselves, and in later years were again replaced with VIFM drives (Variable Inductance Frequency Modulation), also BBC designed and built. The performance of these last drives was so good that it was actually better than the measuring equipment being used to maintain it - what you were in fact measuring was the performance of the test gear. This situation had to be borne with for several years, until there was enough money in the piggy bank to replace the test gear too.

Maybe the re-engineered stations were not unfortunate – at least they got more up-to-date drives. Sutton had to soldier on with the original drives until its FM installation was re-engineered in the early 'eighties.

The Buzz Factories

Local radio was no new thing to the BBC – when broadcasting started in this country, all radio was effectively local since there were no networking facilities in position. However, latter-day local radio broadcasting commenced with the opening of Radio Leicester, on a fairly low power as an FM service. This pilot scheme proving successful, further low power stations were set up, and eventually the focus moved on to the 'big cities' – London, Birmingham, Manchester and others. These areas would need rather more powerful installations to cover the required area, but eventually money and (rather grudging) Government approval was obtained for them.

There was a story then current that at one point the Government got cold feet about the project, and was wobbling about withdrawing permission. In order to bypass this possibility, the BBC decided on a *fait accompli* – get them in and working before the Govt changed its mind. To this end, a number of transmitters were actually flown in by airfreight from the USA, since no British manufacturers could provide the goods off-the-shelf. The stratagem worked, though the installations were rudimentary indeed.

Sutton was to be host to two of these new sites – 'Radio Birmingham' as it was then called (it later became Radio WM when the West Midlands conurbation came into being) and 'Radio Derby'. The entire operation was conducted on a shoestring, and had to be done from existing sites. Sutton was fine for Radio Birmingham, but much too far from Derby to give a really good service there. Derby itself is in a river valley and shielded from Sutton, and field strengths, particularly in the city centre where the studios were located, were low. Listeners here were troubled with all sorts of interference, and Sutton became known jocularly by the station announcers as 'the buzz factory'. In later years a small ten-watt relay was installed at the studios themselves, purely to cover the city centre. This situation persisted until the late 'nineties, when a new site for Radio Derby FM became available at Drum Hill, just to the north of the city.

The new transmitters supplied were Gates 1kW units, a variant of the FM-1 series that used an all solid-state driver feeding a single tetrode amplifier valve. They were in the typical American style – over there, local radio transmitters are just a box that you bung into a corner of the studio control room, and then forget. They were made as simple to operate as possible – indeed, they had few operational controls, 'Plate On' and 'Plate Off' pushbuttons and a paddle switch

labelled 'Raise' and 'Lower' (this operated the output coupling loop so as to alter the output power. The valve was driven in such a manner that it was almost impossible to damage by mistuning). Maintenance and troubleshooting was intended to be done by an outside firm of contracting specialists, not studio staff. This being the case, no access to the innards was encouraged, and the back door of the unit was firmly screwed shut. This didn't suit BBC methods, so an immediate modification was to remove the screws and install a rear-door Castell key locking system, interlocked to the mains supply isolator. A small earthing wand was also provided.

Aerial installations were quite simple. From memory, Radio Birmingham had four tiers of two sets of yagis per level, horizontally polarised and pointing west and south, covering Birmingham to Wolverhampton. The radio Derby setup was even simpler: two tiers of one yagi per level, pointing rather east of north and covering Derby and Burton-on-Trent. (Burton was not actually within the editorial area, being in Staffordshire, but there was no way to avoid covering it, so its citizens were treated as honorary Derby residents and included in news broadcasts. When the site moved to Drum Hill, coverage in Burton suffered and there were complaints). Interestingly, the Derby aerials were mounted with their elements at 45 degrees to the horizontal, thus producing one of the first mixed-polarisation stations.

In use, the transmitters were very reliable, although in the early days the monitoring was extremely sketchy. It consisted in fact of a set of lamps on the control desk, basically indicating whether programme input (landline from the studios) and RF output (from the transmitter) were normal. Monitoring the output had to be done on a Hacker portable radio (Hacker in those days meant a respected set maker, not a dodgy prime minister nor an antisocial web user). Eventually a set of spares for the equipment arrived. I was particularly bemused by one item, a spare inductor. The packet contained a straight length of copper wire, plus a slip of paper saying 'wind this round the shank of a quarter-inch twist drill to make a coil of ten turns, one inch long'. I wonder how much it cost to fly that across the Atlantic.

Local radio was a little unusual in opening on FM only. Listeners on that band in those days were not great in number, and the studios were continually complaining that what they needed was a medium-wave outlet. Eventually, they were given one, though again it was all done at minimum cost. In the case of Radio Birmingham, there was a lash-up consisting of a Marconi 5kW AM transmitter installed in a corridor (the 'Zoo') which initially fed a sloping-wire aerial supported from the main mast. This wire passed directly over the main transmitter block, and was a deep embarrassment from the start. The field strength inside the building was enormous, and Radio Birmingham found its way into most of the programme distribution amplifiers, being both heard and seen.

To overcome this, another arrangement was speedily devised; the wire aerial was removed and the transmitter now fed a couple of 150ft. pole radiators down in one of the fields. The mast base pads were made from railway sleepers, and the ATH's (Aerial Tuning Huts) from tiny fibreglass shelters of the kind then used by road works night watchmen. The poles were driven with a suitable combination of power and phase so as to produce a main lobe pointing at Birmingham, and two deep nulls centred on London and Manchester, which were using the same frequency. Cunningly, the masts were sited in such a position that the London null also coincided with the main television mast. This was done so that the TV mast would not reflect or re-radiate any of the signal, and so spoil the radiation pattern. Unfortunately, the signal could not be kept off the mast stays, and these re-radiated with abandon. This upset the performance of the installation somewhat. Field strengths inside the building were now lower, but still high enough to make faultfinding using sensitive measuring gear a misery. Eventually another site became available when Independent Local Radio started up from Langley Mill, and to everyone's relief this was used instead and the temporary setup at Sutton was torn down.

Hullabaloo and Custard...

... were the official names of the kangaroo mascots used by the BBC in its publicity drive to announce the coming of 625 line television on UHF. This was of course the BBC2 channel, in monochrome only, and made necessary the renaming of the old 405-line BBCtv channel to BBC1.

Custard was never much in evidence (like jam, that was for tomorrow) but there was certainly plenty of hullabaloo available to make up for it. The new service opened in London only (of course) from Crystal Palace, when the infamous power-cut incident on the opening night led to all programmes being cancelled. At this time, the new BBC2 installation at Sutton was in the throes of installation.

The new transmitters were 25kW units by Marconi, and used klystrons in the final amplifier. Nothing like this had ever been seen on site before, and caused many head scratchings and prognostications of doom. At the same time, new aerials had to be provided, which involved rebuilding the top of the mast, described elsewhere. All the same, when the December 1964 target date was near it became evident that the new aerials would not be ready on time, so a temporary aerial was provided on the old 150ft reserve mast, providing some sort of a signal to the Birmingham area in time for the opening date.

Despite being 'a cutting-edge product by one of the leading manufacturers in the country', the new transmitters proved to be rather unstable and a bit of a disappointment. Though, to be more accurate, it was the drive (exciter) units that had poor stability – the high-power amplifiers in themselves were pretty good, and suffered from only one shortcoming, which will be dealt with shortly. The drives, however, were a continuous source of trouble. When I use the word 'unstable', this is not to imply that the unit would dive off into violent oscillation in quite the manner of the 405-line vision transmitter: but rather, the linearity of the drive would change quite markedly over the short term.

The staff spent so much time fiddling with these drives in an attempt to maintain transmission of something that looked like a vision signal, that the fact became noticed by the station EiC. This led to the issuing of a memo, and ultimately to the infamous 'Closed-Doors' experiment. Basically, the memo said that too much fiddling about was going on, and accordingly the drives would be lined up 'properly' by the shift SME, after which the transmitter hall doors would be closed, and in fact locked with a padlock and chain, to prevent unauthorised twiddling.

This was done early on a Monday morning, after which the locks were applied and the keys handed to the EiC. No more than ninety minutes later, the key was being asked for, because by this time the pictures had become unusable.

A lot of the early problems were probably due to staff inexperience, coupled with the fact that the line-up procedures given in the handbooks were pure gobbledegook and in fact couldn't be made to work anyway. Over the following months, low cunning on the part of the staff devised line-up procedures that did, in a way, work, and devious strategies were evolved which kept the gear on-air without too much interruption. But to the end of their days, these original drives remained unstable, and it was a rare shift that passed without someone having to go and give them a surreptitious tweak. Eventually after many years the fact that the drives were a total liability was recognised, and they were torn out and replaced with much more modern, and stable, Pye IF Modulation drives, to everyone's immense relief.

Continued in the next issue of The Bulletin

BBC2 Advertisement with Hullaballoo and Custard

A brief resumé of British (and several overseas) finished goods & component manufacturers (as at May 2005) part 10 by Dave Hazell

LAB - see under "Radio Resistor"

LCR In 1972, LCR Components Ltd, Woodfield Works, Tredegar, Mon. Manufacturer of polystyrene capacitors, recently specialising in "TV replacement" type multi-section electrolytics and multi-section electrolytics for smoothing in HT supplies for valve amplifiers (currently enjoying a resurgence). Currently (2001) based in South Wales.

LTV Ling Altec Ltd, Baldock Road, Royston, Herts. Maker of PA equipment. Ad in 1970 says " 30 years of experience".

La Rediotechnique. French electronic component manufacturer in 1967. Connected with Philips.

Lab-Craft Ltd, 71 Newbury Road, Netley Park, Essex (in 1957). Maker of signal strength meter. In 1964, at Gainsborough Road, Woodford Bridge, Essex.

Labgear. Labgear Ltd., of Willow Place, Cambridge (in 1946 & 58). Called Labgear (Cambridge) Ltd from July 1951; Labgear Ltd from July 1957; Labgear Cablevision Ltd from August 1983; Teleste Cablevision Ltd from January 1991 and (once again) Labgear Ltd from July 1998. It was established circa 1938/39 by L W Jones, who continued as Managing Director until circa 1968, when Sant Kharbanda took over. Sant Kharbanda retired in 1982 and was replaced by John Turrill (formerly of Belling & Lee). Sant Kharbanda died in 2000.

Labgear has manufactured many different products over the years: radio test and laboratory equipment (such as Geiger-Muller radiation counters), transmitter variable capacitors and coil winding machines; wirewound resistors and mains droppers, aerials and aerial amplifiers, signal strength meters, TV pattern generators and Teletext adaptors. In 1971, they were making backpack mobile radiotelephones. Labgear later moved to purpose built premises at Cromwell Road, Cambridge (by 1962) and then, in 1972, to Abbey Walk, Cambridge. Pye Business Communications took over the Cromwell Road site, in 1972. By 1978, there was a small satellite factory at Ely. John Turrill initiated expansion by moving this production capacity to newer 'warehouse' units at Angel Drove, Ely (Labgears's home in 2002). Ely slowly took over from Abbey Walk as the main factory. Eventually production at Cambridge ceased entirely in 1989. Abbey Walk continued as head office site until Easter 2001, when we all re-located to Angel Drove. The Abbey Walk premises are now (2002) mostly demolished and the site is being re-developed for housing.

Labgear was bought by Pye in 1951 (it is suspected that prior to this, Labgear was not a limited company and a dormant Pye company – Orr Radio Ltd - had its name changed to Labgear when Pye took over in 1951). Orr Radio Ltd was incorporated in October 1932. From 1982, it became a subsidiary of Cambridge Electronic Industries plc. Sold in the 1991 to Teleste (of Finland). For very many years, the Managing Director was a Mr Sant R Kharbanda, who was also a director of Pye. Following a management buyout from Teleste in 2000, Labgear is now independent and located in Ely, Cambs. In 2004, Labgear was bought by Philex plc, a company who market a range of "pattern" replacement parts for TV and video products (belts, remote controls, etc.).

Lamb, Hingley & Co Ltd, Stour Works, Lye, Stourbridge, Worcs (in 1958). Maker of "Electrapex" clothes drying cabinets.

Lambda Electronics Ltd, 21 Aston Road, Waterlooville, Hants (in 1970) – also in 1970, at Marshlands Road, Farlington, Portsmouth. Maker of power supplies. In 1976, there was a Lambda Electronics at Abbey Barn Road, High Wycombe, Bucks – possibly an American (making voltage regulators, etc) firm with the same name – later Semtech? Lambda (UK company) Later merged with Coutant, to form Coutant-Lambda?

Larsholt – trade name of Larsen & Hoedolt, Ryesgade 51-53, DK-2100, Copenhagen 0, Denmark. Established in 1924. Maker of FM tuner front ends, etc, and complete tuners.

Lasky's Radio Limited, 3-15 Cavell Street, London, E1 (in 1967 & 70). Established in 1933. Retailer of consumer electronics and electronic components. In 1974, a member of the Audiotronic group of companies, Audiotronic House, The Hyde, London, NW9.

Lasso. Brand name of Herts Pharmaceuticals Ltd, Welwyn Garden City, Herts. (in 1946). Maker of wire labelling and adhesive tape products (e.g. Lassotape).

Lawson Fuses Ltd, Meadowfield, Ponteland, Newcastle-upon-Tyne, NE20 9SW (in the 1980's). Industrial fuses manufacturer.

Lawson Tubes Ltd, 18 Churchdown Road, Malvern, Worcs (in 1967). Supplier of "Century 99" CRT's for TV sets.

Lea Birdge Cabinet Works Ltd, Bridge Close, Oldchurch Road, Romford, Essex (in 1964). Cabinet manufacturers.

Leak – in 1947. H J Leak & Co Ltd, 470 Uxbridge Road, London, W12 and (by 1950) at 57-59 Brunel Road, Westway Factory Estate, London, W3. Maker of high fidelity audio equipment, established in 1934 by Harold J Leak, as a maker of public address equipment. The company went on to be pre-eminent in high fidelity amplifiers, VHF/FM tuners, pickups and loudspeakers. In 1965, Leak introduced their first transistor amplifier, the Stereo 30. Taken over by Rank Organisation in January 1969. Production soon relocated to the Wharfedale factory in Idle, Yorks (certainly by 1973). Harold J Leak died in 1989. In 2003, the brand is owned by the International Audio Group (Wharfedale, Leak, Quad).

Lec Refrigeration Ltd, Bognor Regis, Sussex (in 1958). Maker of refigerators (still going in 2002).

Lectrona. Brand name for loudspeakers made by Acoustic Products Ltd, Stonefield Way, Victoria Road, South Ruislip, Middx (in 1952). At 50-58 Britannia Walk, City Road, London, N1 (in 1948 & 50). Believed to be a subsidiary of Murphy Radio Ltd (W.World, June 1952, p230).

Le Carbone (Great Britain) Ltd, South Street, Portslade, Sussex (in 1964 & 82). UK arm of a French battery maker. Later became SAFT, then Alcatel-Saft. See under SAFT.

Lee Products (Great Britain) Ltd, Elpico House, 90 Great Eastern Street, London, EC2 (in 1950 & 53). In 1955, Lee Products (International) Ltd, Elpico Works, Olive Road, Hove, 3 – Imperial AM/FM table radiogram and Impresario tape recorder. In 1957, a range of "Elpico" branded valves and CRTs were introduced – Lee Products (Great Britain) Ltd, Elpico House, Longford Street, London, NW1 (still there in 1961). In 1958, a range of Italian made radios, tape recorders and FM tuners was introduced under the "Geloso" brand. Also in 1958, they were advertising Elpico car radio aerials. In 1962, sole UK distributor for "General" transistor radios (from Japan). In 1962, Lee Products (Great Britain) Ltd, 10-18 Clifton Street, London, EC2. Maker of "Elpico" branded tape recorders, radios, amplifiers, etc. For a time up to 1970, they were the UK distributor of Hitachi products. Founded by Gordon S Lee.

Leevers-Rich Ltd, in 1952. Taken over by Mining and Chemical Products Ltd (MCP), in 1971. In 1964 & 71, Leevers-Rich Equipment Ltd, 319 Trinity Road, Wandsworth, London, SW18. By 1976, it incorporated Bias Electronics. Maker of studio audio recording equipment and bulk tape erasers.

Leisure. Brand used for stainless steel sinks and cookers. It was originally established in 1925 as a small motor agents and repair business in Long Eaton , derbyshire. In 1926, this became Watts & Co (Long Eaton) Ltd (or is it Wallis & Co.?). Later, circa 1930, the company diversified into stainless steel sinks (an American idea new to the UK).In 1954, the company was bought by Allied Ironfounders and in 1955, commenced trading as Leisure Kitchen Equipment. In 1969, Allied Ironfounders was bought by Glynwed and in the following year, Leisure also became involved in gas appliances. Later on, the business was merged with Flavel of Leamington, to form Flavel-Leisure. In 2002, Glynwed sold the (Leisure Consumer Products) Flavel and Leisure non-range cooker brands to Beko UK Ltd (subsidiary of the Turkish company). What remained of Leisure was renamed Rangemaster. See also Flavel and Allied Ironfounders entries.

Lektrokit Ltd, see All Power Transformers Ltd.

LEMCO. The London Electrical Manufacturing Company Ltd, 462 Fulham Road, London, SW10 (in 1946 – but also active at least during WW2) – also at: Hillingdon Estate, Glasgow, in 1946. At 459 Fulham Road, Hammersmith, London, SW6 (in 1948 and 1968). The 1964 "Trader" yearbook shows: Bridge Place, Parsons Green Lane, London, SW6 (also in Wireless World ad in 1965). In 1967 & 72, Beavor Lane, Hammersmith. Manufacturer/supplier of capacitors (mainly silvered mica types but also ceramic, plastic film

and electrolytic) in the 1940's & 60s. In 1967, the company was bought by Transitron Electronic Corporation of Wakefield, Massachusetts, USA. Around the same time, Lemco closed a factory in SW London, to concentrate activities at Beavor Lane, London, W6. Lemco continued to operate as a wholly owned subsidiary of Transitron. What happened after this?

LEMO – connectors (Swiss company?).

Leo Computers Ltd, Minerva Road, Park Royal, London, NW10 (in 1958). "Lyons Electronic Office". Established in 1949?? A subsidiary of J Lyons & Co Ltd (Lyons coffee shops, cakes and tea). In 1963, the firm merged with English Electric data processing division, to form English Electric-Leo Computers Ltd.

Levell Electronics, Park Road, High Barnett, Herts (in 1962 and 1970). Founded by D A Levell? At end-1970, Moxton Street, High Barnett. Maker of low cost test equipment. In the early 1990's they became part of The Advanced Electronic Technologies Group and relocated to Technology House, Mead Lane, Hertford, Herts, SG13 7AW.

Lewis Spring Co Ltd, Studley Road, Redditch, Worcs (in 1965). Maker of transistor mounting slips, washers, etc.

Lexington. Pickup and audio amplifier brand name used by Cooper Manufacturing Ltd, 134 Wardour Street, London, W1 & 17 Hanway Street, London, W1 (in 1946).

Licon Electronics Ltd. A company set up in 1969, by Plessey and ITW (Illinois Tool Works), to make miniature electromechanical switches.

Light Soldering Developments Ltd, 106, George Street, Croydon, Surrey (in 1955). At 28 Sydenham Road, Croydon, in 1959 & 70. In 1975, 97-99 Gloucester Road, Croydon. Maker of soldering irons. "Litesold" & "Adamin" brands.

Lindsey (C S) Ltd, Crown Works, Godman Road, Peckham, London, SE15 (in 1964). Maker of leather and cloth cases for small radios, instruments etc (including supplier to Perdio).

Linear Products Ltd, 5-9 Maude Street, Leeds, 2 (in 1957). In 1958, 1970 and 1982, Electron Works, Armley, Leeds. Maker of "Linear" HiFi amplifiers.

Ling-Temco-Vought Corporation. At one time, one of the largest conglomerates. Built up by James Linf of Dallas, Texas, in 1947 as the Ling Electric Company. In 1955, the company went public. It went on to buy L.M. Electronics (1956) and Altec Electronics – HiFi systems and loudspeakers (1959). In 1960 Ling's company merged with Temco Aircraft and bought Chance Vought aerospace. In 1961, the new group was named Ling-Temco-Vought. In 1964, Ling created a holding company and split the business into three separate ones: LTV Aerospace, LTV Ling Altec (see Pye Ling Ltd) and LTV Electrosystems. In 1965, Okonite (wire & cables) was taken over and then, in 1967, the Wilson golfing and sports equipment company. In 1968, Braniff Airways, Jones and Laughlin Steel and National car rental were acquired. In 1970, the company's share price was not doing so well and Ling left. Paul Thayer took over and sold Braniff and Okonite. In 1971, Thayer changed the company name to LTV Corporation. In the 1970s, the company sold off many divisions and ended up as mainly a steel producer. It eventually went bankrupt.

Link Electronics Ltd, Kildare Close, Eastcote, Ruislip, Middlesex (in 1968). At Walworth Ind Est, Andover, Hants, in 1975. In 1980, North Way, Andover. CCTV and Broadcast TV studio equipment, e.g. cameras and test equipment. Later became a UEI company (also Cosworth & Quantel). Effectively closed down by the late 1980's.

Link-Miles, division of The Singer Company (UK) Ltd, Churchill Industrial Estate, Lancing, Sussex (in 1973). UK offshoot of the US Singer company, making flight simulators.

Link Sound & Vision Ltd – formed by Murphy & Pye to provide cable relay of broadcast TV and radio in fringe areas. First one in Gloucester (1950).

Linn Products Ltd, 235 Drakemire Drive, Castlemilk, Strathclyde, Scotland (in 1982). Maker of expensive HiFi turntable and ... Still going in 2002.

Linolite Ltd, 118 Baker Street, London, W1 (works at Mill Works, Malmesbury, Wilts – in 1948 and 1967) – in 1964. Maker of cable clips, light fittings, especially for illuminating paintings, etc. In 2002, a division of SLI – the European buyout of GTE-Sylvania's lighting interests.

Linstead Electronics Ltd, Roslyn Works, Roslyn Road, London, N15 (in 1970-3). In 1965, at 35c Newington Green, London, N16. By 1976, Linstead Manufacturing Co Ltd – same location. Maker of test equipment.

Linton & Hirst Ltd, Stratton St Margaret, Swindon, Wilts (in 1967). Manufacturer of transformer cores, etc. Originally formed by two people in Hoxton Square, London, circa 1945. They relocated to Swindon, from Wealdstone, Harrow in 1962. In 1962, an associate company Redpoint was in operation nearby at Parsonage Road, Stratton, making stripwound transformer cores but later became well known for its semiconductor heatsinks.

Lion TV, 18 Harcourt Terrace, London, SW10 (in 1982). In 1982, makers of the Lion Teletext and Teletext/Prestel adaptors, for TV sets.

Lissen. In the 1920's, Lissen made radio components (including valves), batteries and radio kits. Lissen Ltd, 18-22 Friars Lane, Richmond, Surrey. Also Lissen Ltd, Lissenium Works, Worple Road, Isleworth, Middlesex. For a short period, Lissen was a member of the BVA. It was bought by Ever Ready (GB) Ltd, from its founder T N Cole. In 1944, Lissen Ltd (Ever Ready), Bowman's Place, Holloway, London, N7 (a maker of the wartime utility radio set–manufacturer code U19). See Ever Ready. Lissen Ltd (an Ever Ready subsidiary) was wound up in May 1949.

Littlefuse Inc, 1865 Miner Street, Des Moines, Iowa (in 1955). Also (earlier?) at 4725 No. Ravenswood Avenue, Chicago, Illinois. Maker of fuses. Later taken over by McGraw Edison Co and then Cooper Industries.

Litton Industries Inc. A US multimational company established by Charles Litton. Manufacturer of equipment used in the production of thermionic valves. At one time, Litton owned the Westrex film sound recording system company.

Livingston Laboratories Ltd, 31 Camden Road, London, NW1 (in 1961). Later, at Greycaines Estate, Watford, Herts (in 1966). Probably established by F Livingston Hogg, who was chairman and joint managig director in 1961. Their new HQ (relocated from London in 1966). UK agents for several overseas (mainly US) test equipment manufacturers. They also set up an instrument hire business. In 1967, the original company went into receivership (but the name and assets were bought up). Taken over by the Brammer group in 19?? As at Jan 2004, the Livingston companies were up for sale!

Lloyd (JJ) Instruments Ltd, Brook Avenue, Warsash, Southampton (in 1967 & 73). Maker of decade L, C & R boxes.

Loblite Ltd, Third Avenue, Team Valley, Gateshead-on-Tyne 11 (in 1948 & 64). Manufacturer of "Loblite" light fittings.

Loewe – Loewe Ragio AG, Berlin, Germany. Early manufacturer of radio valves (1920's-) later became Loewe Opta GmbH?

Londex Ltd, 207 Anerley Road, London, SE20 (in 1945 and 1971). Maker of relays. In 1966, also at 42 Croydon Road, London, SE20 and a member of the Elliott-Automation Group. A GEC company by the 1970's.

London Carriers Ltd, Surrey House, Scarbrook Road, Croydon. For many years, the road transport distribution company of Philips. Sold off in the 1990's.

London Electric Wire Co & Smiths Ltd, Church Road, Leyton, London, E10 (in 1965). In 1950, they were laso at 24 Queen Anne's gate, London, SW1 (office?). "Lewcos" insulated wires and strips, "Lewmex" enamelled wires and "Lewosol" solderable enamelled wires. Also "Lewkanex" high temperature winding wires. They had a subsidiary, Printed Circuits Ltd, in 1965. Taken over by AEI in 1959.

London Microphone Co Ltd, 182-4 Campden Hill Road, London, W8. In 1968, a microphone manufacturer (made in the UK).

Long & Hambly Ltd, Empire Works, Slater Street, High Wycombe, Bucks (in 1950). A manufacturer of moulded rubber masks for CRTs (in addition to grommets and other moulded rubber components).

Longlamps Ltd. Produced architectural filament lamps and fluorescent lamps at its Reading and London factories. Taken over by Compagnie des Lampes (a leading French manufacturer) in 1967. Used the "IRIS" brand.

Lorlin. In 1968 & 70, Lorlin Electronic Co Ltd, Billingshurst, Sussex – switch maker. In 2001, Lorlin Switches Ltd, Billingshirst,

Sussex. Manufacturer of electrical power / low power rotary switches and (in the 1970's) electrolytic capacitors. The capacitor division seems to have petered out in the 1980's.

Lowther Manufacturing Co Ltd (The), Lowther House, St Mark's Road, Bromley, Kent (in 1939, 47 and 64). Maker of radiograms, tuners, amplifiers, Lowther-Voight horn speaker and pickups. In 1974, Lowther Acoustics Ltd – same address, but relocated manufacturing to Maidstone, Kent.

LTV Ling Altec Ltd, Baldock Road, Royston, Herts (in 1969). Maker of variable frequency ac power supplies. Previously Pye-Ling? Prior to that (in 1958) Altec-Lancing Corporation – UK sales by Soundrite Ltd, 83 New Bond Street, London.

Lucas. Joseph Lucas (Electrical) Ltd, Great King Street, Birmingham B19. Founded circa 1875? (acc to p26iii-iv, of 1946 "Electrical Engineer's Ref Book"). Although best known for the manufacture of electrical components and batteries for the car and vehicle industry, Lucas also made semiconductors in the 1960's and 70's, some of which, mainly rectifiers, found their way into consumer electronics. By 1964, they also owned G & E Bradley Ltd. In 1971, the company was known as Joseph Lucas (Industries) Ltd. Lucas were also involved with the Centralab product range (including a factory in N. Ireland). The electronics division was, in 1972, located at Joseph Lucas (Electrical) Ltd, Electronics Products Group, Mere Green Road, Sutton Coldfield, Warwickshire – they were also UK distributors for Centralab and their own products. By the 1980's, Lucas had diversified into aerospace. Lucas merged with the US company Varity, in the mid-90's and was taken over fairly soon after, by TRW (USA).

Lugton & Co Ltd, Radio House, 209-212 Tottenham Court Road, London, W1 (in 1954 & 64). TV, radio, electrical wholesaler. Established in 1901.

Lustraphone Ltd. 84 Belsize Lane, London, NW3 (in 1948). In 1957 & 65, St Georges Works, Regent's Park Road, London, NW1. In 1974, Lustraphone HiFi Ltd, Unit 2, Browells Lane, Feltham, Middx. Microphones and audio amplifiers,

Luxram Electric Ltd, 72, Great Eastern Street, London, EC2 (in 1964). Distributor of Luxram and Corona branded lamps and a manufacturer of lamp making equipment. In addition, there was an associated company, also (from 1965) controlled by Philps – Luxram Lamp Works Ltd, which manufactured lamps.

Lydiate Ash Laboratories, Lydiate Ash, Nr Bromsgrove, Worcs (in 1947). Maker of oscilloscope(s).

Lymelite Ltd. Formed in 1948, with a factory at Newcastle-under-Lyme, Staffs (hence the name). Manufacturer of fluorescent lamps.

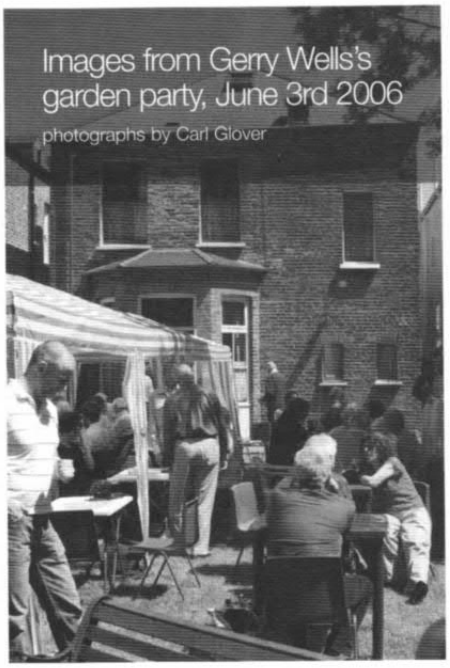
Lyons (Claude) Ltd, Valley Works, Hoddesdon, Herts (in 1969). Maker of "Regulac" variable voltage transformers since 1934.

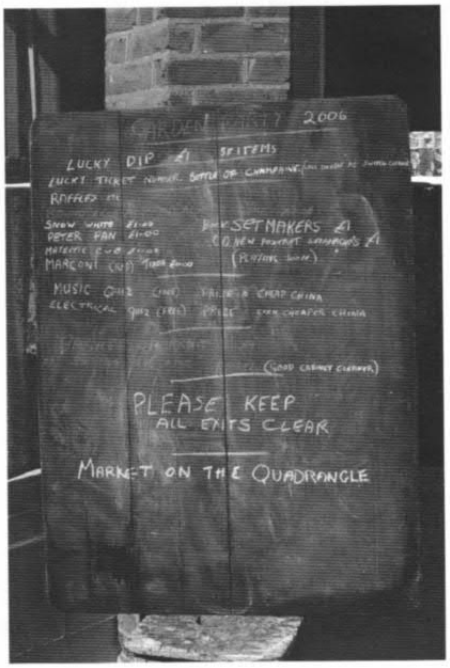
Lyons Instruments Ltd, a Claude Lyons company, Hoddesdon, Herts (in 1968 and 1971). Maker and distributor of test equipment.

Lystan. In 1937, the brand name of Lystan Products Ltd, Lytham (Lancs?). Produced a valve tester, safety plug adaptors and suppressor safety plugs. In the same year, the brand and products were acquired by Telsen Electric Co (1935) Ltd, Fitzgeorge Street, Rochdale Road, Manchester 9.

Images from Gerry Wells's garden party, June 3rd 2006

photographs by Carl Glover





Eurovision, the beginnings of global television continued from page 21

This huge engineering challenge was organised by a technical committee under the chairmanship of M. J. L Pulling of the BBC. The network, which ran to 4000 miles of radio circuits, extended from Belfast to Rome with branches out to Copenhagen and Berlin. It utilised 44 transmitters, around 8 relay stations and 4 standards converters. One of the most spectacular links was the one that connected the German and Italian TV systems and became a permanent part of the Swiss national network. It carried the TV signals across the Alps. It ran from Chasseral 5,000ft up in the Jura range of northern Switzerland through a relay station 60 miles away and located at 12,000ft on the Jungfraujoch and on to the summit of Monte Genereso near Lake Lugano in southern Switzerland. Made in Britain it formed part of the £2m worth of British equipment supplied to the Eurovision network.

With all the technical and engineering problems to solve, the last thing anyone needed was some form of industrial action but seven weeks before the scheduled start date the International Federation of Musicians, Actors and Variety Artistes delivered a bombshell. It resolved at a conference in Paris that 'all organisations affiliated to them and having agreements beyond June 15th and that all organisation having no such agreements should boycott all international relays until the 3 federations had reached an agreement with the EBU'. It was not until February 1957 that agreement was reached and so in April 1954 many of the participating services' scheduled programmes had to be scrapped and new plans made. This meant that sport was going to play the major part over the next two and half years until a permanent agreement could be reached. For those interested, the deal which was agreed on 1st February was a supplementary fee of 50% if three countries are involved in a relay to 150% if for 8 or more. When one thinks of the large events like the Royal Weddings, then the musicians and singers involved, these days on a global basis, have a great deal to thank those negotiators for.

Returning to June 1954, the month of international television kicked off in the afternoon with the Fetes de Narcisses at Montreux provided by Swiss TV switching to Italy in the evening for a visit to Vatican City where the Pope spoke in 5 languages and delivered the apostolic blessing. People here in the UK sat by their fireplaces on a wet Whit Sunday and watched the beginnings of what was hoped would become regular programming on an international scale. People on the continent became much more interested in the medium and the sale of receivers showed a marked increase even before the month of relays was over. The UK's main contribution was broadcast on the 12th June and included scenes of the Queen reviewing RNVR on Horse Guards Parade and the Glasgow Police Sports Day and the Richmond Horse Show. The restrictions placed on programme makers by the lack of an agreement with the artists organisations was obviously reflected in the overall choice of items and to a great degree this bias would remain despite the eventual agreement reached in 1957. It effectively forced the broadcaster to only consider events outside the studio and thus placed a greater emphasis on sporting events, in the first three years around 66%.

Following the success of this first major week of programming, the BBC had to withdraw from the Eurovision Network. I have not been able to find out why but with hindsight, it may have had something to do with the imminent arrival of ITV but that is only conjecture. In any event the Corporation did not rejoin until September in the following year. By that time the first section of a permanent two way link between London and the continent was complete. The cross channel link moved to the GPO centre at Tolsford Hill along with the standards conversion equipment which by now had become quite sophisticated.

Things really started moving in the New Year of 1956. Italian TV undertook the massive task of covering the Winter Olympics from Cortina in which every Eurovision country participated. This was followed in April by the live coverage of the wedding of Prince Rainier and Grace Kelly. Despite the problems with artistes and musicians 1956 also saw the first successful Eurovision song contest which is the only regular programme from those early days which still claims a place in the schedules.

New Year's Eve 1957 was chosen as the date for the transmission of the first single programme to which several countries would contribute under the control of a single director. The thought of co-ordinating 10 live sources from 10 different countries is almost beyond comprehension but the unanimous choice by the EBU of the BBC's Francis Essex was fully justified. He kept in touch with everyone on the night via an omnibus talkback circuit and, in addition to the complicated split-second switching at 11 switching centres hundreds of miles apart, a split screen effect was achieved where a small boy in Brussels was seen apparently lighting the announcer's cigarette in London.

On the technical side the events of July 14th 1958 also take a bit of beating. RTF fed the Eurovision network from 2 pick up points, one in the South of France, the other a TV programme from Algiers some 800km away on the other side of the Mediterranean. The link was made by equipping an aircraft as a relay station flying at 10,000ft circling the Balearic Islands off the coast of Spain. It was the first occasion when the Eurovision Network had been provided with a programme from another continent. Staying with RTF, it's interesting to see from the photographs the way in which the art department solved the problem of providing a three dimensional way to combine the Eurovision logo with RTF's and other broadcasters' logos. Today of course computer graphics would solve that problem.

Soviet Russia and its satellite states established its version of the Eurovision Service under the name Intervision at around this time and the two networks began to bring the people of Western and Eastern Europe a little closer at a time when the Cold War was at its height.

1960 saw 18 European countries linked together for the transmission of picture from the Olympic Games in Rome. It was the biggest network link up yet and included 4 countries from the East European Block, plus Finland and Yugoslavia.

A year later and Eurovision was carrying live pictures of Yuri Gagarin's arrival in Moscow following his epic journey in space. The celebrations were televised live from the Airport and Red Square to the viewers in Britain. The BBC swiftly followed this carrying another direct relay from Red Square – the May Day parade.

The network grew and developed and by 1967 the entire geostationary satellite of Intelstat was used for the programme 'Our World.' This was repeated on an even larger scale in 1971 with the programme 'Children of the World.' The Soviet equivalent to Eurovision, Intervision, signed with international news agencies to enable more material to be injected into the Network and through satellite links Eurovision was extended to other continents. In 1970 an EBU Television News Co-ordination Bureau opened in New York and a year or so later Latin America was linked in. Since 1974 the Arab States Broadcasting Union, ASBU, was also linked on a regular basis and three years later with the launch of the EVN, Eurovision News, satellite the Asia Pacific Broadcasting Union along with the ASBU allowing all these continents to link to the daily Eurovision news exchanges. By 1983 over 1200 news items were being carried by the network.

The collapse of the Berlin Wall in 1989 brought the broadcasters of Eastern Europe into much closer contact with the West and by 1993 Eurovision and Intervision merged. With the close links developed over the previous 30 years it should be viewed as one of the great successes of collaboration between Eastern and Western Europe during the Cold War.

Today we take for granted the high quality news, special events and sporting coverage we see on our screens. Those early monochrome pictures from France are a far cry from the technically sophisticated ones we see today. The faltering connections which must at times have worried Ralph Barrett and his colleagues have been replaced by a stable network which is being constantly updated and refined. I wonder whether Ralph and his colleagues had any idea of just how significant their efforts first in Calais and then Lille would prove to be.

In addition to thanking Ralph I'd also like to thank Armi Heikkinen and Françoise Davies of the Communications Service of the European Broadcasting Union for their help in providing examples of the Eurovision logo and Brian Flowers for checking some of the details in the article. For those interested in visiting the website of the EBU go to www.ebu.ch/en/ for the English language version and click on 'History'. There is a brief resume of the service and also the opportunity of watching two video sequences. The rest of the website shows just how sophisticated the service is today.

Letters

Dear Editor

Follow up to Crystal Triode Wireless

Firstly let me thank those who responded, either in these pages or by E mail, after the publication of the above article in the Winter 2005 Bulletin. Antony Wedgewood was kind enough to supply me with a copy of the early Radio Constructor article on which his own set was based and which I had missed. A few others referred to their own late fifties construction efforts with early RF transistors, kits of parts and "white spot" surplus devices. Surely a topic in its own right.

In the penultimate section of my original piece I had referred to the difficulty of reproducing the modified Bettridge circuit with different 2N110 transistors. I subsequently obtained more of these devices and set about a series of further tests which I referred to in the article also. In the Mark 2 receiver only one transistor gave any sort of detection in the first stage, but weaker than in my original reproduction radio. The remaining six devices didn't want to play any radio frequency games at all.

I have now examined several "enthusiast" point contact radio circuits from this period. They are like the Bettridge circuit but without the " feedback capacitor" or have included a variable base resistor or a variable supply from a potentiometer. They also have no proper deliberate bias in the emitter circuit and rely on so called auto bias. I have tried a few of these and cannot get them to work with the 2N110. Either I am overlooking something very fundamental, have extremely bad luck or the 2N110's available now (although old stock) are substantially different beasts to the GET 1 and OC51. This is possible. The composition of the collector whisker when the current pulse "forms" the point will determine the extent of the buried fourth layer that is produced in the crystal. A point transistor made like this is what the Americans in the fifties referred to as a "hook" transistor and is responsible for the negative resistance effects and other "funnies". A further consideration is that these 2N110's may be rejects rather than surplus. Like Clive Sinclair's M.A.T's they may be out of spec. but may work in some circuits.

I thought I would have a final go and decided that one problem was that the detector needed some proper bias current. This would overcome one source of variability, the variable leakage current through the crystal in so called auto bias mode since the applied bias would now swamp it. I have come up with an "improved point contact radio circuit" in an attempt to get the most out of the 2N110. It is a bit like a John Scott Taggart circuit of the twenties in that almost everthing that can be variable has been made variable. Seriously though it has one extra variable (preset) over the original and this is helpful.

This circuit works with four out of the seven remaining 2N110's while all of them seem to work in the audio stage. It is also more stable than the original. In one case it is slightly more sensitive but you will still need to turn your hearing aid up. The capacitor C in Tr1 emitter is not needed with all transistors but if too large will cause squegging, ie oscillating at several frequencies. The procedure briefly is to set the voltage on the detector so that it just oscillates with the bias control around mid setting and the neutralizing capacitor about a quarter open, then back off the bias slightly and optimise with the two capacitors. There are some hand capacity effects at the point of maximum sensitivity. Treat this circuit with respect. Like any regen.set it can cause interference and a point contact RF stage is not an option unless you are a masochist!

Henry Irwin

Dear Editor

Re: A brief resumé of British (and several overseas) finished goods & component manufacturers part 8 by Dave Hazell

In Dave Hazell's review list of companies number 8 he posed the question under the name Hunts on page 38, about their continuing manufacture of Power Factor capacitors and what happened to them.

Hunts did indeed continue as makers of power factor correction capacitors for the lighting industry and were bulk suppliers to Thorn group. I was development manager for ballasts for the Osram–GEC group and our main supplies of such capacitors came, by the mid 1970s, from BICC Ltd. The impregnant used was a Polychlorinated Biphenyl Oil (PCB). This material was difficult to handle and use and was also the subject of health and contamination problems. Monsanto were the worldwide suppliers of this impregnant under the trade name Arochlor.

Less expensive capacitors, but of a lower standard of performance and temperature range, were made using a petroleum jelly or a wax impregnant and were widely used. Hunts were one of the major sources of this type; there were other makers. There was always a market for cheaper lighting fittings and the control gear (ballasts) were the main cost. Some of our competitors omitted the power factor capacitors entirely from the lower wattage luminaries. Hunts made these capacitors mainly at Wrexham (they subsequently closed Addington) and in very large numbers, some tens of thousands per week. They were doing their best to sell us capacitors, but to no avail.

Hunts were also making small wax impregnated radio capacitors but these gained a poor reputation in the radio industry due to premature failure. BICC Ltd then took over Bryce Capacitors at Plymouth who at the time were making rather specialised capacitors only for large industrial plants. Hunts, I remember made water cooled capacitors used in large industrial plants such as the inverters for the Power link to France. I dealt with both Bryce and Hunts for capacitors at high voltage (5kV being typical) required for the photoprinting industry, also a highly specialised design.

The BICC Ltd bought Hunts and closed them down. They physically scrapped the impregnation plant at Hunts to stop any competitor from buying the then almost new plant. I believe that BICC continued to use the Hunts name on some of the specialised products for a while.

I left the lighting industry in 1981 and I do not know the industry from then onwards. But at that time BICC had become one of the dominant makers of power factor capacitors by buying up first Bryce and then Hunts. All–plastic power factor capacitors were, by then, in vogue in the lighting industry and these did not use any impregnant if I remember correctly.

Dave also mentioned ITT Components Group Europe Ltd at Paignton. They also manufactured power factor capacitors for lighting and in bulk but I believe we as GEC were in effect almost their only customer. They could never make the promised quantities we required, in excess of 10,000 per week. They were regarded however as good quality. Lighting was a mass production large numbers business in the main.

I hope some of these recollections may be of help.

Yours Sincerely
Peter D Parker

Dear Editor

Ageing Membership and the 'Wow Factor'!

The ageing membership of the BVWS has concerned me for some time. Just look around at any Harpenden and take a guess at the average age?

We need to attract new members and particularly some less than 50. Unless we get a younger generation coming along, then I fear many nice radios (and televisions) will return to sheds, garages or even worse! The lessening number of 'oldies' simply won't be able to absorb all the current collections.

As much as I enjoy them, could we not refrain from Christmas DVD's and other seasonal gifts and use this money for an advertising budget?

A friend asked me how do you get to hear about the Society? You can't pick up a Bulletin at a Newsagent's, as you can for classic cars or motorbikes. Most of us already had an interest (we listened to the 'wireless' as kids or worked in electronics) and heard about the BVWS through word of mouth or the Internet. There must be people to whom radio and even early television did not figure large in their upbringing. But the same can be said about steam trains and yet they have become popular. Maybe with advertising and getting some public outlets for Bulletins then dormant interest can tapped.

I don't know what current electronics magazines there are, there is very little UK electronics industry left, so perhaps advertising in computer magazines and quality newspapers would be an alternative. I'm sure our Editor could come up with some eye-catching ads with 'youth appeal'.

As to the Wow Factor it seems certain that Catalin and the ever-popular Bakelite Ekco models won't go back in the shed. How then to save some of the others and broaden their appeal to the collecting public, who seem largely oblivious to the charms of old radios.

Recently I had some friends round and showed off a restored large cathedral. They were impressed with the cabinet and sound but I actually got a "Wow" when I turned the radio around. Inside were lots of glowing valves, in re-plated cans along with polished and matt lacquered coil screens etc. The beauty of the chassis obviously made an impression and if that had been the purpose, could have helped find the radio a new home. So maybe one way to save some of the more technically interesting but less pretty radios is to do the best possible

job in restoring them. This means a cabinet in good enough order to grace a lady's sideboard and the insides done to 'show off' a little. In the US they refinish some of the chassis to custom car standard but I'm not suggesting that. Also, those sets that are in museum quality condition should of course be left exactly as they are, along with the specialist items from the dawn of radio.

Gary Tempest

Dear Editor,

I was interested in Peter Carlton's description of his visit to A.P. and Dick Howett's piece about the Science Museum (Spring 2006 Bulletin). In particular, both comment upon the lack of archive material offered for sale on DVD.

Following a visit to the Museum of Film, Photography and TV in Bradford (also part of the Science Museum) a few years ago, I made similar comments to John Trenouth. Much depends upon copyright and demand.

Some years ago a few members of the 405-Alive group did succeed in persuading the BBC to part with some archive newsreel, demonstration and interlude film material on VHS – at a price! Most was fragmented – even missing the sound track in places. I did manage to piece together most of the 50's version of the Demonstration Film as I remembered it. However, that was originally broadcast on weekdays between 10.00 and 12.00, alternating every fifteen minutes with the test card while the filmed announcement by Sylvia Peters that "there now follows fifteen minutes of Test Card 'C'" was missing.

I'm unsure as to who should be approached at the BBC (perhaps BBC Enterprises) but if sufficient members were willing to participate, it might be worth making enquiries about further acquiring vintage material for private use.

A few months ago Home Choice Video (www.Choicesdirect.com) were selling a limited edition DVD set to celebrate 60 years since Muffin the Mule was first broadcast: product reference 674405 (DVD reference MAVD048). This is the original film material and should not be confused with a recent animated version. DD Home Entertainment (www.ddhe.co.uk) have also marketed several old TV series such as The Army Game, The Saint and Robin Hood.

A few US 1950's TV series which appeared on British TV (e.g. The Burns & Allen Show, The Jack Benny Program and The Dick Van Dyke Show) have recently been repeated on the Open Access channels (Sky channels 883 & 173). It is worth regularly scrutinising their sparse schedules for any gems.

Baird's film archive (intermediate film system) was destroyed in the Crystal Palace fire while, before the war, 'telerecording' had not evolved. Most of the surviving material was promotional film produced especially for cinema newsreels etc. The only attempt at the off-screen filming of a TV play – The Scarlet Pimpernel – incurred the wrath of Alexander Korder who insisted upon its public burning!

Some items have surfaced, including a piece of film showing freak (Sporadic E) reception in the USA of part of a 1938 transmission from Alexandra Palace. It is worth contacting the Alexandra Palace TV Society (www.apts.org.uk) for a list of some items in their archive although I doubt they're available to copy.

At an early age I was virtually abandoned in front of a pre-War Ultra T22. Probably around 1949/50 I remember watching a film which gave me nightmares - it was broadcast on Ch.4 again a few years ago, starred Todd Slaughter and was called A Face At The Window. Bearing in mind this was a 'horror' film I wonder why the BBC broadcast it in the afternoon? But I was probably the only 'child' viewer!

I, too, would love to accumulate more material since it is quite at home on old working TV's.

Yours sincerely,
Malcolm Burrell

Dear Editor

I am desperately trying to find a radio made by Smiths in the 1920s, which I believe was sold to an Italian dealer at the NVCF in October 2005.

H. Smith was an electrical engineer in Weymouth in the 1920s, whose company produced three-valve radios using their GPO registration number 2093. This number suggests that the prototype, or an early production run, was a two-valver - but no two-valve Smith radios are known to have survived.

The radio, shown in the photograph, is very similar in many ways to Smith's sloping front model and was sold as a Smith two-valve radio at NVCF in 2005. If so, it may possibly be the missing link and as such could be vitally important in the socio-economic scene in South Dorset. (See also my article in the Bulletin for Winter 2004: South Dorset Wireless makers in the 1920s.)

If any collector or dealer (possibly Italian) recognises this set, and knows of its

whereabouts, I would be incredibly pleased to know about it. Please note - I am not trying to get it back to UK. What is important is the fact that it exists, and can be included in a register of such old products.

In case of a positive result, kindly contact me at john@jrose2.wanadoo.co.uk. and I will be overjoyed!

Yours sincerely
John Rose

Dear Editor,

I have just received the latest issue of the Bulletin and note with interest the pictures of the Audiojumble from earlier this year, in particular the one indicating that a valve testing service was on offer.

Those of us with an interest in valve equipment have on occasions a need for a valve tester, but the cost of such equipment is way out of the reach of many of us, and the days when a visit to the local repair shop and have a valve tested for maybe 3d or 6d are long gone.

However, it occured to me that perhaps such a service could be provided by the Society for a fee at events.

I realise that a tester may have to be purchased and someone qualified to operate it together with suitable transport. However the availability of this service may provide an additional incentive for members to attend, to the advantage of the Society as a whole.

Yours sincerely
DM Wallace

Dear Editor,

May I say thanks to the wonderful series by John Holloway on the 'Unofficial history of broadcast television' – part 6, of which appeared in the Summer issue of The Bulletin.

A small error appeared in the copy, which may be of help. Mention was made of the 1958 ATV series 'The Larkins'. This was not, in fact related to the later HE Bates dramatizations featuring a family of nearly the same name.

The 'original' 'Larkins' was a half–hour comedy series that was transmitted on Saturday nights and featured Peggy Mount and David Kossoff as Ada Larkins and Alf Larkins respectively. Peggy played the part of Ada Larkins admirably – as a loudmouth battleaxe, ruling over her henpecked husband, son, lodger and most of her neighbours in the street.

It was a part she literally fell into, after playing a similar role as 'Emma Hornett' in the 1956 film 'Sailor Beware'.

A subsequent full–length feature film spin–off of the series called 'Inn for Trouble' was made shortly afterwards. If anyone has any copies of this old series, I would be interested to hear.

Yours sincerely
Steve Knowles

Dear Editor,

I have found the series of articles "an unofficial history of broadcast television" to be excellant and informative. However in part 6 I am not sure that information on the early days of colour is quite accurate; either this or I have misunderstood what John Holloway is trying to tell us.
He says that following the 1962 White Paper, the encouragement to develop colour television transmissions meant the BBC started colour tests on 625 from Crystal Palace in November 1962. I could be wrong, but I don't think these tests started as early as that, given that BBC 2 didn't go on the air until April 1964. Certainly from then they were radiating colour test slides and films both morning and afternoon, as I worked for RCA and we used these transmissions to test the receivers that had been converted from 525 NTSC to 625 NTSC. By summer 1965 the BBC were testing 625 PAL, which became the standard for the UK. John correctly states that a limited colour service started with Wimbledon in July 1967 and some documentaries and "late night line-up" were in colour, but the BBC were short of colour cameras and colour VTRs, which limited their output. I appologise if I have misunderstood, but I think it is important to set the record straight.

Yours sincerely
Graham Dawson.

The life and times of Studio 'S'

by Dicky Howett

Revealing the secret engineering log books of BBC Televsion (Southampton).

Recently I acquired a small set of BBC Television engineering logs written by BBC staff over short periods between 1986 and 1987. In this instance the logs refer to the BBC's Southampton studio centre called with faultless BBC logic, Studio 'S'. As a rule, BBC engineering logs were used to chart the day-to-day progress (or lack of) concerning such technical trivia as loose cables, blown cue bulbs and indeed blown entire cameras!

Studio 'S' was (and probably still is) the studio whence emanated such regional BBCtv delights as 'South Today'. These BBC engineering logs (usually confidential-but not here chums) make interesting, pithy and occasionally arcane reading. Written by anonymous engineers, (they know who they are) the technical logs present an invaluable guide (where legible) of daily broadcast television engineering practices, plus trials and indeed many tribulations.

To set the scene, during the 1980s, Studio 'S' was a humble BBC television regional outpost, equipped with a hand-me-down collection of recalcitrant colour kit, incorporating four sturdy examples of that much-admired camera, the EMI 2001 known throughout the BBC as the 'cameraman's camera' . However, as these logs graphically illustrate, by the end of the 1980s any residual love for the 2001 camera had completely ebbed away. The reasons for this (and more) are recorded thus...

STUDIO 'S' ENGINEERING LOG.
(Abridged for intelligibility)

26/8/86.
CAM 2 Ghosting. Cable to viewfinder is faulty. CAM 1 Zoom control is not centralised ie; is more sensitive one way than the other. Also tends to creep..

29/8/86.
CAM 4 Soft again this morning-are focus volts drifting? At lunchtime however the camera is now meshing. To cure meshing I re-adjusted focus to optimum and re-registered. Now OK.

4/9/86.
CAM 3 'Hooking' slightly at top of picture. It occurs on all cameras but is worse for CAM 3

8/9/86.
CAM 1. Ring on Y channel. Found yolk earth strap not connected to yolk.

15/9/86.
CAM 1. Viewfinder low brightness. Swapped with MAINT spare. CAM 1. Altho CAM 1 greyscales ok, on monitor it looks yellower than 2&3.

17/9/86.
ALL CAMERAS. An amazing increase in resolution and sensitivity achieved by cleaning the Autocue screens!

18/9/86.
PEDS. Tilt locks on 1 & 3 need tightening. Also pan lock on 2

19/9/86
CAM 3. 100Hz-ish pickup, mostly on Red, but slightly on other channels. Not visible with fully mod pix, so they are using it for now...

23/9/86.
ALL COLOUR MONITORS. Colour balance appalling!

30/9/86.
CAM 2. Excessive ringing on Green channel. Changed head amp. This improved matters.

CAM 1. Green tube. Small hole visible at low light levels.

2/10/86.
CAM 1. Green tube rejected for softness. Replaced with new tube. Okay. CAM 1. Luminance meshing. Started off slight, increased dramatically, but eventually put right.

3/10/86.
CAM 2. Lens pack PSU S/C blowing main fuses.

8/10/86.
CAM 2. Nasty slash on Y channel. Cured by tightening earth tag on tube o/p. CAM 1. Flashing during TX. (transmission)

9/10/86.
CAMS 1, 2 & 3. All cameras have had ringing and noisy channels.

13/10/86.
TUBE CONDITIONER TURNED ON FOR TEN HOURS. Adjusted alignment of CAM 4. A little improvement.

29/10/86.
CAM 1. V/f has bogey top left. To be investigated.

30/10/86.
CAM 2. Slightly soft v/f. Duff peaking control. Replaced. CAM 4. Soft due to duff zoom tracking.

6/11/86.
CAM 2. Zoom sticking.

10/11/86.
CAM2. Pedestal cable clamp shattered. ("It came off in my hand, guv..") Quite..

23/11/86.
CAM 1. Meshing badly. Tweaked alignment so that meshing now matches that of CAM 2.

24/11/86.
Slide file slides (production) mechanically bust. Screw loose. Had my attention and sympathy. Now OK. Signed (DMB). (another hand had added "God help it!)

12/1/87.
CAM 1. Ped gassed up.

20/1/87.
CAM 2. Zoom tracking control changed due to existing one being bent Also, crap cleaned off front element of lens.

11/2/87.
CAM 1. Pan lock handle came loose and then came off in spigot which disappeared into its hole, with only a small bit showing. Tried unsuccessfully during line-up to retrieve spigot. Cameraman was happy to have no locking facility so left until tomorrow.

12/2/87.
CAM 1. Retrieved spigot from hole! Took front plate off pan/tilt head. Replaced locking handle and now OK. CAM 2. Taken upstairs for major surgery. Block replaced with lovingly cleaned spare. Re-aligned, registered etc. No improvement noticeable. Bad ringing on all colour channels.

13/2/87.
CAM 2. Earth missing on Blue tube. Put in new earth tag and this cured ringing on all colour channels. Increased patch size. Checked beam align, focus. Still no vast improvement. Changed lens between CAM 1 & CAM 2. CAM 1. Creeping zoom. Adjusted pot. Now OK.

23/2/87.
CAM 2 & 3. Both found with matrix out. CAM 2. Blue flashing fixed.

24/2/87.
CAM 1. Very bad line rate shading on Red channel.

25/2/87.
CAM 1. (09.00) Shading on Red channel caused by viewfinder. Changed for spare. CAM 1. (14.00). Camera died completely. Caused by new viewfinder.

4/3/97.
(18.45). All cameras looking naff. CAMS 1 & 2 not matching in colour. CAM 3 set up.

6/3/87.
CAM 1. Gassed up. ALL CAMS. Yes, they do need a CCU line-up.

18/3/96.
CAM 4. Was seen to lose frame lock. Investigated but nothing concrete found.

23/3/87.
CAM 3. Pan & Tilt head locks need attention.

27/3/87.
CAM 4. Grey scale. Magenta cast now. Corrected. Gamma Laws don't match. Needs a CCU line-up. CAM 3. Hair-like object in top RH corner.

1/4/87.
CAM 1. April Fools Day!!. Out for shading corrector mod. CAM 2. Field blanking not working. Traced fault back to shading corrector. Also failure on pulse board of field blanking o/p. Consistent line flashing possibly from camera end rather than CCU. Luminance yolk may have been jogged. Pictures softer than normal.

13/4/87.
CAM 2. (17.15ish) Viewfinder replaced with spare in an effort to reduce ringing on all channels. CAM 2. (18.30). Replacement viewfinder causing breakthrough on picture with smells of burning. Replaced with original viewfinder but this also failed to work.

2/8/87.
CAM 1. Picture fluttering as last week (but not too serious).

As the writer of the log indicates ironically, however bad things may seem, the day is never completely lost with BBC Engineering on hand to sort things. Regional television always had to make do with 'roll-in' cameras and second-hand kit, so the ground-rules were laid well in advance.

By the mid-1980s, the BBC's main electronic production cameras were the Link 110 & 125 and on obs, the ubiquitous Philips LDK5. The staunch EMI 2001 soldiered on in various BBC backwaters, but by the end of the decade, the cameras' end was very much in sight. (It had originally been installed at TV Centre Studio 8 in 1967 so its design life of ten years or so was well into extra time). Finally, however, the BBC kept the camera running at one major production centre, Studio 'C' at Elstree. In July 1991 the EMI 2001 was scrapped after it had recorded 'EastEnders'. And it showed.

Minutes

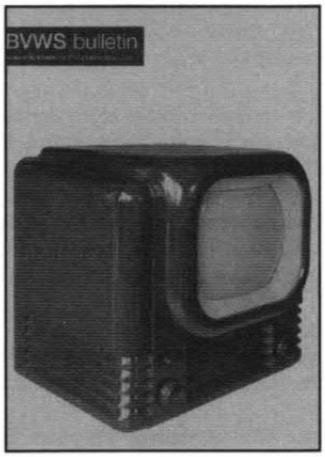
Minutes of BVWS Committee meeting held on Thursday 11th May 2006 on the conference telephone starting at 7.30 pm.

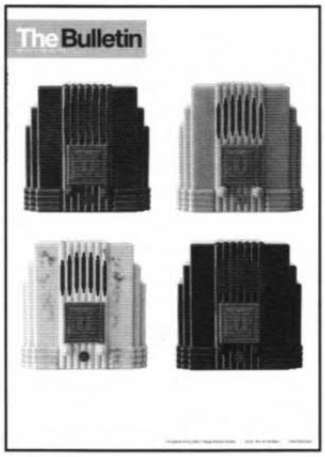
Present: Mike Barker (chair), Graham Terry, Ian Higginbottom, Carl Glover, Guy Peskett, Paul Stenning, Terry Martini, Jeremy Day, Jon Evans, Martyn Bennett.

1. Apologies for absence: none (all present).
2. The minutes of the meeting held on 16th February 2006 were not circulated (due, it was discovered later, to rejection of the circulation email by the list server). Were later accepted as a true record.
3. The Membership Secretary, GT, reported that the membership stood at 1602 leaving 104 yet to renew.
4. The Treasurer, JD, reported a satisfactory state of affairs with the Society's account balances standing at £38,196 (deposit) and £1,262 (current).
5. The Bulletin Editor, CG, reported that the summer Bulletin was full and that the Autumn issue was about one third assembled. He reminded the Committee that he will be away in Japan during July and August.
6. The content of the DVD for Christmas 2006 was discussed. TM listed a number of sources with no copyright problems and proposed that a mixed program be put together from them. He offered to show some of the material to the Committee at the Garden Party which was warmly received. He also emphasised the need to be ready earlier this year so that last minute hitches in production, such as occurred last time, would have less impact. TM and JE will discuss production at the June Harpenden meeting. The question of obtaining the rights to issue the BBC-Mullard film "Discovery of Television" which has not been seen since the 1960's was discussed. MB reported that BBC Heritage had been unhelpful. It was suggested that a letter be sent to the Chairman of Governors (Michael Grade) asking that either the film be shown or the Society be authorised to distribute it to members.
7. The Chairman reported general satisfaction with the new venue for the NVCF on the part of both stallholders and visitors. Given also that the costs of the last two events have been covered he was able to recommend that the summer fair be held next year. This was agreed. The first task is to set a suitable date given the three other major events (Drayton Manor, Dunstable Downs, and the French show) that occur around the same time. GP will contact the organisers of the French and Dunstable Downs event.
8. Garden party, it was suggested that some live music be put on, MB to arrange.
9. AOB (i) The chairman apologised to TM for some unfortunate wording in the last set of published minutes.
(ii) It was suggested that some copies of Gerry's portrait and new postcards be produced for the Museum.
(iii) MB suggested that Committee members look into using Skype, this would greatly reduce the cost of holding meetings using the telephone conference facility (which itself had proved very successful).
(iv) MB proposed that new membership badges be produced, slightly larger than previous patterns and bearing the legend "30 years" be produced. This was agreed.
(v) The idea of extracts from "The man in the white suit" being put into next year's Christmas DVD was discussed.
(vi) MB reported that a proposed Bakelite display at the October Harpenden would no longer take place, but would be re-arranged in 2007. An alternative display with a theme of 'Recording' would now take place instead.

The next meeting will be held at 13 Warneford Road Oxford on 21 July

The meeting closed at 21.16





Back issues

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Vol 11 Numbers 1, 2, 3, 4 Inc. BTH VR3 (1924) receiver, Marconi's 1897 tests, Origin of the term 'Radio', Baird or Jenkins first with TV?

Vol 12 Numbers 1, 2, 3, 4 Inc. the Emor Globe, The Fultograph, Ekco Coloured Cabinets.

Vol 13 Numbers 1, 2, 3 Inc. Direct action tuning, The Philips 2514, Noctovision.

Vol 14 Numbers 1, 2, 3, 4 Inc. Cable broadcasting in the 1930's, The story of the Screen Grid.

Vol 15 Numbers 2, 3, 4 Inc. The wartime Civilian Receiver, Coherers in action, Vintage Vision.

Vol 16 Numbers 1, 2, 3, 4 Inc. The Stenode, The Philips 2511, Inside the Round Ekcos.

Vol 17 Numbers 1, 3, 4, 5, 6 Inc. Wattless Mains Droppers, The First Philips set, Receiver Techniques.

Vol 18 Numbers 3, 4, 5 Inc. The First Transistor radio, The AVO Valve tester, The way it was.

Vol 19 Numbers 1, 2, 3, 4, 5, 6 Inc. The Birth of the Transistor, Super Inductance and all that, reflex circuits, A Murphy Radio display, restoration.

Vol 20 Numbers 1, 2, 4, 5, 6 Inc. Radio Instruments Ltd., Japanese shirt pocket radios, Philco 'peoples set', notes on piano-keys, the story of Pilot Radio, the Ever Ready company from the inside, the Cambridge international, the AWA Radiolette, this Murphy tunes itself!

Vol 21 Numbers 1, 2, 3, 4 Inc. Marconi in postcards, the Defiant M900, GPO registration No.s, Personal portables, the transmission of time signals by wireless, the Ekco A23, historic equipment from the early marine era, the birth pains of radio, inside the BM20, plastics, Ferdinand Braun, pioneer of wireless telegraphy, that was the weekend that was, the first bakelite radios, BVWS - the first five years, the world of cathedrals, Pam 710.

Vol 22 Numbers 1, 2, 3, 4 Inc. Another AD65 story, the Marconiphone P20B & P17B, listening in, communication with wires, the story of Sudbury radio supply, French collection, Zenith Trans-oceanics, Farnham show, Alba's baby, the first Murphy television receiver, AJS receivers, Fellows magneto Company, Ekco RS3, Black Propaganda.

Vol 23 Numbers 1, 2, 3, 4 Inc. Sonora Sonorette, Bush SUG3, RNAS Transmitter type 52b, North American 'Woodies', Why collect catalin, Pilot Little Maestro, Theremin or Electronde, The Radio Communication Company, Early FM receivers, an odd Melody Maker, Black propaganda.

Vol 24 Numbers 1, 2, 3, 4 Inc. The Superhet for beginners, Triode valves in radio receivers, History of GEC and the Marconi - Osram valve, KB FB10, Great Scotts!, Riders manuals.

Vol 25 Numbers 1, 2, 3, 4 Inc. Repair of an Aerodyne 302, Henry Jackson, pioneer of Wireless communication at sea, Zenith 500 series, Confessions of a wireless fiend, RGD B2351, John Bailey 1938 Alexandra palace and the BBC, Ekco during the phoney war, Repairing a BTH loudspeaker, The portable radio in British life.

Vol 26 Numbers 1, 2 Inc. How green was your Ekco?, The Amplion Dragon, Crystal gazing, The BVWS at the NEC, Installing aerials and earths, novelty radios, Machine-age Ekco stands of the 1930s, Volksempfänger; myth & reality.

Supplements:

1 'The story of Burndept'.
2 'WW 1927 data sheet'
3 'Seeing by wireless' the story of Baird Television
4 Reproduction Marconi catalogue

Earlier Bulletins and supplements are priced at £2:00 each + postage. Bulletins from volume 21 onwards are priced at £2.50 each. + postage.

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Cheques to be made payable to 'The Vintage Wireless Museum'.

News and Meetings

GPO registration Numbers
Martyn Bennett has the role of custodian of the BVWS list of GPO Registration Numbers. As many members will know the project of assembling this list was started in the early days of the BVWS and, more recently, has been enthusiastically carried on by 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.

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2006 meetings
1st October Swapmeet at Harpenden
15th October Southborough. Please note, this will be the last of the Southborough swapmeets.
22nd October Workshop at British Vintage Wireless and Television Museum
22nd October Radiophile *Exposition* at Cowbit
3rd December Wootton Bassett
13th December Heinrich Hertz – Sparks that Changed the World Presentation by Ralph Barrett at The Institute of Physics, 76 Portland Place, London W1N 3DH. Starts 6pm, open to non–members, tickets not required.

2007 meetings
11th February Audiojumble at the Angel Centre, Tonbridge
4th March AGM and Auction at Harpenden
3rd June Swapmeet at Harpenden
15th April West of England Vintage Wireless fair
29th April NVCF at Warwickshire Exhibition Centre
1st July Wootton Bassett
2nd September Audiojumble at the Angel Centre, Tonbridge
30th September Swapmeet at Harpenden
2nd December Wootton Bassett

2008 meetings
NVCF (date to be announced) at Warwickshire Exhibition Centre
6th July, 7th December Wootton Bassett

Workshops, Vintage Wireless Museum:
For location and phone see advert in Bulletin. 11:00 start.

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
West of England Vintage Wireless Fair:
Willand Village Hall (J27/M5). Doors open 10:30.
Contact Barrie Phillips, 01392 860529
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, 01793 536040
Southborough: The Victoria Hall, London Road.
Southborough, A21, Kent. Doors open 10:30.
Contact John Howes, 01892 540022 (between 8 and 9PM Only please)

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

A BURNDEPT NO. IV WIRELESS RECEIVER, NO. 1383; WITH MATCHING BURNDEPT TUNER, NO. B2000, CIRCA 1926.
Sold for £2,400 in May 2006

Auction
7 November 2006

Consign by
5 September

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