"JOURNAL OF THE CONSTRUCTORS CLUB"

Hot Iron

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Contents

The Walford Electronics website is also at www.walfordelectronics.co.uk

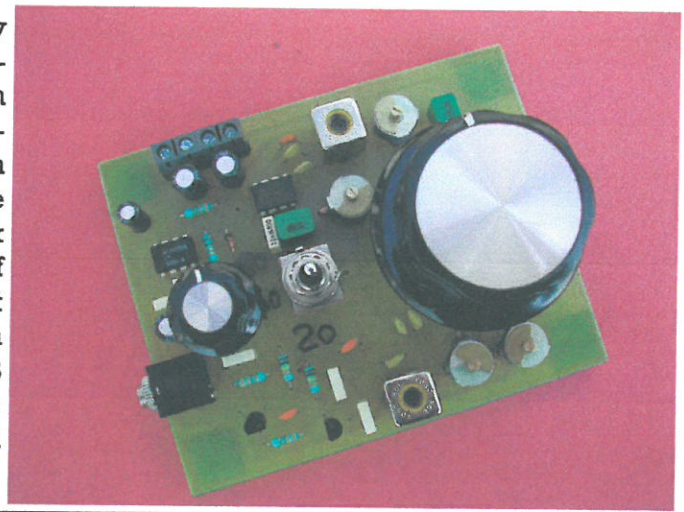
Editorial

As I forewarned last time, I was rather occupied with other things during the last 6 weeks, so firstly my apologies for this late issue of Hot Iron. We were actually away in New Zealand and Australia for most of the time attending an agricultural Conference and doing farm visits and tours - we got back just on a week ago. They are both staggeringly beautiful countries and we had a most excellent time - everybody is so positive and helpful too! Suspecting that many of you may also have an interest in elderly machinery (apart from radio etc), I plan a little colour supplement to this issue taken from the 500+ photos that I took! My apologies to those who don't share these interests and I promise a bit more radio related topics next time!

One can only marvel at how modern electronics makes life so much easier now. We must have flown about 35,000 miles on 10 flights with only one slight hitch (due to a failed weather radar on an incoming plane). Even a few years ago, one would not easily contemplate such a complex and tight itinery involving six countries and four airlines. Where would we be without modern aircraft flight control systems and mobile phones etc? All of this has its origins in the very early radio systems described later in this issue - in view of its importance I make no apology for devoting 3 sides to it - especially as I didn't have to type it!. Tim

Kit Developments

I have now taken the 'busy' sign off my website and Notch and Audio kits are now available from stock. I have also written up the Notch (and peaking) filter up for PW which should appear after Christmas. Although these have been designed primarily for the Minster they can be used with other rigs as well. While away I took the opportunity to contemplate the structure of my range of kits and have decided that I must press on very quickly with the Minster and then get stuck into some simpler projects - like the 3 band Willet RX on the right! One that also appeals to me is a 2 or 3 band phasing single sideband CW rig. More on that later! Tim G3PCJ



Hot Iron is a quarterly subscription newsletter for members of the Construction Club. Membership costs £7 per year with the first issue for each year appearing in September. Those people joining later in the year will be sent the earlier issues for that year. Membership is open to all and articles or questions or comments or notes about any aspect of electronics—principally on amateur radio related topics– is very welcome. Notes on member's experience building their own gear, from kits or otherwise is most interesting to other constructors. To keep it interesting, your thoughts and ideas are required please! For membership, I only need your name and address and subscription. Send it or any other suggestions to Tim Walford, Walford Electronics, Upton Bridge Farm, Long Sutton, Langport, Somerset TA10 9NJ © G3PCJ

Pulling Ceramic Resonators Higher in Frequency – David Brewerton M0EZP

You've built your simple rig based on a ceramic resonator VFO but then you think "if only I could pull the band spread HF a bit, I'd be able to join in that net!" Here's something to consider...

Ceramic Resonators are stable, small, and inexpensive but have a 0.5% tolerance in their resonant frequency. You might also have more stray capacitance in to the circuit than expected, so your band spread might be different to intended (probably lower in frequency). Remembering that adding capacitance lowers the frequency of a tuned circuit, you can adjust your band spread LF by adding more capacitance. However, if you want to adjust your band spread HF you might be stuck because you might not be have any capacitance you can get rid of (remember your tuning/ trimming capacitors are adding 30-50pF at minimum). An interesting characteristic of Ceramic Resonators is that when they are connected in parallel, they have a higher resonant frequency than either of them connected on their own.

In my tests using 3.69 MHz resonators, remembering each will vary in frequency slightly, this is what I got in the Sutton:-

1 resonator on its own = max 3680 kHz with a -70 kHz span
2 resonators in parallel = max 3735 kHz with a -68 kHz span
3 resonators in parallel = max 3755 kHz with a -61 kHz span

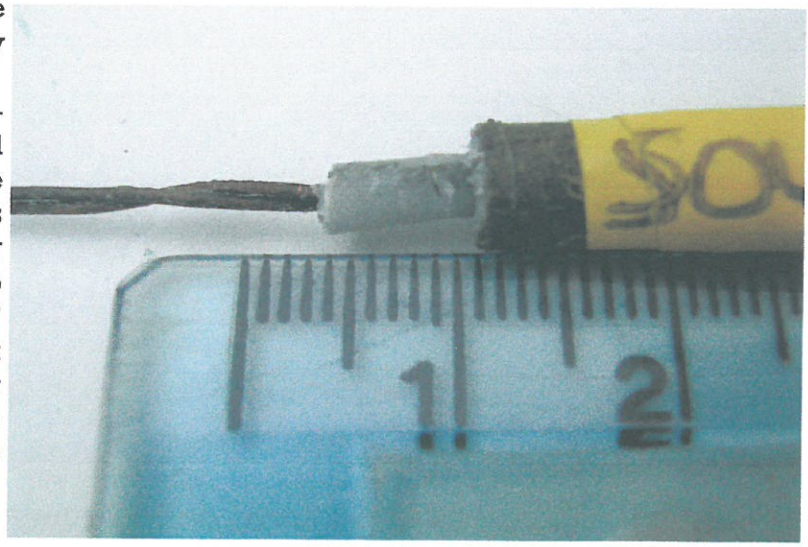
As you add more resonators in parallel it appears there is a law of diminishing returns in the increment to the resonant frequency and in their frequency span before oscillation stops. In my Sutton transceiver, I originally tried using a panel switch to connect in the 3 resonators in parallel but found that the wiring associated with it added much capacitance and the max frequency was around 3730. So to reduce the capacitance, I now use a small plug-in board with 2 x 3.69 resonators on it which connects in parallel with the existing 3.69 resonator and my max frequency is now 3755 kHz!

With thanks to Jack Ponton's (GM0RWU) article on Parallel Ceramic Resonators http://eweb.chemeng.ed.ac.uk/jack/radio/projects/resonator.html

It is also widely suggested that resonators can be pulled slightly HF by adding series inductance - try a few micro-henries. Never tried it myself so cannot be more definitive! Tim G3PCJ

The aerial feeder conundrum!

Nobody has yet offered any explanation for the single core RF cable (with two plain twisted wires) that we have unearthed at my friend's war time dug-out. Further excavation has now revealed that the original dug-out was just a single 'room' accessed by lifting up the whole seat box of his garden privy. The concealed radio room, which is next door to the original room, was evidently added later in the war when the radio equipment was added. This is thought to have included at least a 17 set and probably a TRD set. A buried duct for the aerial feeders has been found but no known examples of the TRD set have been found as they were all 'put beyond further use' at the end of the war. A mock-up of the TRD has recently been made but very few details are known.



This radio installation undoubtedly had a twisted twin core balanced feeder connected to one vertical dipole hung in the nearby trees; but how was the other single conductor RF feeder (shown right) used? There appears to have been a second vertical 'dipole' several wavelengths from the first but no suggestion of any operation other than the low VHF band around 50 MHz - so what was its purpose? Someone please help us solve this puzzle! Tim

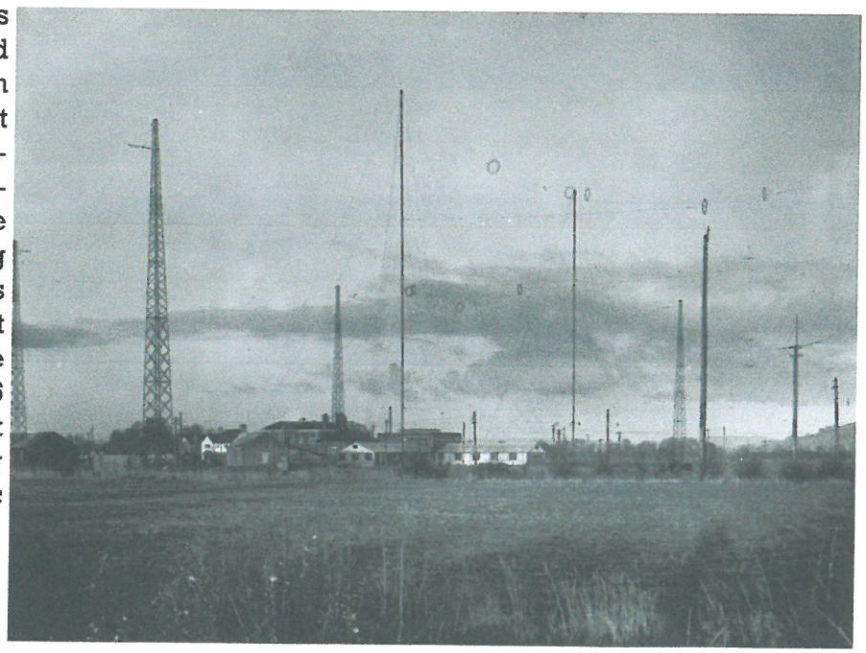
The Story of Portishead Radio - Long Range Maritime Radio 1920 - 2000

Broadcasting to ships had been taking place since the early days of radio; the General Post Office (GPO) long wave stations at Poldhu and Caernarfon had been conducting two way traffic with ships within a few hundred miles of the United Kingdom prior to the First World War. However, no long range system existed until 1919 when the GPO and the Marconi Wireless Telegraph Company agreed to convert a redundant Imperial Wireless Chain receiving station at Devizes in Wiltshire for long range maritime use. Comprising a receiver and a 6 kilowatt valve transmitter, station GKT was opened for service early in 1920, with a guaranteed range of 1,500 miles. The radio officers at GKT were housed in old army huts, with radio telegrams being sent to and received from ships up to 5 days from any British port at the rate of 11d (just less than 5p) per word. Radio traffic was keyed to and from the London Central Telegraph office from the operating station.

This two way "long range" service proved to be immensely popular, and by 1924 it became necessary to expand the station at Devizes to cope with the increased demand. The GPO constructed a second long wave transmitter and built a new receiving station at Highbridge (near Burnham-on-Sea) in Somerset, to which most of the radio officers transferred. Ex Station Manager Don Mulholland recalls: "The old building was originally a bungalow, and it housed an engineer, handyman, kitchen, writing room and the office of the OC. In addition it had very large long wave receivers, some nine feet in length (guessing). The receiving positions operated on 143 Kc/s, answering and calling frequency, and on working frequencies of 121 and 129 Kc/s. As you can see they were extremely long waves. 143 was GKU (the familiar name of the station to R/O's). I worked long wave from wing C in the first half of the 50's but was done away with then. In the heyday it was only large liners who had long waves. Other ships did a QSP on MF to the liners. This system was also used when short wave was introduced. Eventually short wave tests were conducted. I think it was with the Esperance Bay on a trip to Adelaide.

As a result of the success the bungalow had a top floor put on and PEY was built in 1928. Operating on 8, 12 and 16 Kc/s, with call signs GKL GKG and GKS, and working calls of GKN (I think) GKF and GKJ. The familiar name of the station was then GKL. It was Nick Carter (the OC previous to me) who thought up the more recent set of call signs GKA GKB GKC etc. So it was mainly LF downstairs with HF upstairs. GKL had a four poster rotating device operated from inside the station (upstairs). As a kid I operated it, as a ship was tuned in, so it was rotated for the best signal. At the same time a similar contraption at Portishead was rotated - a simple dipole with reflector. By 1926, experiments on short wavelengths had established that world-wide communication could take place. The GPO installed the first maritime short wave transmitter at Devizes, keyed by operators with receiving equipment at Highbridge that same year. Initials tests proved outstandingly successful, and it became necessary to construct a brand new transmitting station. This station was to be located at Portishead, near Bristol, and thus in July 1928 Portishead Radio was born. Three long wave transmitters were installed, followed in 1929 by a new short wave transmitter, ultimately resulting in the closure of the Devizes station.

Throughout the 1930s this long range service expanded greatly, with a gradual decline in the use of the long wave (short range) service, However, new markets were being discovered, including the use of Portishead by the morse code operators on the flying boats, passing traffic from as far as South America and India. The great liners were also making heavy use of this new service, and by 1936 Portishead Radio, now with 4 short wave transmitters, was handling over 3 million words of radio traffic with a staff of 60 radio officers.



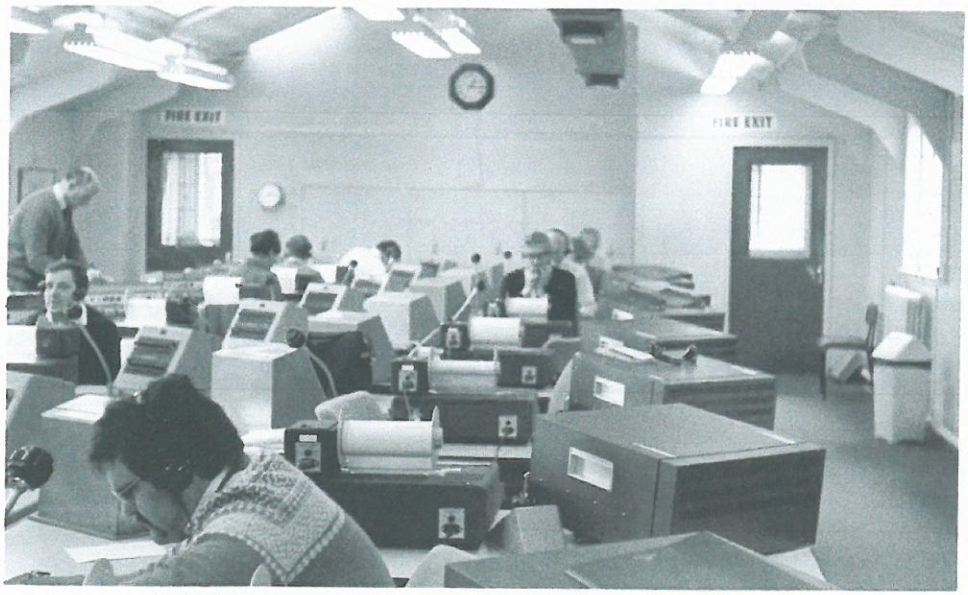
Portishead Radio Contd. Pt2

The war years between 1939 and 1945 saw great changes in the role of Portishead Radio, two way communication with ships changed to a broadcast of traffic without any acknowledgment of receipt. For obvious reasons, transmissions from ships were kept to a minimum so as not to release their positions and destinations. However, distress calls, enemy sighting reports, news of the North Africa landings and clandestine signals from Europe ensured the station was kept busy. Early in 1943, the workload had increased to such levels that Portishead's civilian staff were augmented by naval operators from HMS Flowerdown. Many of the civilian staff were seconded to Government services at home and abroad, not only to man radio stations but to train the many new radio officers needed for convoy work. A special aircraft section was constructed to maintain communications with patrol aircraft in the North Atlantic.

Peacetime brought a return to commercial activities, and with it a vastly increased demand for long range communications. An "area scheme" was established in 1946 to enable British and Colonial registered vessels to use naval stations around the world to relay their traffic to Portishead. 1948 saw the opening of two new operating rooms with 32 operating positions, a broadcasting and landline room, and a central control room with a steel plotting map of the world measuring 36 by 16 feet. A bureau file of both ship and aircraft positions was maintained, and many were plotted with magnetic indicators. During the late 1940s and early 1950s transatlantic liners provided a high volume of traffic, all using radiotelegraphy (morse code) transmissions. The development of the landline telex service enabled customers to deposit and receive traffic directly from Portishead, with high traffic users installing their own private wires. The Suez crisis in 1956 brought high levels of telegraph traffic in both the to-ship and from-ship directions, leading to increased staffing levels towards the end of the decade.

The 1960s saw the station continue to expand, with increased traffic levels and the development of a telex over radio (TOR) system. A press transmission of news was transmitted by morse to enable ships to produce their own news sheets. By 1965, 86 radio officers were handling over 11 million words of traffic per year, and communicating with over 1,000 ships each day. The introduction of the Daily Telegraph transmissions to the QE2 in 1968 by radiotelex was another first for the station. April 1970 saw the transfer of the radiotelephone service from Baldock to Portishead. This necessitated the use of extra transmitters at Rugby and Portishead, and the temporary use of an additional control centre at Somerton (Somerset). Further transmitters at Ongar, Leafield and Dorchester were transferred from the International point-to-point network were brought into service to cater for the increased traffic levels.

The area scheme previously mentioned was terminated in 1972, and with it the Naval presence at Portishead. However, traffic figures continued to rise, with the developing oil market and the deepwater fishing industry all providing work for the station. The leisure market continued to expand, with the early round-the-world yacht races providing valuable publicity for Portishead Radio and its services. By 1974, traffic levels had increased to over 20 million words per year, now handled by 154 radio officers. To-ship traffic was housed in a 'carousel' in call sign order (British and Foreign), and was interrogated by numerous R/Os performing traffic list, WTC (Wireless Telegraphy Control), Circulation and Bureau functions.



Portishead Radio Contd. Pt3

Further expansion of the existing operating area was impossible, so in 1976 work commenced on a purpose-built building to house the various services then available to ships. A new computer based message handling system was installed, and the manual radiotelex service became more popular, resulting in the development of an automatic system. The Portishead transmitting site was closed in 1978 followed by the Dorchester site in 1979, leaving the sites at Leafield and Ongar operating alongside the main transmitting site at Rugby. However, the famous name of Portishead Radio was maintained to provide the maritime community with a familiar and well known service. The advent of satellite communications in the early 1980s had little initial impact, and in 1983 the new control centre was opened, providing new radiotelephone and radiotelegraphy consoles, with automatic radiotelex being installed later that year. Remotely controlled receivers and receiving aerials, located at Somerton, were utilized for all services, resulting in the dismantling of the receiving aerials at Highbridge. The old operating rooms were demolished, creating space for administration offices and stores. Automation of the W/T service by necessity caused a reduction in operational staff numbers, although management (overseer) posts were maintained. 1985 saw the opening of a new aircraft service, providing world-wide "phone patch" and flight information services. This service proved so popular that many land based industries based in remote locations in Africa used the aero frequencies, culminating in the opening of the Gateway service. Relief agencies, military units, embassies, and industries used the service, which acted as a lifeline to those located in countries where normal landline links were poor or non-existent.

By the end of the 1980s, satellite communications were making significant inroads into Portishead's traffic figures. It became clear that a severe rationalization program was necessary in order for the station to remain viable, which resulted in the closure of the transmitter sites at Leafield and Ongar. The number of operating consoles was reduced in line with the decline in radio traffic, and the number of staff employed fell proportionally. In 1995, the 75th year of the UK's Long-Range maritime radio service, BT's Satellite Services opened a Customer Support office at the Highbridge site, staffed by 12 ex-GKA Radio Officers, leaving the terrestrial radio station manned by less than 20. As the station began to die, more staff transferred to the Satellite Services side, and in early 2000 the decision was made to close down Portishead Radio for good.

So it was that on 30th April 2000 Portishead Radio went off the air for the final time. (After a final 24 hours of cross band operation with many lucky amateurs! G3PCJ.) The Satellite Services office however continued to thrive, but in early 2001 BT surprisingly decided to sell the whole Aeronautical and Maritime department to Stratos of Canada, resulting in the closure of the Customer Support Office and the redundancy of the staff. At the time of writing there are no inhabitants at the station - it remains empty and unloved. An ignominious end to what was once a bustling and efficient station. No trace of radio equipment remains - the final aerial mast has gone, the maritime radio display in the reception area has been removed, and all maritime photographs and pictures have disappeared. Only the microwave link tower and the building sign (which still bears the legend 'Portishead Radio Station') serve to remind anyone that a maritime radio station once occupied the site.

The Local Council are now (Dec 2008) trying to establish a suitably active and dynamic exhibition aimed at reminding youngsters and others in the locality of the importance of what used to be a world famous radio operation.

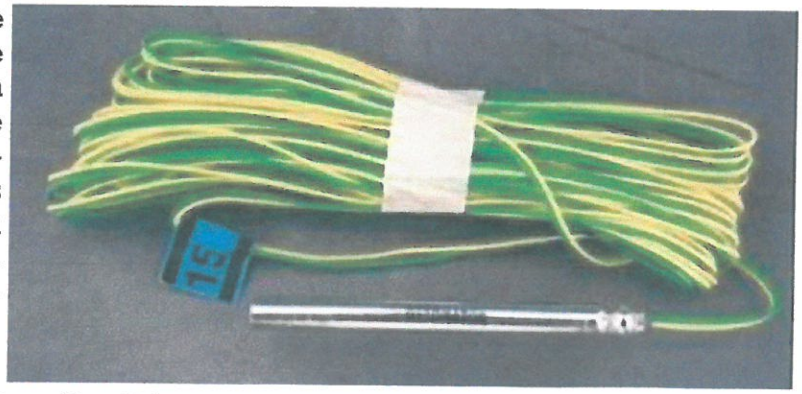
The above most excellent article and photos have been very kindly provided by Larry Bennett G4HLN, and Brian Lea - both late of BT. Larry has also provided me with another article that appeared in the May 1975 Lloyds List about long range maritime comms in the 1970s - if anybody is interested, I will be delighted to forward it by e mail. Tim G3PCJ

The Varnished Detonator – only an Englishman! - Dave Buddery Jnr G3SEP

Whilst at University, I was secretary of the Amateur Radio Club - we had a shack in a wonderful location, on top of the Electrical Engineering Building, about 240 feet up, in central London. It was so far from any residential property that TVI wasn't going to be an issue, those were wonderful times and it was close to the Sunspot Maximum too. There was one drawback to the location. We were close to the outlet of the main college boiler chimney. The college had centralised water heating and needed a massive boiler, which burned fuel oil – this clearly had a considerable sulphur content and there must have been rather a lot of sulphur dioxide in the flue gases. We were lucky enough to have a 35 foot lattice mast bolted to the side of the lift housing and this was topped-off by a HAM M rotator (we WERE VERY EXPOSED at 275 feet of antenna elevation!!), a wide spaced Hy-Gain full size 20 metre beam and a Mosley Elan (if I recall) for 10 and 15 metres. By the end of my second year, these aerials had been up about three years and had not really been looked at since. We were becoming concerned by what we thought was a lack of signal from the Elan and erratic SWR with the Hy-Gain. I, the Chairman and a few of the better end of our little gang decided to take a look for problems, so we borrowed the chain hoist from college maintenance and lowered the mast. When we got it down, we were horrified by the state of the connections to the Hy-Gain and by deterioration of the coax plastic outer cover, partly due to the sulphur and partly by a few years of the sun. There was also very considerable corrosion to the beam elements. I remember us all standing there, covered in soot, hot, tired and a bit sun-burnt (it was midsummer after end of term exams). We decided that the Union Bar was a good place to ruminate on our predicament so we cleaned up best we could and went down there.

As about the third pint went down, I thought of something and said "Did any of you ever read "Slide Rule" by Neville Shute"? One or two of them had and one said "Why, does it relate to our problem?" I replied, "It may, do you remember what they did when the R-100 [she flew to Canada and back and did not crash!] which had been hanging in a big damp shed near the Humber at Howden for over a year, was beginning to show signs of corrosion in its Barnes Wallis designed geodetic spars? They varnished the whole thing and years later just before it was broken up Neville Shute reported it was still in excellent condition as a result. Maybe we could varnish our beams!" There was a stunned silence. Then one of them said "Do you know how to go about it?" "Yes," I said, "I've done a few boats in my time." We had another beer or so (!) and figured out what sort of varnish, when, what who, how, how much etc etc. Things were looking up! A week later it was ALL DONE and the beams were back up, new coax and all. The Hy-Gain SWR problem was fixed and on 10 metres in particular, the band sounded a lot livelier. The aerials looked wonderful, gleaming in the sunshine. I recall the Head of Electrical Engineering, Professor Brown, asking me later how they seemed to look so shiny and he was smiled when I told him what we had done! He hadn't come across that before and he was a keen antenna man.

Many, too many moons later, I found myself "somewhere in Asia" troubleshooting the reason(s) for a 5% misfire rate on an explosives energy source survey. 5% is far too high, it ought never go over 2%. The incumbents had been at it for a while but to no avail with our advice going to them by e-mail. Finally, they swallowed pride and asked for a visit from one of the London technical hit squad (i.e. yours truly). The "misfire" was of the "no-fire" variety. The explosive (some 20 metres underground) in a back-filled but "wet" hole, below the water table, was failing to detonate. One problem was that sometimes the charges were in the hole for 4 to 6 weeks. It was unavoidable given the nature of the work. I'm not going into detail about why we were sure it was not related to the explosive itself, it has no bearing on this story. It had to be the detonator. Anyway, I arrived out there and looked at the electric detonators in use, which were of the generic type found in that line of exploration anywhere in the world (like that right). I was aware that the work was going on in a very heavily farmed and irrigated area. I asked a few questions about the chemical content of the groundwater.



The Varnished Detonator Contd.

No-one present on the operation knew but one of the local advisers who was attached to the project said they would know at the hydrology department of the Local Government Office in a town about 20 miles away. So we booked an appointment and went to see them. Sufficient English was spoken at the level of Government Officer that we were meeting with and they produced analyses of various groundwater locations throughout the area. One thing was clear – it had a high Nitrate concentration due to the leaching out of fertiliser. The light came on – the Nitrates were corroding the aluminium tube of the detonator! I didn't say anything at the time, but let the meeting go on to its conclusion. There was no need to hurry in front of these rather charming folk, so I invited them to Supper. After Supper, we bade them goodnight and our small group minus the officers adjourned to the bar of our hotel (the officers 'didn't drink' – say no more).

In the bar, I told our guys what I thought and why, talking about my experiences with the aluminium aerials at University. I suggested we got hold of some blank detonator tubes as a matter of urgency, drilled a test hole in the camp, cased it with plastic casing to keep it open and lowered maybe 10 of them threaded on a plastic cord with a non-electrolytic weight to take it down. Incredibly we had all this done within 72 hours. I asked them to let me go back to London and return 3 weeks later. They were to leave the detonator shells ALONE in the hole while I was away. I was closely quizzed about why and explained that I thought it would take the low concentration of nitrates (in chemical terms) a while to attack the aluminium and after all it was the charges which had been in the ground for 4 to 6 weeks which had the problems. If we saw corrosion then we would try varnishing the detonator shells (or rather, the manufacturer would have to do it – it was ruled too dangerous for us to do it ourselves – wrongly so, I thought but never mind).

I went home and came back out to Asia 3 weeks later as planned. That afternoon we pulled the plastic cord out of the test hole and the detonator shells looked like lace work. Now we knew for sure – and my suggestion to varnish the detonator shells was taken up immediately. We flew up to see the detonator manufacturers, taking the corroded shells with us. The next batch of detonators were varnished and we persuaded them to do a rush job on 1000 detonators for ready use. Within the next month, it was clear our problems were over; the misfire rate was below 1%. Neville Shute plus an obscure corner of amateur radio experience had gone to the rescue! The varnished detonator for exploration use in irrigated farming areas is now a standard product from the manufacturer in question.

NB you can check on the R100 spar varnishing story in "Slide Rule." It's there! OR go to Google – type in 'R100 varnish corrosion' and see what comes up in Wikipedia.

In a separate e mail Dave comments *'The area was hypersensitive as one side of the block boundary was the international border and it was a sensitive one. We were warned not to take cameras and we had to hide GPS receivers in our luggage. We had the border marked on the GPS in memory. A local driver got me stuck twice in one afternoon out on an area of mud/sand flats which were a bit soft in places. It was about 120 F and 105% humid. After the second time, I drove and we got stuck no more. I kept driving until we got back on to hard ground then I let him drive again! I had a personal army bodyguard at all times outside the protected camp. He was armed with an M16 and I was a bit of a hit because I used to go down to his mess with him and eat their food which I thought was a lot better than the stuff they gave us!'* G3PCJ

VFO Stability?

One of our regular contributors has sent along this photo of a most important element in stabilising his simple ceramic resonator based VFOs! Who is he?! G3PCJ

The Brendon with linear, or on 15m! - David Rowlands G6UEB

Whilst I was waiting for my Brendon to arrive I built a miniature DSB transceiver based on ideas in SPRAT. Once my Brendon kit arrived, I duly set to on the construction of it. I managed to get a maximum of almost 2 watts out however I've backed off the potentiometers to give a max 1.5 Watts into a dummy load.

I had an 80 m Ramsey linear that I'd picked up on Ebay some time ago so decided to build the two units into one case. The case is from Maplins cat # N81AL. To fit the Brendon into the case, I had to turn the connector blocks around. I also had to be mindful of all of the earthed components most of which are on the opposite side of the circuit board from the block connectors. With solder both on top and under the PCB great care was needed to ensure that when finished the PCB would slide into the case. It really IS a tight fit, but I have done it with care. The Ramsey board after a slight trim was an excellent fit – the on/off switch on that linear was removed and replaced with a wire link. Another wire link was removed and made way for a rear-panel mounted toggle switch. The other toggle switch turns the Brendon on and off. Both Brendon and its built-in linear can be used separately as I have provided the Brendon with a separate RF output socket. The linear can therefore also be used with a small 80m AM transmitter that I have. To use the linear with the Brendon, connection is made as if to an external transmitter/transceiver. Both the linear and the Brendon are powered through the linear's power socket.

Before I fitted the TX low pass filter into my Brendon I substituted a RD16HHFI for the IRF510 PA stage and found that the set was able to transmit on 15 metres. The output power was the same as usual and with this transistor the Brendon would work up to 10 metres judging by the data sheet. With the sunspot peak coming around again this might be worth considering. Meanwhile now I've built it I need to get a few contacts on my completed Brendon! I shall be interested to know how others have got on with this set especially when running it "barefoot" on 1.5 Watts.

Comment from G3PCJ. The driver and output stages of the Brendon's TX are not really intended to run seriously above 80m so I am somewhat surprised that David had this success on 15/10m with this higher speed power MOSFET that is used in some CB rigs! It is the output stage of my 6m Chirnside AM TCVR that is in development. It was David's note introduced me to this useful device. Tim

The Fifth Somerset Supper!

Next year the 25th Yeovil QRP Convention takes place on Sunday April 26th 2009. The Fifth **Somerset Supper** is to be held the evening before on April 25th. The format will be a buffet style supper for better discussion of the exhibits etc. It will be at Lower Farm, Kingweston, near Somerton in the Old Court Room. Jane and David Sedgman also do limited B and B/catering. They are 'four star' members of Farmstay UK and will do us proud! David may might be persuaded to show us his large model railway installation. Our guest of honour and judge for our informal radio construction show, will be Rev George Dobbs G3RJV - very well known as the Editor of the Journal of the QRP Club - SPRAT.

Get building your equipment for entry tickets now and make a note in your diaries; places will be limited - the Sedgeman's website can be seen at lowerfarm.net If you wish to stay overnight with them please contact them direct. Tim