"JOURNAL OF THE CONSTRUCTORS CLUB"

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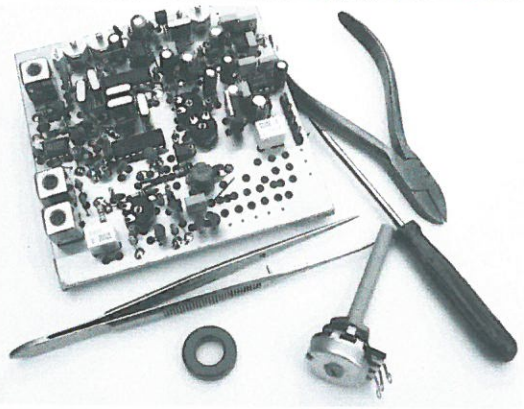
The Walford Electronics web-site is also at www.walfordelectronics.co.uk

Editorial



I am delighted to welcome another contributor of articles for Hot Iron. Dave Buddery Jnr G3SEP is, I am told, one of those very capable CW operators who can copy about three high speed CW signals simultaneously! He is the son of another Hot Iron contributor with the same names who is G3OEP - talk about things running in the family! As you will see, G3SEP was using his amateur radio experience to good effect for his work in the oil industry in the remoter parts of the world.

I am sure there are other Members of the Construction Club who have interesting tales to tell or who can raise topics that will be of interest to readers. We all have our own interests within different parts of the hobby, so please do come forward and pen something. I don't really mind what the topic is as long as its radio related. Don't forget that I am also very glad to have questions or other thought provoking topics raised, on which I will try to obtain a reasonable response! You don't want my musings all the time - I need other contributors please! Tim G3PCJ

Kit Developments

The new Mk 2 Signal Generator is now available and compliments the ABLO. The former is for wide range coverage (200 KHz to 30 MHz) whereas the latter has the emphasis on stability and use as a rig's Local Oscillator. They cost £34 for the Sig Gen and £49 for the ABLO; £3 P & P and both have small optional upright PCB front panels. The all (traditional) band CW rig that I mentioned last time is now called the **Upton**. It uses the new Pylle CW TX, several twin LPF kits, Product Detector and the Audio Amplifier kit, with the ABLO acting as LO. Its quite a large assembly, especially if you add a 5 digit counter! See later! It did not work first time due to grounding problems which has necessitated minor track revisions to a couple of the audio kits. Cured now I think!

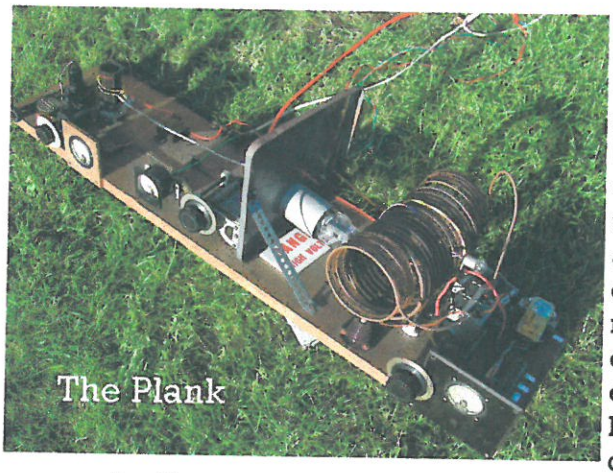
Meanwhile both the **Knole** and the **Knapp** have had to wait because of pressure from other farming type activities; I long also to get started on laying out the Minster but that is a major exercise which needs a clean sweep of many evenings - sadly this is not too likely in the immediate future! In addition, Steve Hartley G0FUW is planning some construction courses and has tried a Brean DSB phone TCVR; but we fear this is too dense for novice constructors - so we might need a new version called the **Brendon** with a small PCB front panel instead! No time to think! 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, [illegible]lectronics, Upton Bridge Farm, Long Sutton, Langport, Somerset TA10 9NJ © G3PCJ

Eric Godfrey G3GC

I am very sad to report that poor Eric died on Mar 15th after various trips to hospital, following falls etc, and other longer term complications. Eric was born in the 1920s and was brought up in West London, showing a very early interest in electronic technology. He obtained an experimental transmitting licence in his teens, about 1936/7, and spent all his working life in the research labs of EMI at Hayes. During the war, he assisted professionally with many military projects. When not working, he was an ARP Warden and also a 'secret listener' for the intelligence services, regularly forwarding CW traffic to his handler. He eventually became EMI's expert on aerial systems and was heavily involved with the early very tall TV transmitter masts.

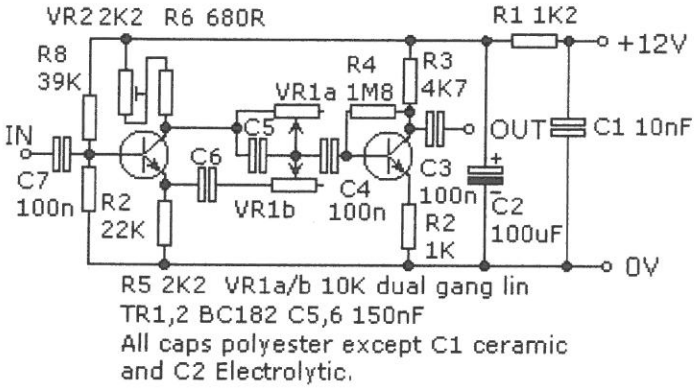
Eric retired in about 1982, moving to Yeovil and joining Yeovil ARC. At that time, YARC had its base right next door to Eric and it was there that I first met him. There was much interest in home construction, and Eric presented a challenge cup for the winner of a Construction Contest, which bears his call and is still presented annually. I recall some consternation when I entered an SSB rig (my first) made entirely in tobacco tins; he was not impressed because it looked a mess but was kind enough to remark on some measly little strips of aluminium acting as knobs on very small Polyvaricons in the RF filter tin! He was very keen to promote both understanding of the technology, and for things to be well made, perform well and be durable. He decided that entries should be left with, examined and evaluated by an external adjudicator, who would then provide a critique on each entry and announce the winner to a Club meeting. He was always a keen CW man and was soon doing the local slow morse transmissions, with talkback and help for struggling students like me! He was able to send immaculate manual CW at different speeds, in sessions straight one after another. He has my only CW contact in his log book - hardly a long or high speed QSO! At about this time, Eric also took on the job of founding Editor of YARC News, which he produced on his BBC computer for over a decade. He was also a keen supporter of the Yeovil QRP Convention; regularly exhibiting and operating his replica 1938 CW TX (see below - crystal oscillator and 807 PA), which I would like to donate to a suitable museum. (Any suggestions?)

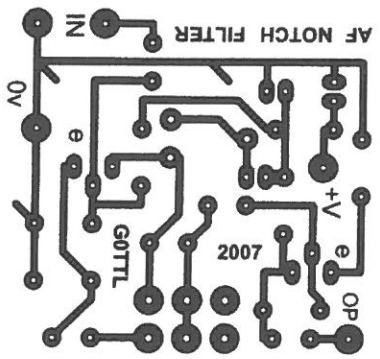

The Plank

When I started designing kits, one of the early projects was the Yeovil CW and SSB 20/80m TCVR; Eric built the Club's version and helped to correct and improve the Manual for it. I have his version of the rig here now and it is a splendid example of how one can, or should build a rig. I used often to get him to evaluate the technical aspects of the instructions for new rigs; and his wife Catherine, would improve my English! He often gave talks to YARC, and other local Clubs, on his main interests – aerials, matching techniques, and CW operation. He organised the YARC RSGB Field Day entry here on the farm in May 1990 - see photo - with Peter G3CQR (now also silent key). He set up a centrally supported half wave dipole for 160m fed by open wire line connected via a KW (E-ZEE) Match to his own Drake TR7, which I now have awaiting a suitable space to set it up properly. I recall that a little amber fluid, as he referred to whisky, helped to keep the station on air into the early hours of the morning! In later years, Eric's health was a little fragile, and he spent considerable periods in hospital. When at home, he continued his regular Saturday morning 'sked', with members of his 'home' radio Club at Edgeware. He will be sadly missed by all those that knew him personally, or for his writings in various journals, including many in Hot Iron; he also leaves a strong and lasting impression on YARC and my own radio activities. Tim Walford G3PCJ

Simple Audio Notch Filter by Richard Booth G0TTL

A tuneable audio notch filter is a useful tool in the battle against interference on the crowded HF bands. This simple project, despite only having two active devices, does a good job of phasing out unwanted audio noises leaving the signal that you are listening to relatively unscathed. It is particularly useful in direct conversion phone receivers.





The audio input is coupled by C7 to the base of TR1 which operates as a phase splitter with two out of phase signals being produced at the collector and emitter. The collector output is applied to the phase shift network comprising of C5 and VR1a whilst at the same time the emitter output is applied to the other phase shift network comprising of C6 and VR1b. At one particular frequency (controlled by the position of VR1) both these signals will undergo the same degree of phase shift. Both phase shift outputs are mixed together at the slider junction of VR1. Therefore the result is, when you have an input signal at the same frequency where the two shifters produce the same phase change that particular input signal is cancelled out to a great degree. All other frequencies are allowed to pass with little or no attenuation. The filter tuning range is 100 Hz up to about 5 KHz. The preset VR2 is used to optimise the filtering null by adjusting the output level at the collector of TR1. TR2 is configured as a buffer amplifier to overcome losses in the filtering process, and also to provide high load impedance for TR1. Output is coupled by C3 which isolates the wanted AF from the dc voltage at the collector of TR2. Although this is an active filter there is no overall gain. R1, C1, 2 are used for power supply decoupling.

Construction is straight forward and you can either build it using my PCB layout or on Veroboard. The dual gang 10K linear pot is available from Maplin - part number JM81C and at just over £1 is not going to break the bank! The audio input is best taken from the wiper of your receiver volume control and I suggest you arrange a double pole switch so that you can switch the filter in and out of circuit as required. Feed the output of the filter back to the audio pre-amplifier of your receiver. Various NPN bipolar transistors were tested in this circuit and most general purpose types worked well. You can use BC108/9 types if available. In theory you should use 5% tolerance or better polyester capacitors for the phase shift capacitors C5 and C6. In practice I had good results with standard 7mm block types but the tolerance is worth bearing in mind.

There is nothing much to adjust other than the preset resistor VR2. Connect the filter in circuit and adjust the preset to its centre position. Arrange some interference from your signal generator if you cannot find anything on air! First of all adjust the main filter tune control VR1 until the best null of the offending heterodyne is obtained. Then carefully optimise this by adjusting the preset VR2. Once set there should be no reason to adjust VR2 again. The small PCB can be mounted by leaving it on the back of the pot when it is fitted to a control panel.

I hope you enjoy building this little project and it proves to be a worthwhile addition to your receiver. As ever I would be most pleased to hear from you.

HF Radio experiences in the oil industry – Aerials in the Wet.

I started work in the oil industry more years ago than I care to remember. By that time, I had been licensed (the old pre-Class A/B etc. licence) for 8 years. After a short spell training in the UK I found myself in the jungles of West Africa, living and working from a houseboat in the river systems of that country. We used HF SSB to keep in touch with the town office, report daily activities etc. The transceiver at our operation (on the houseboat and in town) was an excellent little hybrid American unit made by Stoner. I had not heard of them before and never since, which is a shame because this little transceiver was an excellent piece of kit. It was a true hybrid with a single "quick heat" version of the 6146 in the PA and it ran about 50 watts, crystal controlled, anywhere between 2 and about 24 MHz, if I recall. The antenna when I arrived was a fibreglass helical whip antenna with a screw base, the base bolted to a length of thin wall drill pipe.

It was clear to me that we did not have a good signal and once when in town and listening from the "other end" we were noticeably weak but I left things alone, being the new boy. Things came to a head towards the end of the dry season when the first of the seasonal rains started and we began to have real problems, the town office could hardly hear us. The company knew I was a radio ham and soon the boss said, "Take a look at our set-up and see if you can improve things." The Stoner was producing RF although the SWR was pretty dreadful. I thought the problem lay with the exterior termination, as I found out the antenna had been up in the tropics for over 2 years and the coax never looked at. I got a bit of help and took it down. It was fed with RG58 and no effort had been made to waterproof the top end, nor to make a good earth connection at the feed point. I unsoldered the SO239 plug and there were sizzling noises of water boiling as I unsoldered the braid, then I stripped back a couple of feet of the outer jacket to find that it was heavily corroded. Fortunately we had some spare, dry coax so I re-connected the plug, ran a new length, waterproofed the whole thing with self amalgamating tape and made a decent earth connection between the mounting bracket and the steel pipe with read lead applied to the metal joint after it was tightened (you could still get red lead paint in those days). Firing up the rig again, the SWR was better so I took the top cover off the Stoner and retuned the PA for "maximum smoke". I called town and was rewarded by an immediate reply. The town operator when asked reported better signals and the morning scheduled calls started going through sometimes without repeats, so things were looking up.

Things carried on OK for a bit longer but within a couple of months we had moved (relatively) quite a long way from town (from about 40 Km. to over 100 Km.) and outside the ground wave range (we were using a frequency just HF of 5 MHz and ground wave doesn't do too well up there even in a swampy area). We found it hard to be heard at all during daylight hours but it was OK at dawn and dusk. I had measured up the houseboat and figured that we had enough space for a bottom fed inverted L strung between short poles at each end of the houseboat and fed against the steel hull – the houseboat wasn't not long enough for a dipole and the construction ruled out putting up any kind of mast amidships for an inverted V which would otherwise have just fitted. The boss was irritated at our radio problems so I went to him with the idea. He was receptive and within a twinkling I had the antenna up and running. The SWR was much better than the whip and we could be heard at all times.

By this time we were so far from town that a journey between town and the houseboat was quite a risky undertaking through the river and creek system in our 12 foot aluminium dinghy.

Continued overleaf

Aerials in the wet — continued

The boss had a nasty experience when one of the 2 outboard engines broke down just past the half way point and he arrived back from town after dark, fortunately on a night with enough moon and not fully clouded-over. He asked me if we could rig up the spare transceiver in the dinghy with the whip bolted to the hull now that we were no longer using the whip on the houseboat.

The dinghy (built by Freezer of Mill Rythe Lane, Hayling Island – I spent hours looking at that little maker's plate) - had a tiny aluminium forward deck, very thin and flimsy – it couldn't have been more than 18 SWG, so I made a doubler plate, explained the arrangement to him and got the go ahead. We had to put the radio and microphone in two thick plastic bags as a precaution against tropical deluges (the battery too). But it worked and we all felt a bit safer during those 5 to 6 hour trips.

But this state of affairs resulted in weekend breaks only once ever 4 or 5 weeks, whereas we had usually managed a couple of evenings in town every fortnight when the trip was shorter. So we began a rotational system whereby a certain number of key personnel would stay on the houseboat at weekends and one at a time go to town. When you are stuck out in the middle of an equatorial swamp with not much light relief, a night in town is most welcome. No doubt many of you have read "Animal Farm" and are aware that "all animals are equal but some animals are more equal than others", well, as the new boy I was one of the "others," coupled to which was the fact that I didn't need to go to Lodge meetings, then or now, so I got the short straw.

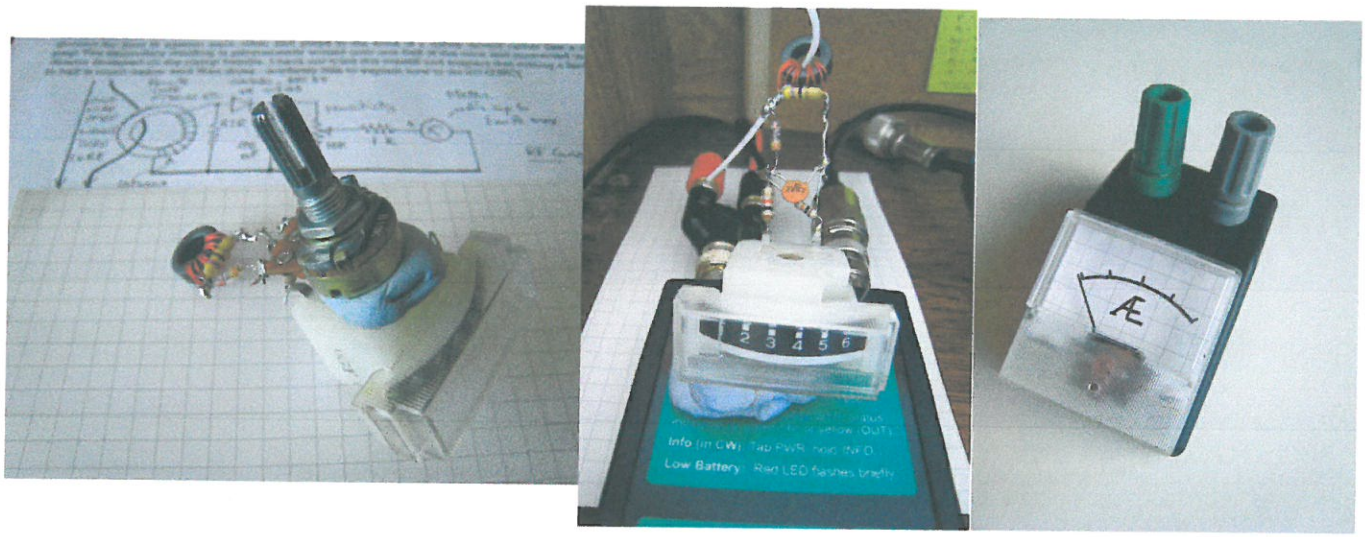
I was stuck out there one weekend, the Sunday finding me working on some equipment in my little workshop. I had a remote speaker in the workshop connected to the Stoner (which was in the manager's office) so that if there was a call, I would hear it and deal with it. I heard a weak call from an unknown but identifiable company operation, so I went to the office and said, "This is Houseboat XYZ, who is calling?" The unknown operation identified themselves and the voice said, "Dave, is that you?" I replied "yes" and then realised I recognised his voice and said, "Is that 'John Smith'", to be answered in the affirmative. It turned out that they were about 700 or 800 miles away in another West African country. We were talking about this and that when the town office, to my surprise, broke in to ask if I was in contact with 'John'. "Of course," I admitted (expecting trouble) and asked "Can't you hear him?" A round robin ensued, during which I established I was the only station in contact with the other two (one up for the inverted 'L' and Ham Radio!) As a result of this 'net' we got some urgently needed spares to John's operation. This cross-border contact was illegal of course, but we didn't get caught, so who cares? In the early 70's, in remote areas, HF radio was the only means of rapid communication and it brought a bit of fun into life out there.

Counter ideas!

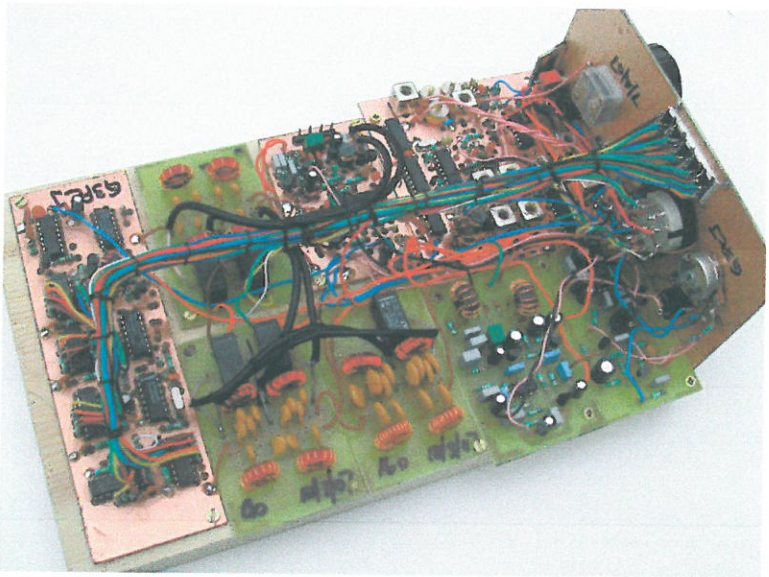
After a few years (actually a couple of decades!) of designing kits, it gets harder to think of something slightly different that looks as though it might be worth developing with a chance of reasonable sales. A digital frequency readout is probably the best 'extra' that can be added to a rig but I have recently sensed that my counter designs are not too price competitive, having originated in the days before micro-processors or PICs became widely available!! The primary objective then, was to avoid the horrible radiation from multi-plexed LEDs that plague receivers in cheap designs! Hence my current designs use dedicated CMOS logic, with very little radiation from the chips themselves, but with many wires to the displays that carry DC, and only change when frequency is altered, so obviating radiation from the wiring. While using a single PIC instead of several chips can reduce the cost of the kit, I don't like the fact that few people will be able to alter, or fully understand the workings of the software - even if I had the inclination to learn the skills for writing the software myself! That approach does little for helping the builder to understand the technology he is using! I need an alternative approach to reduce the cost! Announcing the frequency in CW does not appeal for reasons that maybe deduced from another page! What else can be done? How about a scrolling display with two or three actual digits to display the MHz and KHz numbers in turn? Each actual LED display omitted saves at least one chip and 7 wires! Any other suggestions please! Tim W G3PCJ

Antenna Current Meters

Chris Rees, GU3TUX, who many of you will know from his earlier days of selling keys and other CW related gear, took up the notes on building antenna current indicators. Here is a pictorial sequence of his creations! See the previous Hot Iron Issue 55 for the circuits.



The Upton



This is a multi-band CW TCVR using several different kits. The heart of it is the ABLO which provides the Local Oscillator for all the traditional bands 10 to 160m. It has coarse and fine tuning; the latter also acts as RIT when linked to the transmitter. The receiver uses the Product detector kit with a strong broad-band quad diode mixer (to avoid BCI), followed by diplexer, low noise amplifier and switchable low pass CW filter. Audio output is by the (nearly!) standard Audio amp kit for phones or LS. Receiving RF selectivity is provided by the AMU! The transmitter is the broadband 1.5W Pylle CW kit which is driven by the ABLO, and has diode TR switching for full break in TR control, with sidetone and muting for the receiver. It also includes a receiving broadband RF amplifier to make up for the losses in the diode TR switch. Because the Pylle does not include transmitter low pass filters to remove TX harmonics, you will need external filters - in this case I have used the Dual LPF kits, three of which can be cascaded to cover all six bands. The last unit in the photo, extreme left, is a standard 5 digit counter linked by the cable-form to the 7 segment LED displays which are mounted, with the other controls on a 100 x 160 mm single sided PCB front panel.

This has been quite a challenging project and is not for the novice constructor! I chose to mount all the PCBs by small screws onto a wooden plank behind the front PCB panel. This has the drawback that arranging the ground or earthing is more complex! In fact mine oscillated at audio when the AFG was turned up due to the LS currents getting back into the early audio stages. Eventually I realised that the audio stages needed something nearer 'single point' earthing while the transmitter and low pass filters needed 'ground plane' type earthing arrangements! Despite many ground wire links, I found that using miniature 50R coax between TX and filters lifted the 10m output to just on 1W! I am not offering this as a formal kit because of all the options, but I do have a note on how to connect them all together. If you are interested, please discuss options with me. G3PCJ

Miser's Micro-Henry Meter - by Gerald Stancey G3MCK

"An engineer is a man who can do for a shilling what any fool can do for ten quid."

My philosophy with measurements is that if you have to do a lot of the same type to a high level of accuracy, then it is best to buy the right instrument and ignore the cost. However there are times when one needs to do just a few measurements and there is no way the expense can be justified, and none of your friends have suitable test gear that can be borrowed. This was the position I found myself in when I needed to measure the inductance of a few small, about 1.5 uH, inductors to better than 5%.

The solution went back to first principles and used equipment that is readily available in most shacks. The one thing that we can all measure very accurately is frequency. Even if you don't have a frequency counter, a 100 KHz crystal will calibrate a receiver at 10 MHz to much better than 1%. The connection between inductance and frequency is given by the equation:-

$$f^2_{MH_2} \times L_{\mu H} \times C_{pF} = 25330$$

If we use the unknown inductor as the coil in an oscillator and measure the frequency, then we are part way to finding its inductance. If we now increase the capacity across the coil by a known amount and then measure the frequency again, we can easily derive the inductance. Assume that the unknown coil has an inductance L and resonates with the circuit's basic capacitance C at a frequency of F_1. When the capacity in the circuit is increased by 47 pF, the circuit now oscillates at a lower frequency F_2. The frequencies F_1 and F_2 are related to C by:-

$$\left[\frac{F_1}{F_2}\right]^2 = 1 + \frac{47}{C}$$

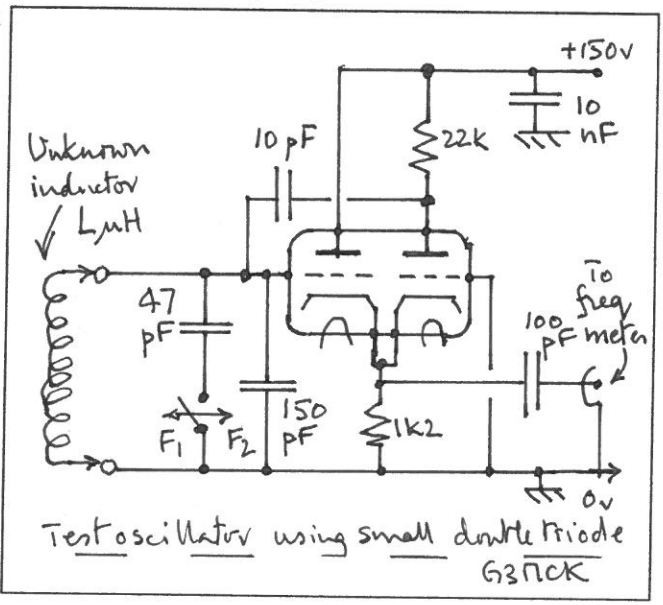
Rearranging this gives:-

$$C = \frac{47}{(F_1/F_2)^2 - 1}$$

Then substituting back into the first equation gives:-

$$L = 539\left(\frac{1}{F_2^2} - \frac{1}{F_1^2}\right) \mu H$$

where F_1 & F_2 in MH_2.



The circuit that I used is shown on the right. I made it with a valve because I had one to hand and felt like doing something with valves! Keep the leads in the oscillating circuit short to minimise stray inductance, otherwise construction is straight forward. Doubtless a transistor circuit, say two FETs, would work just as well. The 47 pF 0.5% capacitor is temporarily soldered into place. I used a frequency counter to measure the frequencies - a calibrated receiver would do just as well. Many modern rigs provide full HF coverage and some domestic short wave receivers have very accurate digital readouts too. If you don't have either of these, then an old clunker like the CR100 and a 100 KHz crystal oscillator, with interpolation of the logging scale will do just fine.

How accurate are my measurements? Well I don't really know as I don't have any precision inductors with which to check them. All I can say is that I get consistent results. To be really accurate an allowance should be made for the other inductances that are present; however, I believe these are small and can be ignored for inductors that are likely to be used in HF projects.

The same circuit could be sued for measuring small capacitors but I have not tried it.

Subscriptions!

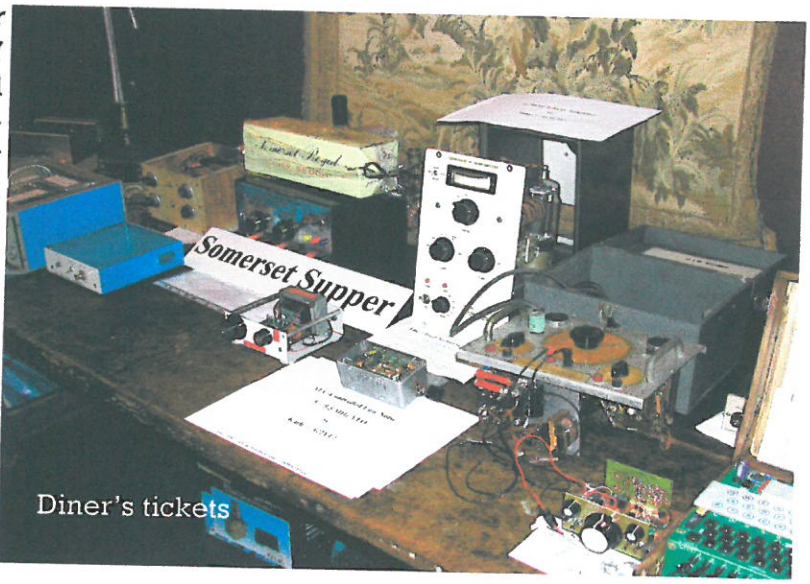
I am afraid its that time of year again! If you wish to continue receiving Hot Iron, let me have your cheque for £7 before Sept 1st for the next issue.

Send off your cheques now!

DDS chips - I have the following surface mount sample devices surplus to my needs:- AD9857AST, AD9283BRS, AD9835BRU. They are all direct digital synthesizer chips needing control from a microprocessor. I also have a 50 MHz xtal oscillator to drive them. Free to a deserving home! G3PCJ

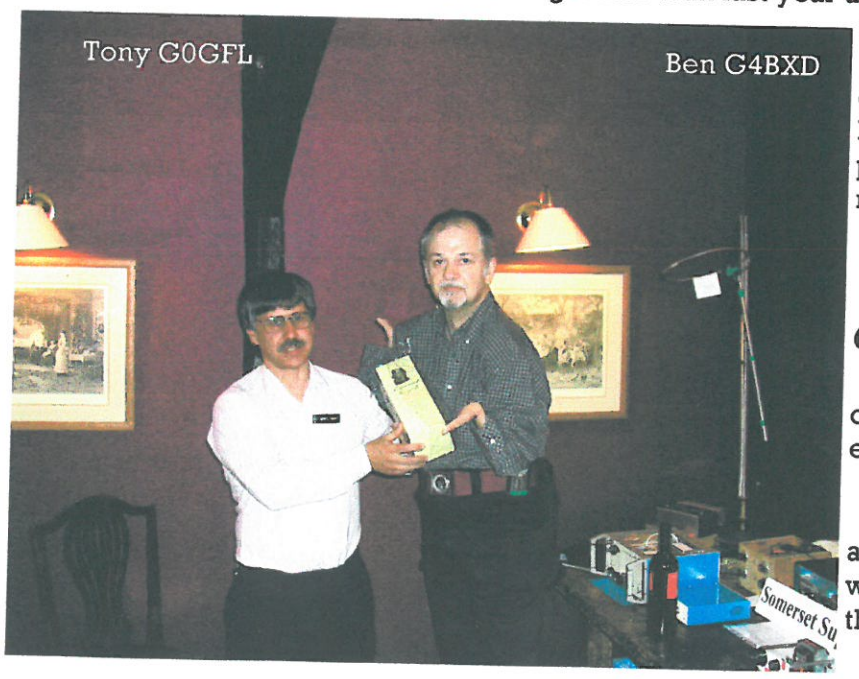
Supper in Somerset!

A few Construction Club members were present at the third ***Somerset Supper*** on the eve of the 23nd Yeovil QRP 2007 Convention which was a most convivial evening. A wide range of home made electronic projects were exhibited by mainly local diners for the informal display and competition. Seventeen items were exhibited at the Antelope Hotel, Sherborne, with a wide range of building skills being evident – from novice constructors to almost professionally made equipment. The items ranged from simple AMUs to high powered valved linear amplifiers.



Diner's tickets

Ben Nock G4BXD, regular contributor to PW and collector of World War II military equipment, had the difficult task of choosing the winners; he awarded the first prize - a bottle of Somerset Royal Cider Brandy - to Tony Marriot G0GFL for his modern version of an Enigma coding machine. Second prize went to Andy Howgate G7WHM for his 160m AM transmitter. Ben commented that 'It was great to see such a diversity of projects and skills but it made my task all that much more difficult!' Tim Walford G3PCJ, who hosted the event, commented that 'He was delighted that the number of entries was greater than last year and the standard of construction was even higher.'


Tony G0GFL

Ben G4BXD

The exhibits created much lively discussion, and it was agreed by all to have been an excellent event with plenty of evidence of original ideas and much fun!

Make a note in your diaries now!

The 24th QRP Convention will be on April 27th 2008, and the fourth Somerset Supper on April 26th.

My apologies for this issue being a little late, I am always heavily involved with the Bath and West Show: this year there was even more to do!