SPRAT

THE JOURNAL OF THE G QRP CLUB

DEVOTED TO LOW POWER COMMUNICATION

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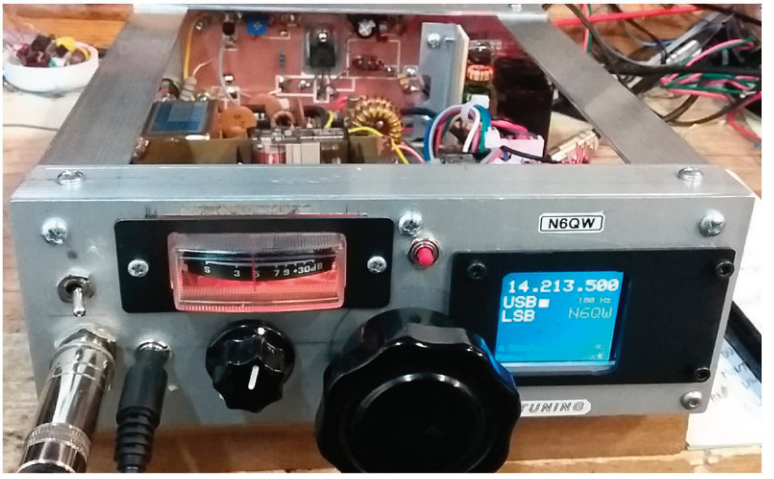

An SSB 20m transceiver by N6QW which uses club sales parts

This could be your last SPRAT. Check your delivery label and please read the Membership Secretary's notes on page 24

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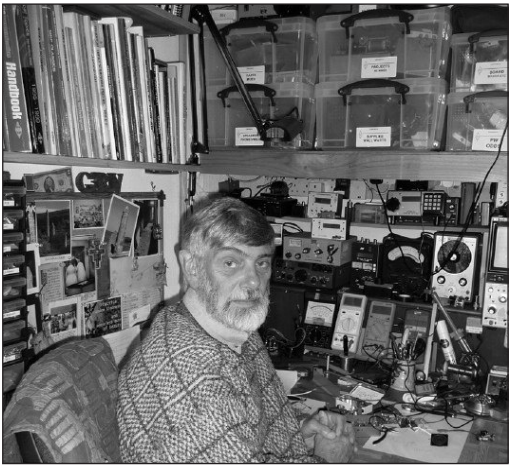

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Rev. George Dobbs G3RJV

I was very pleased to see the proposal for a GM3OXX memorial challenge – see opposite. Thanks to all those of you who have submitted articles for this Sprat – unusually, we have a few items left over ready for the next issue. Please, if you have anything, and almost any format or medium may be used. Ideally we prefer items electronically and in the preferred SPRAT format but we attempt to use any articles we receive, from expensive word processing to a note pad and pencil. Contact me, or G3MFJ for a SPRAT formatted page. We welcome electronic diagrams in the more common graphics, or, we can redraw them. I look forward to seeing your contribution, and, as always, please copy G3MFJ in as well.

72/3

Important Notice to all members – particularly in the UK and Europe, regarding the new General Data Protection Regulations (from May 2018).

The club holds a database of all our member's addresses which is stored carefully and is only used for the posting of this magazine. For this purpose, a copy of the database has to be sent to the printers, and they have assured the club that they will take great care of our data, and they will not pass any information on it to any third party. It is implicit that every time that you renew your subscription, you are giving us active consent to record this activity in the club database. If you are unhappy with us holding this information about you, then clearly you cannot, for all practical purposes, be a member of the G-QRP Club and we will gladly refund your unused membership fees for 2018.

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GM3OXX Memorial Challenge

Vic Winton GW4JUN e mail: GW4JUN@gmail.com

In the Winter 2017/18 Sprat we learned the sad news that George Burt GM3OXX had become SK. George was an inspiration to a great many in our hobby. Here is an opportunity to spend a little time in 2018 to celebrate the life and spirit of George with a Memorial Challenge. The object of this challenge is to get off the sofa, get off the internet and on the air with simple home brewed equipment and to operate in the spirit of GM3OXX i.e. simple set up and only 1 watt (or less) of power.

This is not a contest and there are no rules as such, other than the 1 watt rule. This is because your challenge will be unique to you. A chance to get a "kick up the anode" and get on the air with real radio and with some of the kit you have wanted to build but never got around to building.

Pick your challenge!!

Any mode(s), any rig, solid state or valve as long as it is QRP max 1 watt output. No spark transmissions though, please ☺

Many stations will likely opt to build one of George's famous little rigs – the OXO the Oner, the Fox (or many more) – either as the original or any variant you wish. Add any embellishments you fancy. Maybe you have one already built deep in the shack drawer. Dig it out and get it on the air ! But of course Tuna Tins, Mighty Mites, Rockmites, SCD, SST, Norcal Sierra etc are also welcomed. The only stipulation is that we build and/or operate in the spirit of GM3OXX. Just build it and make QSO's. Perhaps it's a good opportunity to make that 20m Moxon beam from junk parts in the garage that you have been dreaming of, or that remote antenna switch so you can test different antennas easily or do some propagation research on WSPR. Or maybe it's time to try a new band or a new mode, or go retro and try an old mode. Put it in a suitable enclosure (the funkier the better) or leave it naked. Anything like this can be included in your personal Challenge.

Remember that it's all about celebrating the life of GM3OXX and operating in his gentlemanly spirit with simple homebrew equipment on QRPp power.

The Challenge will run until 31 December 2018 All entries to me (e mail as above) and I will compile an article for Sprat with details of what everyone did - what they built and what they worked. If you are subscribed to the Club's internet forum we encourage you to post your personal Challenge and blogs of your progress….. and any technical questions if you need any help getting it all to work. Check out the Sprat Index at http://www.gqrp.com/sprat.htm for original rig articles from GM3OXX.

All entries will receive a certificate and have a lot of fun along the way! Good luck!

Note - from the editor – all the GM3OXX construction articles are on the Sprat DVD!!

The future of the G-QRP Club

Graham Firth, G3MFJ, g3mfj@gqrp.co.uk

I'm sorry about the alarming title but as with all things, nothing stays the same forever and for the club to continue, we will need your help.

As some of you may have heard George G3RJV has been having health issues for some time and has been struggling with the production of Sprat. As a result of this I have been editing Sprat for quite a while - with help from various people, (to whom, many thanks), and George of course. I have been doing this as well as my normal Sales and Treasurer duties.

Over the years of G-QRP George has had an open outlook on the club – people will appear when they are needed. This has worked over the 42 years it has been in existence but now we need to help that process by proactively reaching out to members. Although we are an international club we are UK based and for all kinds of sound and logistical reasons we need help from the UK members.

Going forward, I enjoy my two roles of Sales and Treasurer, they are manageable for me and I am happy doing them. However, the third role of editing Sprat is not - and we need a new Deputy Editor so that George can concentrate on his other role of being Club Secretary, and I can revert to just my normal role. Recently we have had someone who has helped with sub-editing the actual articles we receive, but, we need someone who will do more and perhaps take charge of the process.

We also need to fill the post of Chairman left vacant when Gordon Bennett G3DNF passed away a few years ago. This is more of a leadership management role and we would welcome applications from members who feel they could do this and take a lead in the process of recruiting new, perhaps younger, talent in the running of the club. The roots of this process needs to begin to be formed now. Waiting until any of the principle club leadership falls over will surely bring an end to the club.

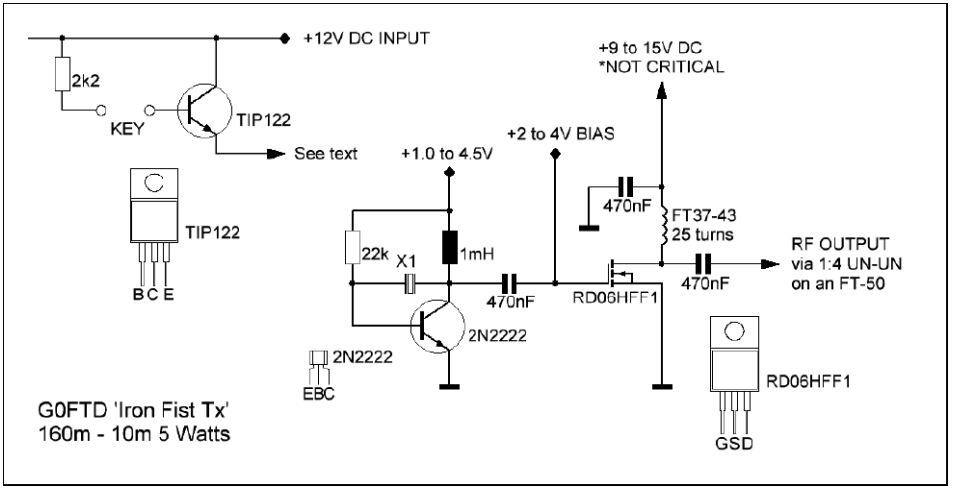
If you would like to discuss these issues further I can be contacted for information at g3mfj@gqrp.co.uk. Meanwhile, please, for the moment, will you continue to copy me in for all article submissions – I will pass them on as necessary.

The Iron Fist - A 5W CW Tx from top band to ten metres

Andy - G0FTD - andyfoad@rocketmail.com

I have always been fascinated by the concept of the "twofer" style of CW rig as a simple way of getting on the air. (Twofer being the two active RF devices). However many designs often lacked power output, or run out of steam above 14MHz. This little combination solves this problem.

A simple 2N2222 xtal oscillator performs well up to 28MHz. For our purposes, we can use it with 1–4.3 volts DC (no more is needed) to drive a power FET. The 2N2222 stops oscillating at about 1.0 volt. If you wish to have a variable output rig then just vary the voltage with something like an LM317 variable regulator, set up to give 1–4.3 volts. The 100mA version (same size as a 2N2222) is just fine.



The Mitsubishi RD06HHF1 is a handy PA. I use these devices with up to 40 volts on them in another amplifier project, peaking 20W output class C! The device is specified as being indestructible with any load presented to it at 6W output. About 2.4V DC bias on the gate provides enough switch-on voltage for the device, and should draw about 10mA. Take note that it is the HHF1 that you require. The other versions have different impedances that are not so simple to set up. The tab of the RD06HHF1 is to ground and does not need insulating from chassis/heatsink. Bolting the device to a reasonable to the metal rig case is perfect. At 6W output, only 500mA is required for the PA.

The input impedance is about 200 ohms for this device (not an issue), output is typically 12 ohms. This suits our 50 ohm world, since a simple broadband 1:4 un-un wound on an FT50-43 is all that is required to couple into your chosen 50 ohm LPF circuit. I think I managed to get about 17–20 bifilar wound turns on my toroid, which will provide ample inductance to work down to 0.5MHz and up to 50MHz. Whatever you do, just fit as many on as you can within the 340 degrees or so or the toroid, using about 22 SWG wire. The usual books and resources on winding broadband transformers can be read by the reader, and is not worth repeating here. Or a convenient resource can be found here -

http://www.philipstorr.id.au/radio/technical/Balun and UnUn.pdf
A 5 amp TIP122 NPN Darlington transistor can be used to key the TX with no chirp. You can use it to feed your preferred DC supply options, such as a 2.4V zener for the gate bias on the RD06HHF1, and maybe the 100mA version of the LM317 to set up the oscillator. (The PA itself doesn't really need voltage regulation as such, since it is happy up to 40V). However the end user might prefer to use a something for polarity protection purposes. The value of resistor on the TIP122 keying circuit is non critical, for normal purposes a 2K2 or higher will suffice. With a low value, or no resistor the Darlington effect means that you can key the rig with a damp finger across the terminals - could be good on a /P rig, and do away with the morse key! Maybe exposed pads of PCB or some screw terminals as a sort of wet finger keying pad. The TIP122 does not really need heatsinking, since it is only really passing on average 50mA to the oscillator and gate bias circuit. But if you do bolt it to a chassis, be aware that the metal tab will need to be insulated from ground.

Having built a few of these transmitters I prefer to use the TIP122 as a keyer transistor which feeds the 12V through to a 2.4V zener arrangement for the bias, and to an adjustable regulator (LM317) leaving the PA going direct to the DC supply – unkeyed. Depending upon construction, it is sometimes useful to have an extra RF choke on the DC feed to the oscillator and PA bias. This makes quite a difference to the reliability of the oscillator starting up. For a belt and braces approach, use RF chokes to the morse key, immediately after the where the morse key terminals connect to the TIP122. The TX will easily give 5W or more output, and just a bit less by the time you reach 10m. This assumes that you are working on a standard 12.5–13.8V supply. However there is nothing wrong with adding a few more volts to the PA if you want 5W+, do not be afraid to add a few more volts if you want to raise the power.

Here's a sample of expected power outputs:
At 10.1MHz, with 2.5V oscillator supply (10mA) and 12.5V PA supply gives 5W output.
At 10.1MHz, with 3.0V oscillator supply (40mA) and 12.5V PA supply gives 8W output.
At 24.9MHz, with 4.3V oscillator supply (60mA) and 13.8V PA supply gives 4W output.
At 24.9MHz, with 4.3V oscillator supply (60mA) and 16.0V PA supply gives 5W output.
Having built a few of these transmitters now, and their associated LPF's based upon the W3NQN designs and found on the club website, I find that the cut off frequencies are just a little too harsh for my liking. In band losses seem to be as much as 1.5dB! For 30m and up, I wind one less turn on each toroid as a quick fix. Turns a 3.5W rig into a 5W rig without adversely impacting harmonic attenuation.

I have also tested various forms of microswitch for a compact inbuilt morse key. They really are very good! Small ones with a roller on them are the best if you decide to make a compact TX in a box for /P use. A hole in the box that reveals the roller for you to key works very well. If you use the roller versions they are less prone to being caught in the fabric of a pocket or rucksack, and therefore do not get damaged.
As for the Iron Fist name? Well iron represents something strong, in this case a QRP rig that can run the full gallon of 5W easily. And it's a CW rig, for which we associate with sending with a good fist.

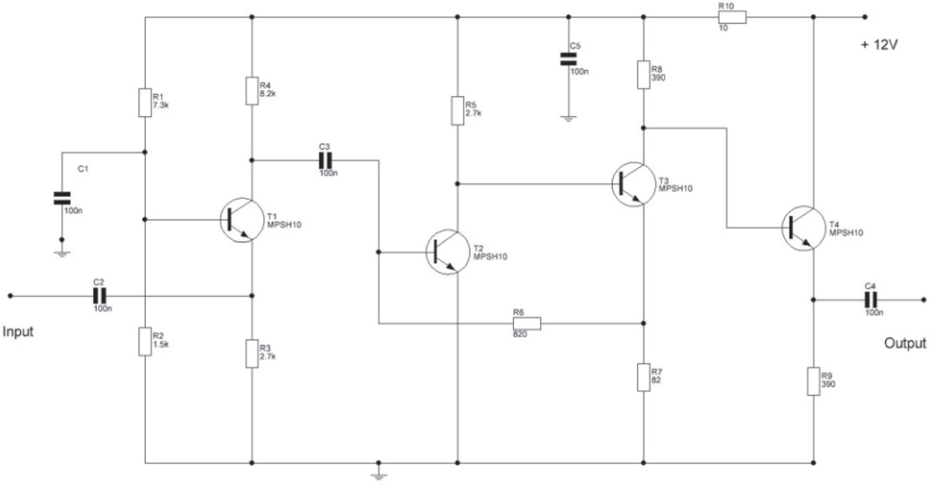
Simple Wideband RF Amplifier

Phil Stevens, G3SES (philg3ses@gmail.com)

A few months ago I was making some measurements on crystals to use in a ladder filter. The low level signals were too small to trigger my digital frequency meter and I realised I needed so form of RF amplifier to boost the signal to my DFM. Although I have one or two suitable amplifiers based around integrated circuits I decided this was an excellent opportunity to try out some MPSH10 transistors bought from Club Sales. This device has a much higher transition frequency (650 MHz) than the usual 2N3904 (300 MHz).

The specifications were as follows.
(1) A reasonable impedance match at input and output into a 50 Ohm system.
(2) To be able to accept signals up to 10 mV.
(3) All components to have wire ends – no SMD.
(4) A gain of greater than 30 dB over the complete HF spectrum.

The circuit is standard 'Text Book' and I first came across it in a Ferranti publication in 1971. The first transistor runs in Common Base mode to provide a 50 Ohm input. This is followed by two Common Emitter stages with current feedback. The final stage uses a Common Collector circuit to drive 50 Ohm loads.



All components are standard values except R1 which is 7.3 k Ohm. (R1 is made up from an 8k2 Ohm resistor in parallel with a 68 k Ohm resistor). The input impedance to T1 is determined by approximately 25 / Ie where Ie is the emitter current in mA. So for Z_{in} = 50 Ohms the emitter current is 0.5 mA this corresponds to 1.35 V on T1 emitter. All capacitors are ceramic.

Construction was based on ugly methods on a plain copper earth plane in a salvaged diecast box. Input and output is taken via BNC connectors. Wires were kept reasonable short but a better layout would probably give better results at VHF. A +12V regulated supply giving at least 50 mA is needed. Any variation in this supply will vary the bias on T1 and therefore the input impedance.

The finished prototype amplifier was tested and gain measurements made. My ancient Marconi spectrum analyser / tracking generator (TF2370) indicated a gain of about 37 dB at HF with a -3 dB point at 30 MHz. Gain at 100 MHz is 29 dB. The design was also simulated on my PC and the analysis gave a very similar gain and a -3 dB point of about 70 MHz with no allowance made for circuit layout.

If readers wish to know more about the circuit or have any problems please contact me by email.

Using PayPal in the club

Graham Firth G3MFJ – sales@gqrp.co.uk

PayPal is a very useful system for sending money to the club – both for subscriptions, and paying for club sales items. The snag with the system is their charges which because they charge a fixed amount plus a percentage, can be a large proportion on small orders – even worse when a currency conversion is involved. For example, a DVD to a UK member – costing £6.20 including postage, we will lose 41p which means we actually only get £5.79. We can just manage this loss, but because we are a club with small margins, this can turn a small profit into a loss.

The way round this, is to send the money to the club as a gift – sometimes called friends & family. If you do this, then they do not deduct any charges. However, any comeback on a disreputable seller is lost, and you can't get your money back if it all goes wrong.

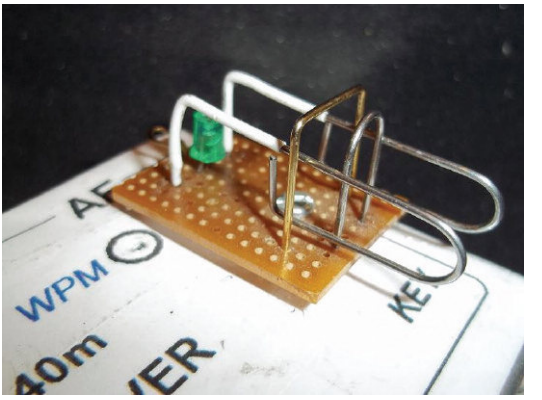
So, I am suggesting that, with a seller you know and trust – the club for example, you can (and please do) send the money as a gift, but for anyone unknown, send it the normal way, so that if you need to dispute anything, you have the might of PayPal behind you. Oh, and by the way, if you are a friend, PayPal assume we know your address and do not forward it, so be prepared for us to ask you for it, or, include it in an email. Thanks

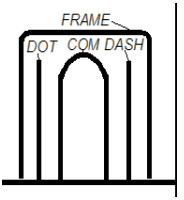
We cannot use this system with renewals, as we are using the PayPal button and you can't have friends with a button, hence the postage charge we have to add!!

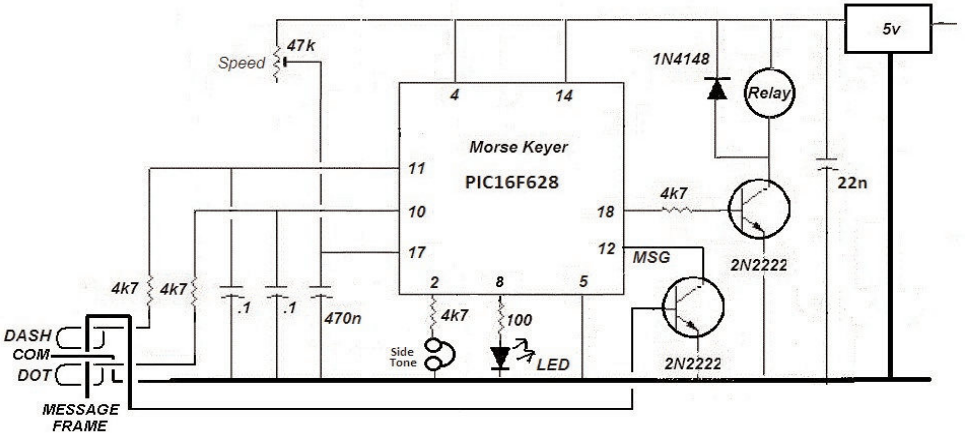
A paper clip auto keyer

Peter Howard G4UMB

Here is a simple keyer I made from large paperclips and built on strip board using existing holes. The frame around the paddles I thought up is used as the message controller instead of a push switch. All the info on the keyer and the HEX program code can be found on the authors DL4YHF website:
http://www.qsl.net/dl4yhf/pic_key.html
You will need a PIC programming tool to load the program into the IC. The message frame on the keyer is touched by any paddle to playback a stored message or to store a message. To store a message any paddle is pressed against the frame and held until the message signal sounds twice “M”. A message is then keyed in using the paddles and then the message frame is touched again and held until the signal sounds three times “S” to store it. A momentary press of the message frame by any paddle will now playback the stored message. This message can be stopped anytime by using the paddle(s) .The keyer has the side tone output and message signal on IC pin 2. The LED duplicates the message signal and is optional. I have made the circuit of the keyer fit underneath the key inside the box and a hole allows adjustment of the speed with a small screwdriver. I have not drawn the relay switches because the way it is used is left to your requirements.







The Christmas Challenge 2017
Gold Frankincense and Mar?

Jon Joyce GM4JTJ (gm4jtj@yahoo.co.uk)

Readers may well recall last year at this time that I reported on a Christmas challenge between myself and Dave, G4FEV, a tradition we have kept up for a few years now. Thinking of a fresh challenge can be a challenge in itself until some helpful TV advert reminded me of the story of the Three Wise Men and their gifts of Gold, Frankincense and Myrrh.

Being an avid home brewer and surface mount devotee, 'Myrrh' was just too similar sounding to 'Mar' for me to ignore.

The MAR series of devices are MMIC (Monolithic Microwave Integrated Circuit) amplifiers which operate into the GHz regime and offer the UHF builder a simple solution to amplification.

They offer the builder a choice of gain from 8 to 22dB with output powers of up to +17.5dbm and are designed for a 50ohm source and load operating from a 5V supply. I have been finding more and more of these devices on old circuit boards usually marked AO6, AO3 or simply 6 or 3 and they can be removed with care either lifting each leg in turn using a toothpick or scalpel blade, or, how I prefer to remove them, which is using a hot air gun and tweezers. For hot air gun read my trusty paint stripper held at a judicious distance from the circuit board.

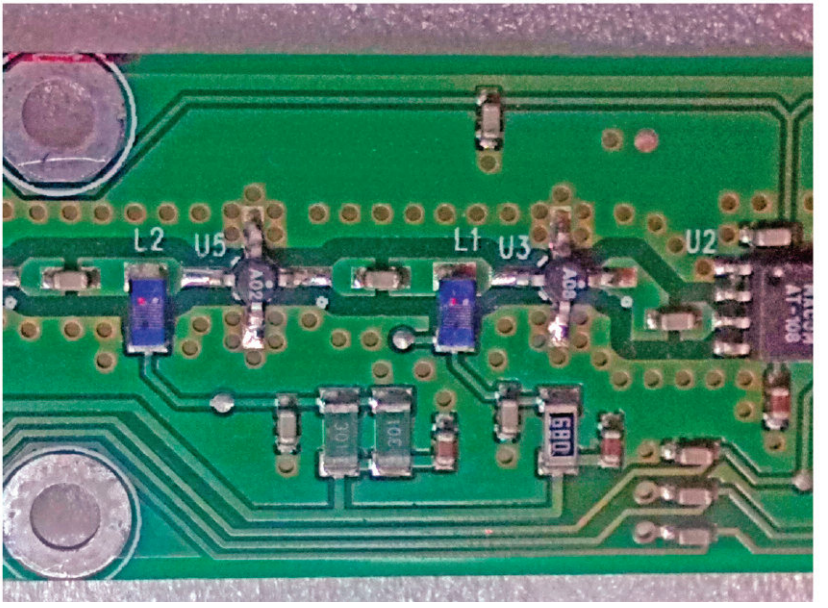
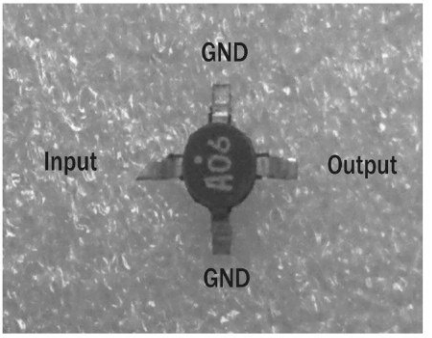


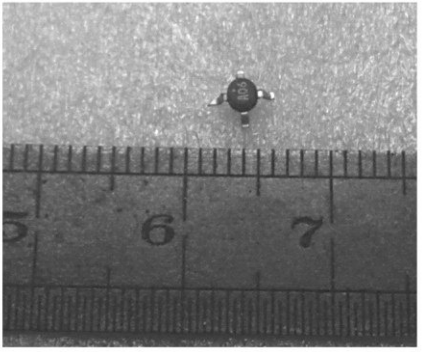
Fig. Typical circuit board showing two mmic stages

So this year's Christmas challenge to Dave, G4FEV, was to build a qrp transmitter with the only active devices being 'MAR's or mmics.

This was to prove a challenge in more ways than one given that I had never seen these devices used as an oscillator before, essential if this challenge was to succeed. The results were novel and I suspect a first for QRPers as well as a first for mmics.

A typical mmic such as the common MAR 6 consists of an input tab, an output tab and two earth tabs as shown in the following photograph. MAR 6 has a maximum output power of +2dbm or 1.6mW and a gain of approximately 20db at 100MHz. Full details of this family of devices can be found on the Mini-Circuits (*1) web site. Note the input tab has an angled cut end.



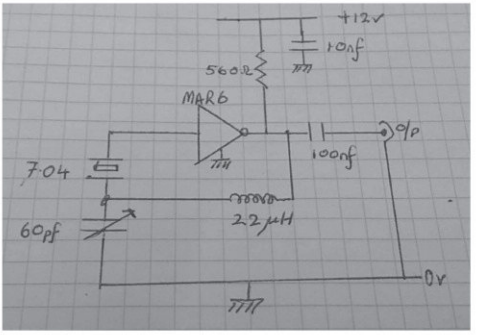


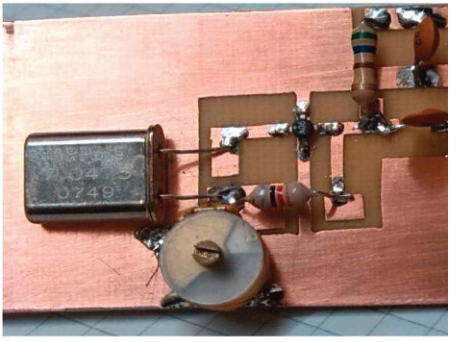
Dealing with these small surface mount devices can also be a challenge in itself but with care and patience, reasonable results can be obtained with normal shack equipment. Get out your magnifiers, tweezers and a fine pointed soldering iron and I am sure most of you will manage. The above photographs will give you an idea of the size. I chose to make up a simple 'prototype' circuit board using my usual technique of cutting thin strips of p.v.c. tape to stick down as a mask and then suspending the copper clad board in a solution of Ferric chloride in an old coffee jar.

I suspect these devices might also lend themselves to 'dead-bug' style building as conveniently two of the legs may be soldered directly to a copper ground plane. However the tabs are fragile and so care must be taken when bending up the input and output legs. I started this project with an internet search to see if any existing circuits were available using the mmic as an oscillator and was extremely surprised to discover how few existed, only one circuit was found on PE1RAH's technical pages on the QSL.net website. (*2) I started with this circuit and its values but found that although it oscillated, it was producing an output on some harmonic of my 40 metre crystal around 60MHz and defied all attempts to 'tame 'it.

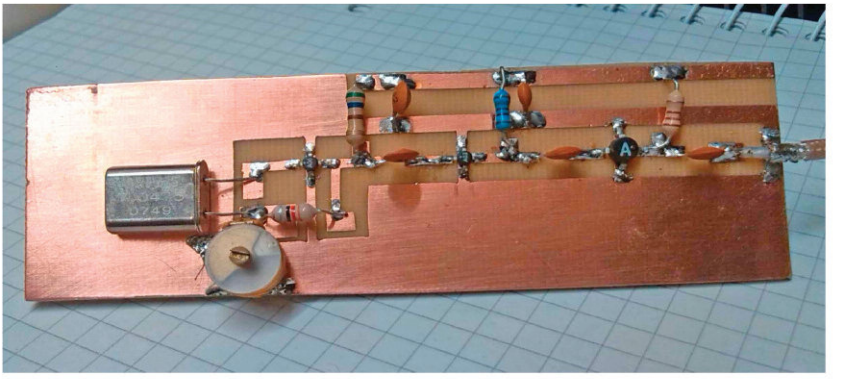
More by luck than by judgement, I started to experiment with different values and feedback methods until I happened upon the circuit shown over the page which oscillated robustly on 40 metres and indicated some level of stability and control of the frequency

using the trimmer. The choice of value of the feedback inductor seemed to be the most critical in ensuring stable oscillation on the crystal's fundamental frequency.
I also established that there would appear to be a minimum value of the trimmer, below which the oscillator would not start and in my case this was about 30pf. I don't think it is any coincidence that the resonance of 30pf and 22uH is approximately 7MHz!!

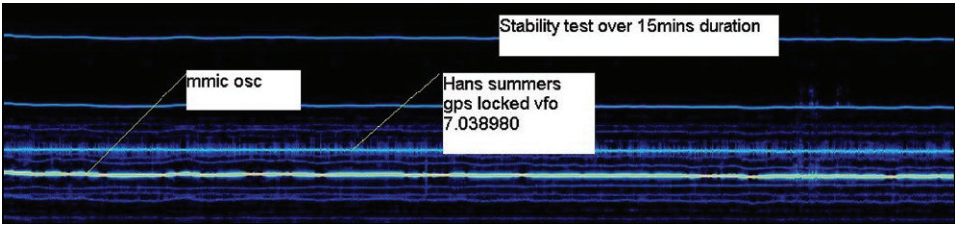




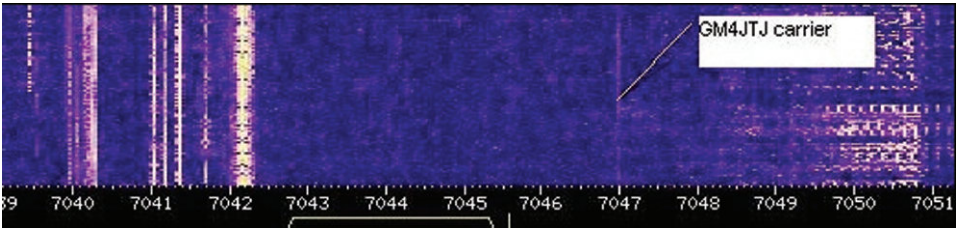
A MAR6's typical operating conditions are 3.5V at 16mA and this was used to establish the value of 560ohms for the series dropper resistor for a 12volt supply.
When I first laid out the pcb, I had decided that I would make provision for a buffer amplifier stage after the oscillator and a final 'QRO' output amplifier.
For the buffer amp I chose a MAR3 which has a maximum power output of +10dbm or 10mW and operates with 35mA at 5 volts. This yields a series dropper resistor of approx 180ohms for a 12volt supply.



The Final QRO stage, an MAV11 (marked 'A' in the previous photo) is part of the same family of devices but has a maximum power of +17.5dbm or 50mW. This required about 100ohms for a dropper resistor due to its 5.5V, 80mA operating point. The various stages were coupled using 10nF ceramic capacitors and can be seen in the photograph of the completed board used for this year's challenge.
I measured the stability by monitoring its output note on my shack receiver, an IC 7100, against that produced by my Hans Summers GPS locked VFO kit featured a few editions ago in Sprat. Incidentally I find this a very useful piece of shack test equipment and it also produces harmonics when set to a VHF frequency which I can comfortably monitor at 3400MHz and 10368MHz.
The following trace was made using the Spectrogram audio analysis software over a period of 15mins from switch-on and I hope it is self explanatory.



The stability of this final design was frankly quite amazing and the oscillator would certainly lend itself to incorporation into other qrp projects as it was extremely stable and was easily keyed without any chirp via the 12volt supply line. (See G4FEV's websdr screen-grab).
The following image proves that the above QRP transmitter works. It shows a screen-grab taken from the DJ3LE on line web-sdr (*3) located in Schleswig, Northern Germany, JO44PN, 778km from my home QTH.



Dave, G4FEV, forwarded details of his approach to this challenge and although choosing a different method of construction, has obtained a very similar result and the following are photographs of Dave's Build.

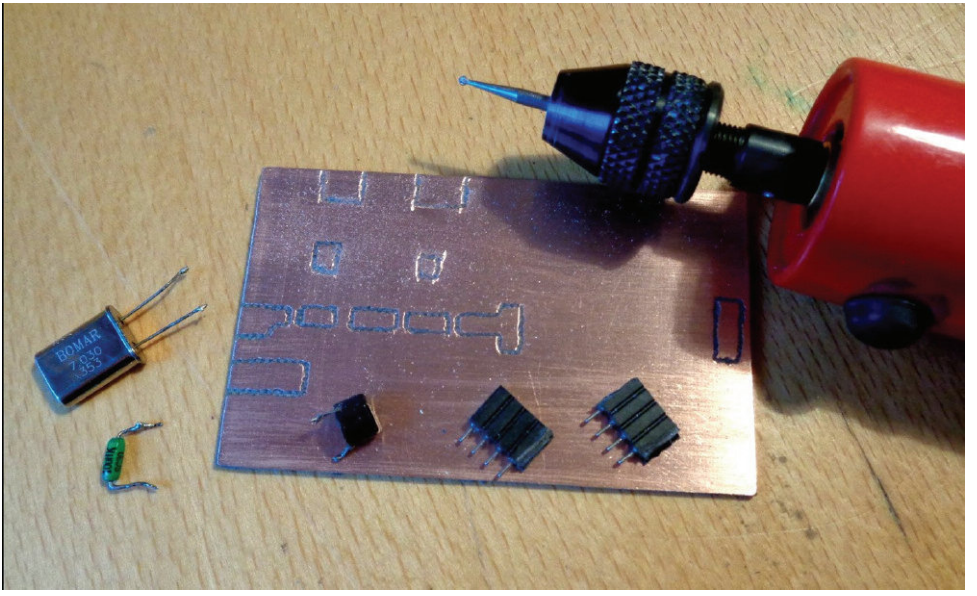


Fig G4FEV's circuit board using a burr to form the islands

The circuit used is the same as that given earlier except for G4FEV's use of a 10uH feedback choke and the more elegant inclusion of chokes in the supply to the individual MAR devices.

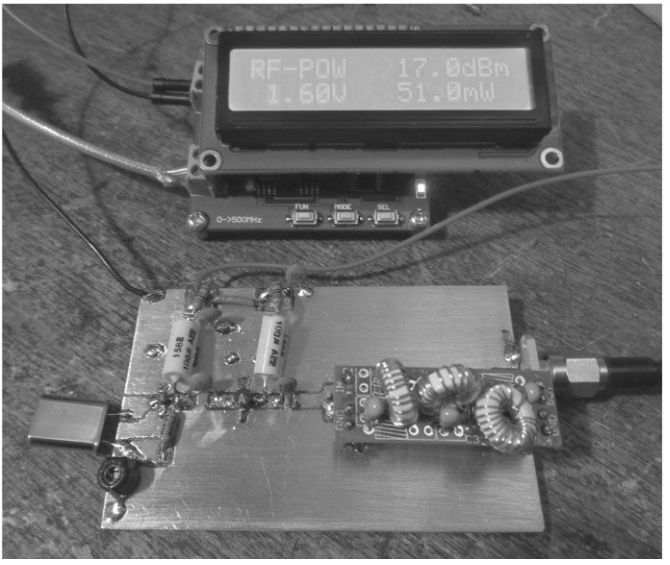


Fig G4FEV, final board using just 2 stages, MAR3 + MAV11
(note the Hans Summers plug-in 40m low pass filter!)

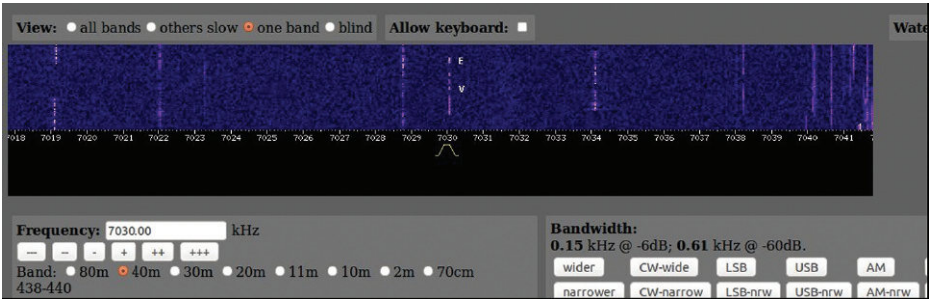


Fig G4FEV signal as received by websdr in Bielefeld, W. Germany JO42HE

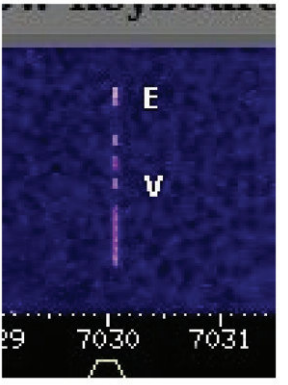


Fig ……..no chirp!!!

This has proved to be a most absorbing project and I believe could form the basis for a lot more development of mmic oscillators. For example, what range of circuit values are appropriate to other qrp frequencies? Can it be made to function as a VFO using a conventional LC tuned circuit?
It might even form the basis of 'moving down a tin size' when a full surface mount version is built. My brother is already accumulating a stock of the smaller 40mm x 40mm Altoids tins for future builds.

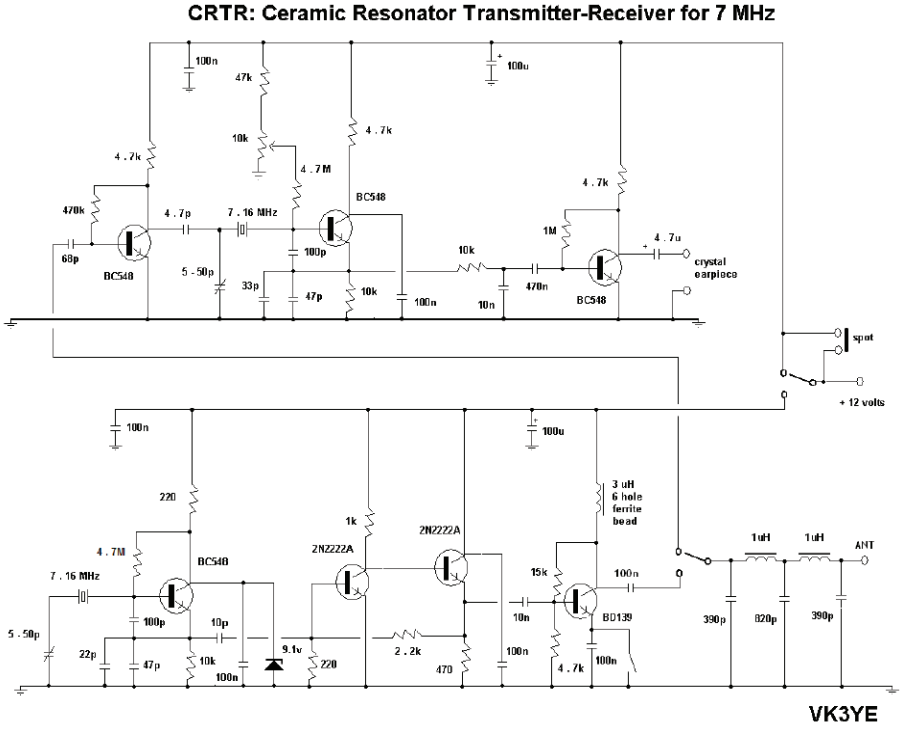
Over to you for some more development work on this circuit……

GM4JTJ

*1 www.minicircuits.com
*2 http://www.qsl.net/pe1rah/technic.htm
*3 http://dj3le.spdns.de:8901/

The CRTR: A ceramic resonator regenerative transceiver for 7 MHz

Peter Parker, VK3YE



I've always thought of regenerative receivers as being more for casual listening than on-air working. Shortcomings compared to the more commonly used direct conversion technique include the risk of frequency pulling, overload on strong signals, and, if independently tuned, poor resettability and band spread.

Previous experiments with VXO and ceramic resonator regenerative receivers showed promise but it was not until seeing F5LVG's 'New High Performance Regenerative Receiver' (Sprat #158, #165 and at http://oernst.f5lvg.free.fr/rx/1v2-tran-2013/rx-1v1-2013-en.html) that I arrived at one worth building as a permanent project.

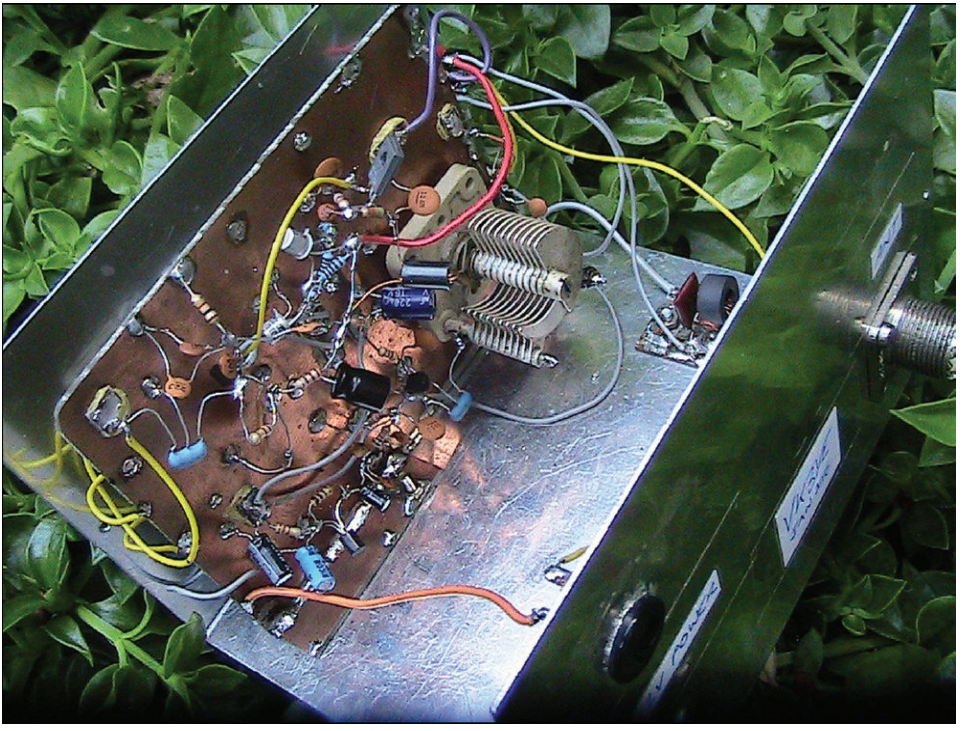
I made no basic changes to the F5LVG circuit except to suit available parts and simplify the circuit by leaving out the RIT. Replacing the tuned circuit with a 7.16 MHz ceramic resonator (available from www.minikits.com.au) and series variable capacitor allows stable coverage of 7.000 – 7.120 MHz. This covers the entire CW portion and some SSB frequencies as well.

Performance is excellent and it handles like a direct conversion receiver. Regeneration is smooth and it can be so finely set that the set can be oscillating on one side of a CW signal but not the other. It can be tuned across the entire CW segment with a need to adjust the regeneration control only one or two times. There is also no frequency pulling when the regeneration control is adjusted.
I suggest starting with F5LVG's design. Then substitute the ceramic resonator. You'll be amazed at what a regenerative receiver containing not a single inductor to wind can achieve. A demonstration appears on my YouTube channel at www.youtube.com/vk3ye . Multiband operation with resonators for other frequencies eg 3.58 MHz is potentially possible but hasn't yet been tried.

Making it a transceiver was the next step. My initial thought was to tap a little RF from the emitter of the regen detector's transistor and fed it to a two transistor buffer via a 10pF capacitor. This buffer is the same that N3ZI uses for his DDS VFOs. Loading caused some transmit/receive frequency offset but this was not easily controllable. Also, when the set was just oscillating (as you'd have it for CW reception) the RF output was low. Advancing the regeneration control greatly increased output. I overcame this by changing the base bias with a smaller resistor (switched in on transmit only) to increase output but there was still the issue of the frequency offset. Also a fixed frequency offset is a disadvantage with simple direct conversion and regenerative receivers with limited or no opposite sideband rejection because you will sometimes wish to change the receiver's frequency to dodge strong unwanted signals.

While using the receiver's oscillating detector in the transmitter portion is no doubt feasible, this is one of those cases where using fewer parts makes a project harder rather than easier. So I instead opted for a trans-receiver with the only common circuitry being the low pass filter in the antenna line. The transmit signal generated by another 7.16 MHz ceramic resonator oscillator. A spot button turns on this oscillator while in receive mode, allowing the transmitter to be brought on frequency. Transmitter power output is approximately 1w – enough to reach over 1000km if conditions are good.

On-air use is a little harder than a direct conversion or superhet transceiver with shared local oscillator and fixed transmit/receive offset. Think of it as like driving a manual rather than automatic car or operating a WWII military set. However the trans-receiver arrangement gives you the flexibility of operating split frequency or independently varying the receiver frequency for best reception. If calling a station you should zero beat the receiver on their signal, press the spot button and set the transmitter oscillator to zero beat then retune the receiver to hear the incoming signal again. You will now be set up on their frequency, ready to call the station being heard. The transmitter is less stable than the receiver and stations worked may notice slight drift. This is the main part of the transceiver which has yet to be optimised. The other alternative is to tolerate a smaller frequency range on transmit by substituting a crystal VXO or twin crystal 'super VXO'.



I regard this as a novelty project, though with coverage of the entire CW portion of the band (along with the potential for crossmode contacts by calling SSB stations) it will be capable of far more contacts than crystal controlled kits. It is no doubt capable of refinement but even as presented it is a fun rig to use.

A Rare Find in the G-QRP Club Sales Bins!

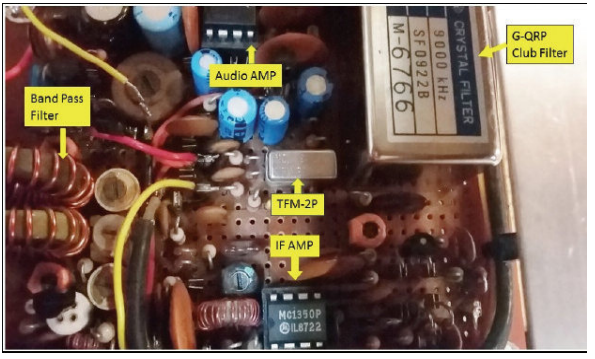
Pete Juliano, N6QW

Through a series of emails with Tony Fishpool, G4WIF I was made aware of some MiniCircuits Double Balanced Mixers model TFM-2P, which had been lurking in the parts bins. I volunteered to check out these jewels and with some assistance of Graham Firth, G3MFJ was provided two units.

Well – don't hesitate a moment to scoop up some of these babies, as supplies are limited and the performance is superb. Basically we are talking a TUF-1 on Steroids as the upper frequency range is 1 GHz and it is a level 7 device meaning don't exceed 1.414 Volts Peak to Peak into the ports. Conversion loss is about the same as a TUF-1 and of course 50 Ohms into the ports.

My application involved the use of a DBM in a homebrew 20 Meter SSB transceiver. The IF Chain uses the G-QRP 9.0 MHz filter and the IF is a "chip', a Motorola MC1350. This rig was built 35 years ago with an analog (read drifty) vfo and crystal bfo. The filter at that time was a 5 pole KVG. Fast forward to today and I decided to take this rig and update it with some modern devices and technology.

The original design used a single pass system through the IF versus the currently popular Bitx Bilateral approach. In my scheme diode steering fed either the signal out of the receiver mixer (a 3N211) or the output of the homebrew balanced modulator into the IF chain. I included some buffer amps (2N3904's) on either end of the filter and then on to the MC1350 and thence onward to a homebrew single balanced diode ring mixer. On receive the BFO signal is fed into this SBM stage and the output diode steered to the audio amp (2N3904/LM386). On transmit, diode steering uncoupled the BFO and connected the LO so now it was the transmit mixer stage. From there the signal passed through a Band Pass Filter and then a 2N5179 RF stage. The driver and final were outboard from the main board.



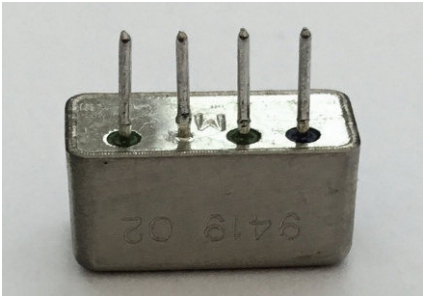
My 2018 upgrade ditched the homebrew balanced modulator

and installed an ADE-1 for that application. The homebrew single balanced mixer following the MC1350 was initially replaced with a TUF-1. About 10 minutes of work and the Mini-Circuits TFM-2P dropped in place of the TUF-1. They have the same pinout –so no wiring changes. For the LO/BFO I used an Arduino Nano with the venerable Si5351. The icing on the cake is a colour TFT display.
In the photo above you can see some of the circuits I described and its placement in proximity to the G-QRP Club Filter, the MC1350, Audio Amp Stages and the Band Pass Filter.
I did not make detailed bench measurements other than to find that it is on par, or better than, the TUF-1 that was installed especially with the upper end being 1 GHz. No doubt it would be a "drop in" for any project requiring the TUF-1 (or TUF-3). They are a 4 pin small footprint device so get some before they are gone! Contact Graham Firth at Club Sales to place your order.

The latest club sales info

Graham Firth G3MFJ

Here seems a suitable place to put the latest from club sales. The TFM-2P were advertised in the Summer 2013 Sprat to an almost zero response. I still have them and they are £5 each plus normal postage. Perhaps Pete's article above may stir up a bit more response! Here it is - it looks big - but it actually measures only 12 x 4 x 6mm:



I keep getting asked about the 2N3866 house-marked transistor – I still have plenty – ask for what you need when you are ordering other items.
If you fancy a go at an SMD Sudden style receiver, I have stocks of LM386 and SA602 in SOIC packages – see the info on the back page – they are slightly cheaper than their bigger DIL brothers.
A reminder about the new Sprat-on-DVD (1 to 172) might also be worth adding – see the piece in the last Sprat - £5 each plus postage.
Everything advertised is available, except that I have sold out of Rex's SBS PCB clamps, and no more are expected. Also stocks are getting low on a couple of the Drew Diamond Project books.

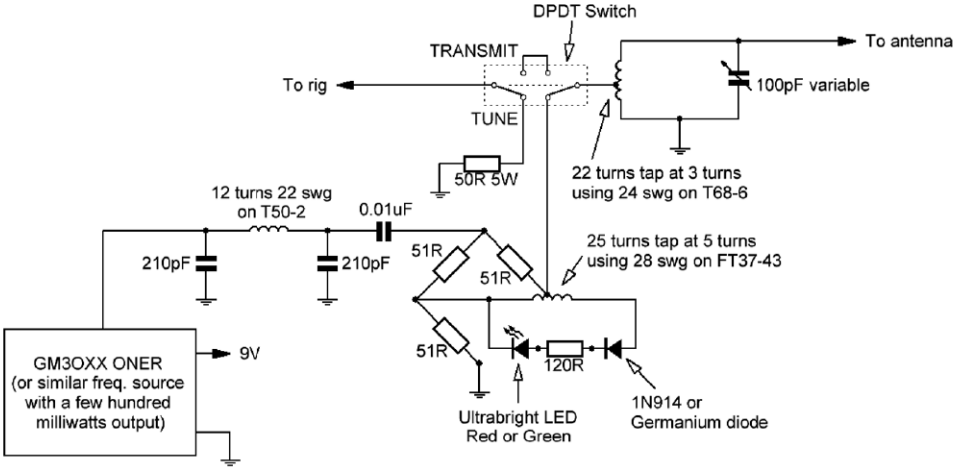
QRP ATU/SWR INDICATOR

Colin Weaving M3WCK

I was fortunate to purchase a MTR Kit from Steve Weber (KD1JV). Much has been said about how wonderful these little radios are. Called Mountain Top Radio, they are the rig of choice for many backpackers, literally fitting into a shirt pocket with remarkable performance. Assembly is not for the faint hearted, and probably not the starting point for SMD assembly, particularly the multi pin packages. To offset this challenge, is the pleasure of getting the rig up and running.

My introduction to Field Trips (just 3) before autumn set in was tough. Weather, Murphy's Law, and total naivety on the importance of ruggedness of antennas, connectors etc. all played their part, but I still managed a few contacts on 20M with a cracking 2W output. This year I planned on doing it better. As I expected to walk to sites, weight /bulk was an issue so the mobile whip was discarded for a 20 M half-wave endfed. The inconvenience of having to find a suitable height tree for attachment of far end was the price to pay. Quickly, I showed the endfed to be a better option - so no surprise there!!

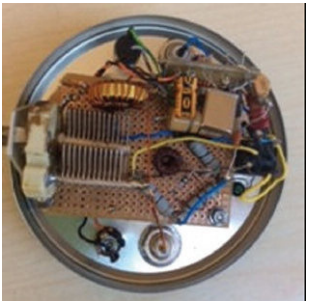
I am always nervous about powering up my MTR into a new antenna or situation. I am rather precious about my output transistors. Thus a method of ensuring antenna integrity was a requirement (Of course an Antenna Analyser would do the job - at twice the cost of the rig and not forgetting the size/weight).



Happily there are some well tested designs on the Internet by KI6J, AA5TB, K7HKL, KD1JV and others. As a first port of call, any of these designs could satisfy the need. However I wanted a complete standalone SWR verifier and antenna tuner with zero risk to my rig. So I borrowed heavily from existing designs and with some modest changes came up with a Tuner/SWR verifier that worked for me.

The well-established 50 ohm bridge circuit was used for SWR indication, and the antenna matching was a typical high impedance to low impedance using a variable capacitor and coil.

To power the bridge circuit, I used GM3OXX Oner, that I had on hand. I quickly discovered the output transistor was getting hot with 12V so reduced the supply to 9V thus convenient to use a standard 9V battery. In order for the bridge to detect mismatches and illuminate the LED's some tweaking was required. I found a big difference in LED's in my junk box. Red and Green were best, and possibly high intensity ones would be better. Lowering the resistance in series with the LED and also a germanium diode (0.2V drop rather than 0.6V) also gave modest improvement. The biggest effect was the coil across the bridge. An amplification stage before the LED as per KD1JV would have made things easier.



The final version was built into a 3¾ inch dia by 1½ inch deep tin, available for £1 including sweets at a local thrift shop. I have used a good quality 100pf variable capacitor as it was on hand whereas a polyvaricon would be OK for QRP. The tuner weighs about 7 ounces.
Operation is straight forward. Connect the antenna to the Tuner and place the ATU in Tune position.
Connect the 9V battery and adjust capacitor until LED extinguishes. 9V can be disconnected and Rig hooked up. Switch to transmit and you are ready to go.
The tuning is fairly sharp. My tests showed the LED extinguishes at about SWR3. Not particularly good, however from a practical point of view you can tune thru the null and then come halfway back to stop in the middle of the dead spot. My testing showed an SWR of 1.5 was easily achieved.

The impedance of a half-wave endfed is quoted as being as high as 5K. As described, the tuner will tune from 1K to 5.6K impedance. A supply of resistors 50, 100, 150, 1.8K, 2.7K 3.9K, 4.7K and 5.6K would be useful to give known impedances when setting up the unit.

After a small amount of usage, would I have done anything differently? Of course the bridge could be powered by the RIG itself rather than the Oner and you would not need the 9V battery or the chance of a flat battery!!

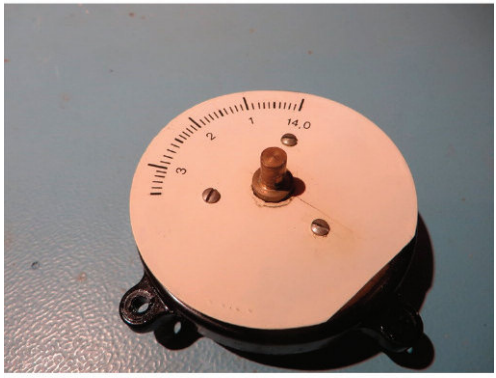
There is also a strong case for refining at which point the LEDs extinguish. For instance noticeably dimming of the LED at SWR3 and total extinguish at SWR2 would be very useful. That would be a matter of finessing the resistor/coil/LED network.

Simple Analogue Frequency-Readout

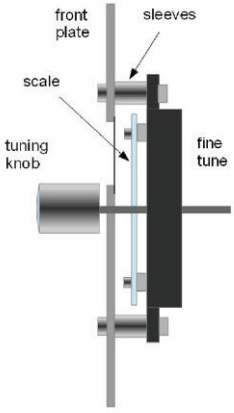
Dirk Krause, DL1GKD

Even in times of DDS, the mounting of a fine drive for frequency control is still standard with homebrew equipment. If not equipped with a counter, the readout is normally done by the scale upon the drive or markers on the front plate what requires adequate external lightness. The simple idea to improve this and give the homebrew rig the look and feel of a classic analogue readout was to mount the fine drive behind and not upon the front plate. This could be done in few simple steps as shown in the pictures:

1. Remove the original scale of the fine drive. The scale is normally fixed with three screws.
2. Replace it with a self-made scale calibrated with the help of another receiver.



3. Cut out the front plate wide enough to offer a good sight upon the scale later
4. Glue a piece of transparent plastic or solid foil from behind to cover the hole as a ‘window’.
A hairline placed in the centre of this part then shows the current frequency.
5. Mount the fine drive with the help of sleeves a few millimetres away from the rear side of the plate.



6. The impression could be further improved, if a backlight is installed. Nowadays, the best choice would be a bright white LED.

That´s it! Have fun and enjoy the improved look of your rig - especially at night ;-).

Membership News

Tony G4WIF, PO Box 298, Dartford Kent. DA1 9DQ

Your last Sprat?
This will be your last Sprat if your wrapper label says “membership expired” or “underpaid”. Please check your wrapper and contact me (or your overseas representative) if this applies to you. Please do not assume if that if you are a UK standing order payer that it can’t be you.

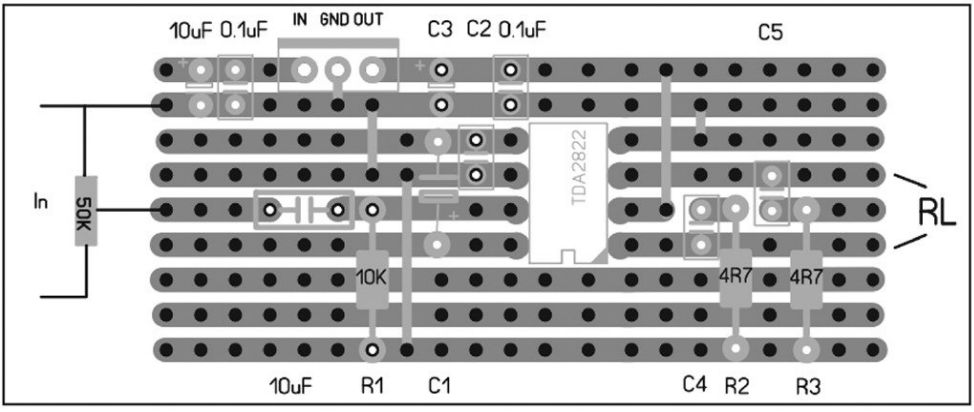
If I could not identify your payment then your membership has lapsed.
Please everyone, check the wrapper now. If underpayment applies to you, there will no further Sprats until you send the balance.

If you sent me cash in any currency other than UK pounds sterling then your payment will not count. As stated in the Winter 2017 Sprat, Euros and Dollars are not acceptable – we can’t spend them here in the UK.

Providing information with your payment.
Astonishingly our overseas reps and myself receive payments with no information about the member paying. We have no special gifts of prescience so please take the trouble to include your name, callsign, membership number and address. An email address is very helpful if we need to contact you about the payment.

USA Members using bank generated cheques.
Sometimes called “bill pay” checks. They seldom have space for information and are sent direct from the bank. Take the trouble please to write separately to Dave W7AQK.
Finally. Contact details for overseas representatives and myself. Our addresses were in the 2017 Winter Sprat and are also on the club website along with email addresses.

Errata in Sprat 173
To end with, something technical. In Sprat 173 I made an error in the TDA2822 amplifier Veroboard layout. Here is the corrected layout.



VHF Manager's report

John G3SEQ QTHR john@g8seq.com

Some time ago there was a group calling themselves "The Horizontal FM Group" who were a group of amateurs that made simplex contacts over some distance using their horizontally polarized beam antennas. Their results were better than that achieved with gainy vertically polarized co-linear antennas. Why you might ask? Well there are at least three reasons:

1) The beams usually had more gain than the co-linears – 10 or 12 dB as opposed to 6dB for most co-linears.
2) Because the beam was directional in the horizontal plane less noise and interference was picked up, or could be nulled out, enabling weaker FM signals to be received.
3) Theoretically, horizontally polarized signals will propagate further than vertically polarized signals under some circumstances. Unless you have studied Physics to a fairly high level, you may not have heard of this but here goes:

When any electromagnetic wave is reflected at a non-conducting surface ie dielectric such as water or the boundary between air layers of different optical density (ie ducts), the vertically polarized wave is refracted into the dielectric but the horizontally polarized wave is reflected at the boundary. The degree of reflection/refraction depends on the angle of incidence and is maximum at a particular angle, called the Brewster Angle, after its discoverer. This angle numerically is 37.5 degrees. (According to a Bill Tidy cartoon, this is the angle you need to lean over the bar in order to see the barmaid's navel through her cleavage!)

This is why Dxers on VHF prefer horizontal polarization to any other but I wonder if many of them know the theory behind it. I suspect most people use horizontal polarization because everyone else does. Some amateurs I've met think it's just a convention that horizontal polarization is for SSB & vertical polarization is for FM, but the type of modulation is irrelevant as far as propagation goes.

CQScotland.com Group Elementary Radio/Morse Events

David Searle MM0HQD, info@cqscotland.com

The above group has run a few of these events recently. The children made simple radios and simple Morse senders. They started learning the Morse code to send messages across the room. Roy, GM4VKI also attended and gave talks about spies and Morse over the years. The children were enthralled with his stories.

Club Awards

Ryan Pike, G5CL, 63 Bishopstone Village, Nr. Aylesbury HP17 8SH.

It's been a little while since I have posted an article in SPRAT, so I thought it best to give everyone a small nudge regarding the club awards.

As a general reminder and if you have a spare moment, have a look at the GQRP website as all the information about our awards is neatly summarised (there is a link on the left hand side column on our homepage). As of 2016, all club awards are free (no need for stamps or dollars!) but you will still have to provide the evidence, declaration etc. Some of them are quite easy to achieve whereas others require a bit more time and patience, but if you don't get on air, you'll never work 'em! I'm sure if many of you have a dig around in your old log books you could be pleasantly surprised.

On a sadder note, I have to report that one of our GQRP Masters has become silent key. You may recall that previously in this column that I often referred to a great friend of mine who actually encouraged me in to the realms of QRP CW many years ago, George Davis G3ICO (GQRP 6406, QRP Master No. 86). I don't think that George ever used more than 5w in any of his contacts and being retired for some years, always had the advantage on me when it came to chasing DX and always seemed to clock up over 100 QRP countries every year with relative ease. George was made a QRP Master in 1996 and was still very active on air and with the Yeovil ARC up until very recently. I am sure I speak for all members of the QRP and DX community in saying that he will be very sadly missed.

However on a happier note I am very pleased to report that Chris Bisaillion VE3CBK has just been awarded his 150 DXCC QRP Countries certificate. Chris used a mixture of SSB and CW to achieve this and boasts a very impressive list of countries in his award, many of which were rarer African countries and islands. Hearty congratulations to him and long may it continue! Also I have just received a letter from Peter G4LDD who has successfully worked 40 GQRP members after trawling through his log books, so another certificate is winging its way on to him as we speak. Congratulations Peter, and it just goes to prove that many could be eligible for a club award if you do a bit of detective work retrospectively!

If you have any queries or need further information on club awards, please contact me at the address above or via email: RPike78088@btinternet.com

G-QRP mini-convention, Buildathon and HamFest

Martyn G3UKV (www.telfordhamfest.org.uk)

Following last year's successful event in Telford (Shropshire) the group at Telford & DARS are repeating the exercise. For your diaries, the Convention and Buildathon are taking place on Saturday evening the 1st of September (hotel venue tbc), and the Telford HamFest takes place the following day, Sunday 2nd September at the Enginuity site near Ironbridge. The Buildathon project, led by Steve G0FUW and designed by Heather M0HMO, is still under wraps, but it is going to be quite exclusive!

COMMUNICATIONS AND CONTESTS

Dom Baines, M1KTA, 34 Bury Road, Stapleford, CAMBRIDGE. CB22 5BP
m1kta@gqrp.co.uk

Firstly a personal apology to all members as this did not appear in the last issue so believed Winter Sports was not happening.
Please assume it will be next year just in case.

G QRP Club Winter Sports
The G QRP Club Winter Sports is one of the most popular QRP operating events. Each year between Boxing Day (December 26th) and New Year's Day (January 1st) the club invites any operators to join in a QRP "QSO Party" using 5 watts of RF output or less. The operating takes place on and around the International QRP Calling Frequencies.
These are : CW: 1836, 3560, 7030, 10116, 14060, 18096, 21060, 24906, 28060 and 60m 5262kHz
SSB: 3690, 7090, 14285, 21285, 18130, 24950, 28360kHz

Well done everyone who took part. Thanks to all for all of the entries both online (hope I didn't miss anyone) and postal especially some DX. I'll return all to you to you shortly, as in previous year especially those that seemed to have sent me some of the station log book pages. Please let me know if you think I have missed you.

Activity seemed a little varied this last year. There were 42 DXCC worked by everyone which was not bad for a week's part-time operating. The total was 1,892 qso altogether and 376 unique calls in all. These numbers are all down on last year, this must in part be due to conditions and my omission from last SPRAT. Once again I saw several members in some logs but didn't see an entry? There were QSO on all bands 160 to 15m and lots on 5262kHz. Once again there was a bit of 2m and 70cm activity in the middle of the period. As per last year I looked at the bands using SDR and then advised that if the QRP CoA

frequency is busy please spread out a bit if you can. Most entrants managed QSO on 3 or 4 bands, the most popular bands were 30m, 40m and 80m as always and 60m showed up much more this year. Self included, a few managed to work Santa Claus this year OJ9X and several YOTA stations appeared a few times as well. No 12m or 10m this year.

Yet again the antenna that seemed to be used most this year was the end fed half-wave followed by the G5RV. A few mentioned they have had Santa deliver new antennas and they were being put through their paces. (I hope the high winds that followed didn't cause you any issues).

George GM3OXX (RIP) always said that we can do nothing about poor band conditions and that we should just go on the air and do our best to make QRP QSOs. That is as true today as the day George said it.

A selection of comments ...
Propagation has been pretty awful lately, and QRP/QRP contacts can be difficult ...G3XJS
Perhaps patchy conditions, and increased local noise levels … G4HMC
It's been hard going at times but the contacts (admittedly, few and far between) have been there…. G3XJS
Activity was sluggish at first but seemed to pick up as Christmas receded. … G3XIZ
I never seem to find time to work as many stations as I would like…. G3NUA
...just finished assembling a QCX transceiver from QRPLabs ... fantastic little radio….G0ILN
..nice to see the different YOTA stations on air….

I could keep going on as many added some extra comments. Winter Sports week is the highlight of the QRP Club year. It should have been advertised well in advance….a few mentioned this.
Anyway this is a hard one to judge but the entrant that deserves the G4DQP Trophy this year was Val RW3AI.

CHELMSLEY TROPHY

Small range of entries after a slow start but this year head and shoulders above the chasing

pack yet again was Peter G3JFS #10890 with 84 DXCC.
Peter followed his success in last year.

".. Conditions have continued to deteriorate during the year making it more and more difficult to have meaningful qrp contacts. QSB remains the biggest problem as often you can reply to stations with good readable signals only to find that a few minutes later they have faded into the noise.
There are brief openings but you have to be lucky to be on at the right time. The secret of course is lots of careful listening.

Results for 2017 are:
719 QSOs - 589 on CW and 130 on SSB.
DXCC - 84 entities - 77 on CW and 54 on SSB.

Rigs used - Yaesu FT1000MP MK-V, ICOM 7100 and various homemade valve and transistor rigs. Max output 5 watts CW and 10 watts PEP on SSB.
Antennas - a 20m doublet and 15m long E/F with a remote Smartuner."

RSGB Spectrum Forum

Please note that the RSGB have also included a condensed version of the band plans which some might find easier to use as a reference.
http://rsgb.org/main/files/2018/02/2018-Band-Plans_RadCom_web.pdf

Antennas Valves and Vintage

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Welcome to AVV for Spring 2018. I wonder what happened to the GQRP Winter Sports at Christmas? I only heard a pitiful handful of members active and although the band conditions were allegedly poor my 5 watts signals from the homebrew one valver were briefly audible on the US reverse beacons on 80m on at least two occasions. There has been little F layer propagation in 2017 but with the right antenna we should still be able to make contact. Let's hope for an improvement in conditions during 2018 and more activity. ***David G4HMC,*** *one of the group keeping 5 MHz QRP active, has sent me details of his aerial system.* 'You asked for some details of the end fed aerial system here as used on 60m. Although my big (233ft) doublet aerial works really well on top band, 40m and above, it is a pretty poor performer on both 60 and 80m. I therefore needed to try something different for those bands. Discussing the problem with Roger **GW3UEP** I opted to try an end fed half-wave scheme with separate aerials for each band. Both aerials are arranged roughly as inverted Ls, the 60m aerial with a vertical section of about 30ft, the remaining 59ft roughly horizontal. The 80m half-wave aerial has 10ft vertical and then gradually slopes upwards to a tree support with a maximum height of 35ft. Both aerials are fed via 50ohm coax to individual remote matching units at ground level. For matching I've followed the excellent article by Steve Yates AA5TB which includes circuit diagrams. See www.aa5tb.com.

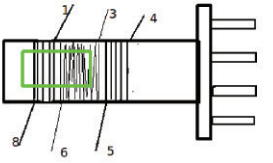
Steve recommends the classic parallel tuned link coupled arrangement with a counterpoise of optimum length 0.05 wavelength. I cut the aerial wire to length using the formula 468/frequency and both of the very short counterpoises lie on the ground. For the values of C and L in the matching units I simply used the rule of thumb 1pF per metre wavelength i.e. 60pF for 60m and 80pF for 80m, then being lazy I used an online resonance calculator for the values of L. Experimentation with the link winding might be necessary although assuming a feed impedance of 3000ohms I found a turns ratio of 8:1 was about right. So, for example, the 60m matching unit has a 2.5" dia. ceramic former with 24 turns with a 3 turn link wound tightly over the cold end of the coil and secured with insulating tape. Setting up, with a bridge at the input to the matching unit, apply a little RF and tune the parallel capacitor for minimum reflected reading which should be zero. Checking the reading at the shack end of the coax should result in a zero reading. If you cannot achieve a zero reflected reading then you must experiment with the number of link turns. For 60m I've tuned the matching unit for 5.262 MHz and for 80m to 3.727 MHz, the home brew net frequency. However as I want to work on 3.560 MHz, I can switch in an additional 20pF or so parallel C by feeding 12V down the coax to a relay in the matching unit. In practice, on 80m an excursion of up to 40 kHz either side of the chosen frequencies results in a SWR of 1.5:1. On 60m it is about 50 kHz. For me that is quite tolerable as I tend to work on or near a few spot frequencies. For QRP work receiver type variable capacitors should suffice in a matching unit for use up to about 10 watts. However, as high voltages are involved with end feeding, wide spaced variables should be used for higher powers. In

use, at higher powers of up to 200w, there is no evidence of RF in the shack or any sign of instability. Both aerials perform very well indeed with reports of 6dB or more improvement on 60 and 80m over my 233ft doublet. Both matching units are built on plywood baseboards and enclosed in upturned plastic storage boxes. A box top thus becomes a base. The boxes are available from any good hardware stores including Wilkinson's. I've used these boxes now for several years and they have proved entirely weatherproof. Just set them on a slight slope, and the upturned rim acts as an effective drainage channel with a few holes drilled at the low point. You will need to drill a hole in the base for the coax cable entry. The ends of the aerial and counterpoise wires can be sandwiched between the base and the top with a friction fit when the boxes are clicked shut. 72 es 73 David G4HMC. Thanks David for this and the activity on 5262 KHz.

Geoff G3YVF recently had to wind a coil for his Codar CR45 TRF receiver. He's managed to reproduce the coil using an old valve base and a plastic tube.

green denco TRf coil, range 3 approx 1.7 to 5MHz.

Wind all coils in the same direction. No gap between the coils. Middle coil scramble wound, outer coils slose wound.



pins 2 and 7 removed as not used.

Ten turns on the outer coils and 37 turns on the middle coil. When correct tuning range established a light doping of varnish applied.

***Chris G3XIZ** is a prolific operator and constructor who has constructed many items of equipment related to valve QRP. At first sight this next project may seem daunting but it is capable of testing many valves that are still in circulation. A larger copy of the circuit is available directly from Chris.*

A VERSATILE VALVE TESTER - G3XIZ

I was greatly inspired to make a valve tester after reading G3VKQ's article in last summer's Sprat. My interest in valves had been rekindled by the 'Valve Activity' days organised by Colin G3VTT and as I had several drawers full of valves of unknown pedigree which needed testing and grading. G3VKQ's circuit was the very epitome of simplicity and would doubtless test a variety of valves but it was necessarily limited in its range of supply voltages and the layout was left open to interpretation. It's been many years since I used a valve tester in anger and that was the AVO Mk II – a most excellent and well designed piece of equipment, so I decided to make a unit long similar lines. Like the AVO Mk II my home made unit has a sloping front panel and the valves are inserted into suitable holders on the top.

The works are housed in a stout, varnished plywood box. The Mk II had a beautiful bank of numbered selector switches by which the appropriate electrode was connected to the corresponding supply. My unit, like G3VKQ's uses jumper leads for this purpose as such switches were unobtainable.
My unit has facilities for three common valve bases: B9A, B7G and International Octal (IO). Valves with other bases may be tested by means of an external adapter which connects to the main unit via a lead to the IO socket.

SPECIFICATION

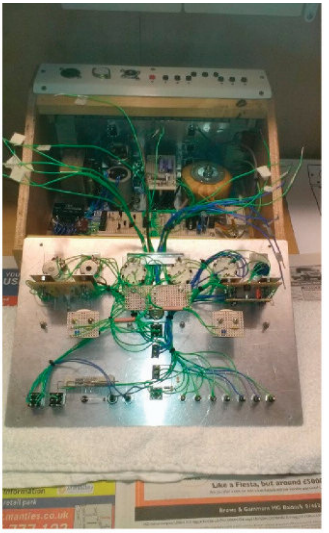
The unit can supply the following:

Anode	Va – 0 to 250V @ 100 mA	continuously variable
Screen grid	Vs – 0 to 250V @ 30 mA	current limited and regulated
Grid	Vg – 0 to -10V and 0 to -50V	continuously variable
Heater	Vh – 1.4V, 6.3V, 12.6V and variable to 25V	DC max 1.5A

The following parameters may be monitored using the front panel m/c meters:

Anode voltage	Va	Anode current	Ia
Screen voltage	Vs	Screen current	Is
Grid bias voltage	Vg		
Heater voltage	Vh	Heater current	Ih

Heater - cathode insulation and Heater continuity



The following parameters may be deduced from the above measurements:

- emission
- mutual conductance (gm)
- anode resistance
- amplification factor
- gas test.

CIRCUIT DESCRIPTION

Although appearing somewhat complex the circuit is in fact only a series of power supplies with associated switching and metering. Two meters were preferred to the usual one (as on the AVO MK IV) as it is useful to simultaneously monitor the grid voltage and anode current without the necessity of meter switching. The meters are protected from serious overload by diode – resistor networks. The HT to both the anode and screen grid are switched and indicated using neon lamps to prevent and warn against inadvertent handling of the jumper leads when the HT is applied.

USE OF THE TESTER

Reference must be made to the valve manufacturer's handbook or data sheet and the appropriate jumpers configured. The default start position for the tester is with all the controls anti-clockwise and all switches up; this gives minimum starting voltages, maximum bias and minimum meter sensitivity.

Once the jumpers are connected (and checked) and the test valve inserted the unit is switched on. The heater-cathode insulation is first checked. The appropriate heater voltage is then set and its current monitored.

EMISSION TEST

The anode and (if appropriate) the screen grid voltages are set next, noting the corresponding currents. These should be very low as the grid bias is presently set at its maximum of -50V.The bias is gradually reduced to the manufacture's specified value and the anode and screen currents again monitored and compared to values on the data sheet. This is a good indication of the valve's emission.

MUTUAL CONDUCTANCE (Gm)

To derive the gm (mutual conductance) one notes the relative (small) change of anode current which results from the corresponding change in grid voltage.

GAS TEST

With the anode current at its steady level press the 'gas test' switch. A small change only should result in the anode current otherwise the valve's vacuum has been compromised.

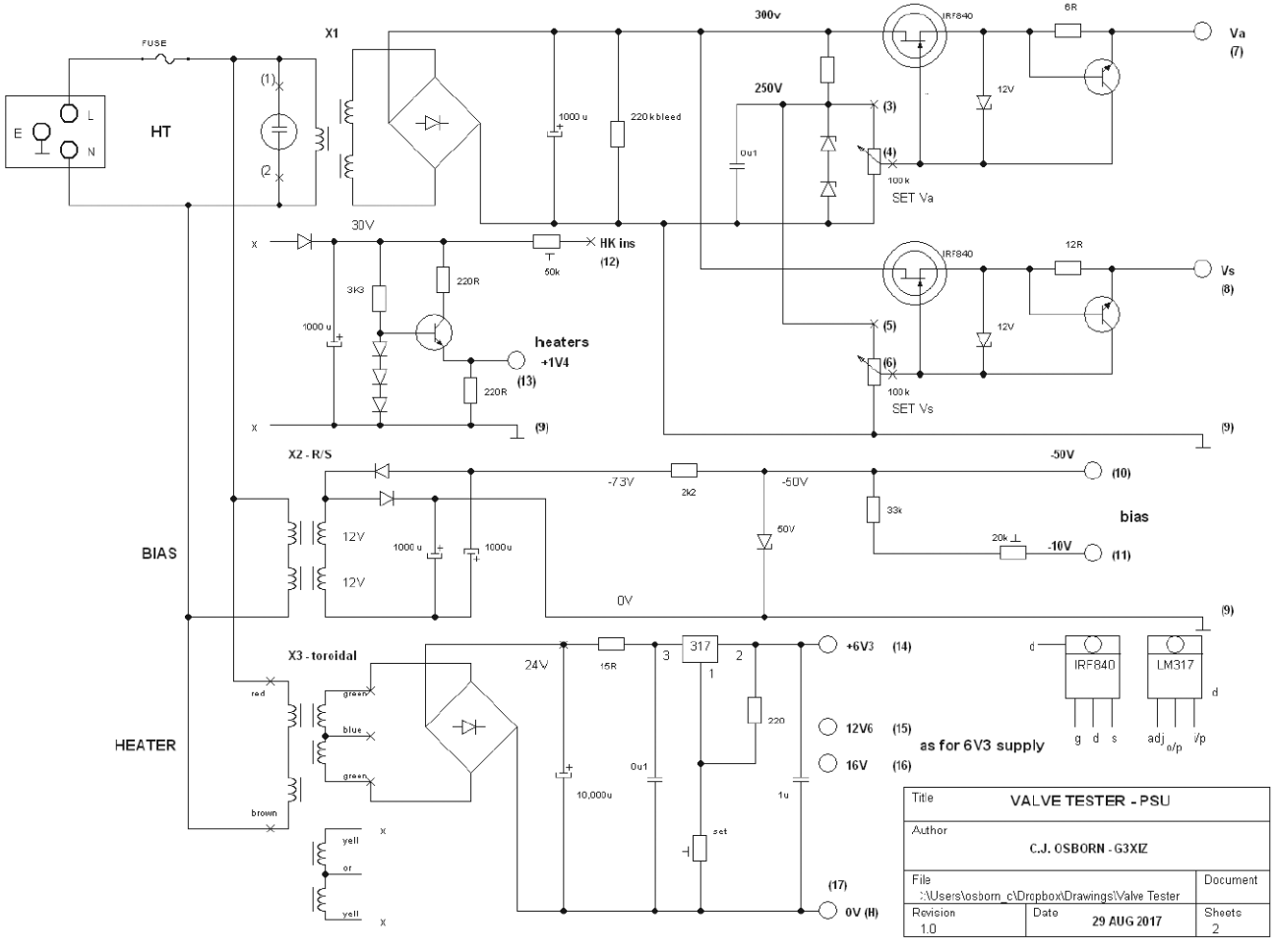
ANODE LOAD

The anode load RL switch may be utilised to place a 10k resistor in series with the anode. This is useful on occasion and especially when testing voltage stabilizers (neon).

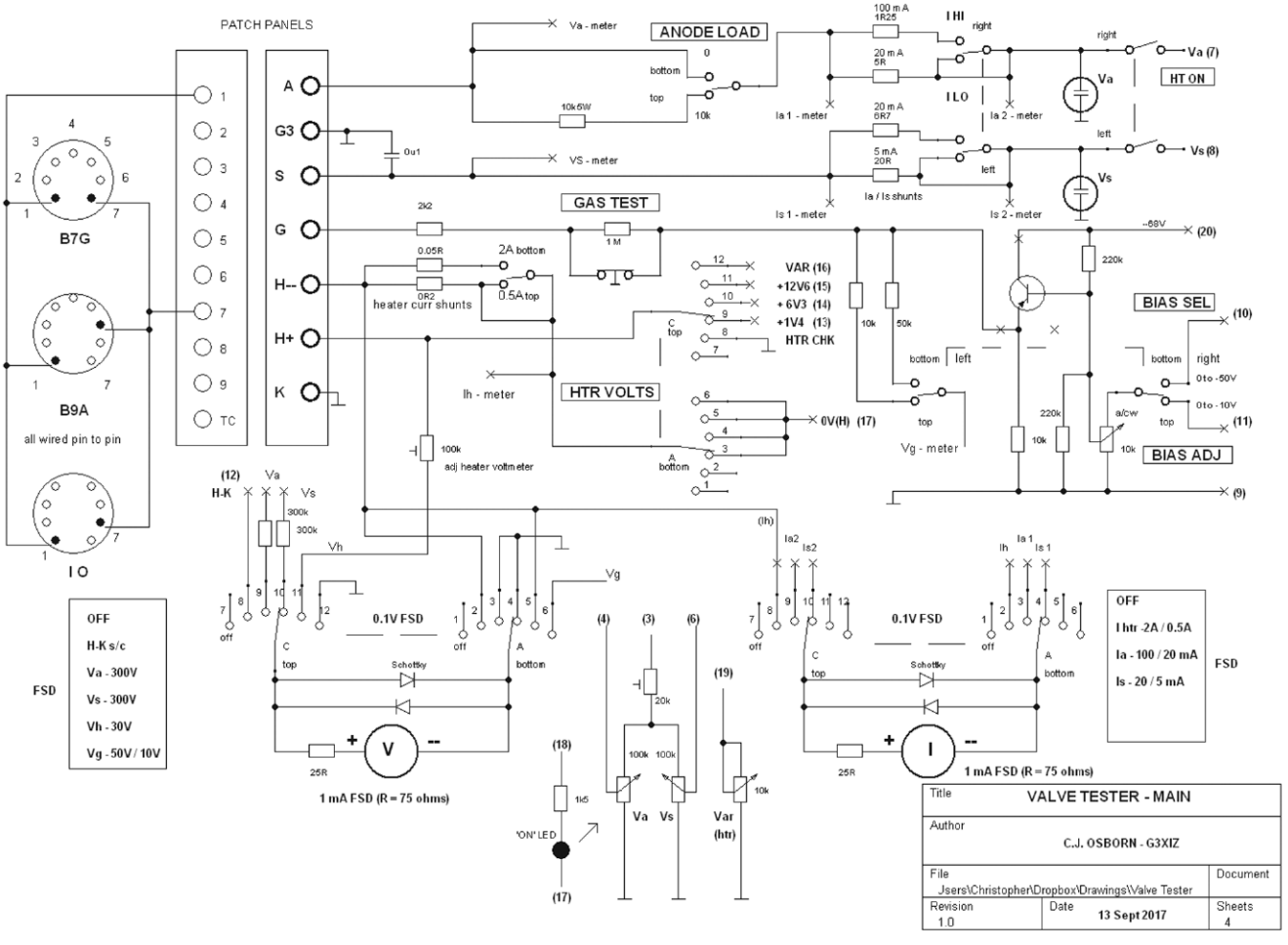
CONCLUSION

I must be in a very small minority of enthusiasts who build valve testers these days. The project took many hours to complete and the circuit was continually being changed to suit component availability. The unit works well and is a pleasure to use so my endeavours were not wasted and I learned some new techniques along the way. Should anyone be interested I'll be happy to supply circuits and information on request via E-mail or SAE. The circuits are on the following two pages of Sprat.

That's it for the Spring AVV and I would like to thank the contributors again. The circuit diagram of the G3XIZ valve tester is on the next two pages. I have some interesting valve equipment coming up in the summer issue of Sprat and of course the next valve (tube) QRP Weekend will be on Saturday and Sunday April 21st and 22nd 2018. Please use your old time valve QRP equipment on the usual frequencies and send brief details of your contacts and equipment used to G3VTT and g3vtt@aol.com not more than 14 days after the event to meet the Sprat AVV deadline. Pictures of your equipment are welcome plus any circuit details in Word please.



Title	VALVE TESTER - PSU	
Author	C.J. OSBORN - G3XIZ	
File	:\Users\osborn_c\Dropbox\Drawings\Valve Tester	Document
Revision 1.0	Date 29 AUG 2017	Sheets 2


PATCH PANELS
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B9A
all wired pin to pin
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Va - meter
VS - meter
ANODE LOAD
0
bottom
top
10k
10k5W
0u1
100 mA 1R25
20 mA 5R
20 mA 6R7
5 mA 20R
I HI
I LO
right
left
Va
Vs
HT ON
Va (7)
Vs (8)
Ia 1 - meter
Ia 2 - meter
Ia / Is shunts
Is 1 - meter
Is 2 - meter
GAS TEST
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1 M
0.05R
0R2
heater curr shunts
2A bottom
0.5A top
VAR (16)
+12V6 (15)
+ 6V3 (14)
+1V4 (13)
HTR CHK
Ih - meter
HTR VOLTS
6V(H) (17)
100k
adj heater voltmeter
~68V
(20)
220k
10k
50k
BIAS SEL
(10)
0 to -50V
0 to -10V
(11)
BIAS ADJ
a/cw
(9)
Vg - meter
(12)
H-K
Va
Vs
300k
Vh
Vg
0.1V FSD
off
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top
A
bottom
Schottky
25R
1 mA FSD (R = 75 ohms)
(Ih)
Ia2
Is2
Ia 1
Is 1
(4)
(3)
(6)
(18)
(19)
20k
1k5
'ON' LED
(17)
100k
Va
Vs
Var (htr)
FSD
OFF
H-K s/c
Va - 300V
Vs - 300V
Vh - 30V
Vg - 50V / 10V
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I htr -2A / 0.5A
Ia - 100 / 20 mA
Is - 20 / 5 mA
Title
VALVE TESTER - MAIN
Author
C.J. OSBORN - G3XIZ
File
Jsers\Christopher\Dropbox\Drawings\Valve Tester
Document
Revision
1.0
Date
13 Sept 2017
Sheets
4

MEMBERS' NEWS

by Chris Page, G4BUE

E-mail: chris@g4bue.com

Members continue to show their sadness at the passing of **GM3OXX** reported in *SPRAT* 173. **GØEBQ** writes, "So sorry to hear about **GM3OXX**. There's nothing to say that hasn't been said. My OXO was my first QRP rig from back in the 1980s, I've worked the USA with it, and got it out again the other day as a sort of tribute to George and had a solid two-way QRP QSO with an OH station. **G3XJS**, whilst commenting on the low level of activity and poor conditions in the Winter Sports, said, "George, **GM3OXX**, (RIP) always said that we can do nothing about poor band conditions and that we should just go on the air and do our best to make QRP QSOs. That is as true today as the day George said it!". I agree.

G4GIR has constructed three QRP Labs QCX transceivers for 30, 20 and 17m. Ian says he had a few problems but otherwise all went together well, and he has been using them on WSPR with some good results on 30m. He has incorporated an AGC mod and a variable power output control from 0-6W. He says, "When band conditions recover, I am hoping to get some CW QSOs on 17m". **G3XGY** asks, "I know there is no Foxx-3 kit for 17m, but I have the xtals. Does anyone know if it's been attempted, possibly with a modified 20m version?".

GØXAR has also made the 30m version of **GØUPL**'s QCX kit which he says is a very good project despite making a couple of mistakes, nowadays known as learning points! He says Hans has now published a comprehensive fault finding guide on his website. Steve had planned to take the radio with him on one of his regular trips to Budapest in February, but ran out of time to test it. While in Budapest he visited Mikrovill, a component shop a short walk from the Deli Railway Station <http://mikrovillkft.hu/>. Steve says they have a wide range of stock including valves and hard to find articles, and the prices are reasonable. He bought a brand new triple-gang variable capacitor in a shielded box with a slow-motion drive for £1.50. The snag is that the staff don't speak English, so any visitors should take a picture of what they want, or a paper and pencil!

Welcome to new member **MØRON** who describes the *SPRAT* CD as. "Excellent CD, full of good ideas and well worth the paltry cost". Andy was planning to warm up his soldering iron after Christmas. Welcome also to 85 year old new member **GØTUJ** who is 'stone deaf' except "to the sweet strains of Morse". Walt was looking to be QRV with a 1-5W CW rig and indoor antenna. **G3JFS** suggests looking at the Reverse Beacon Network (RBN) after

you have sent a few CQ calls and you could be surprised at the places your signals have reached. Peter writes, "Sadly the days of working the world with 5W and a bit of wet string are gone for the foreseeable future". Enter your callsign on the RBN at <http://www.reversebeacon.net/srch.php>.

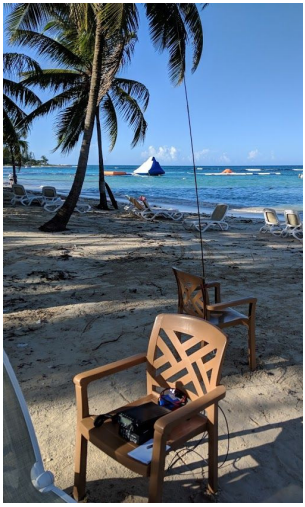
IW1PAG read in *SPRAT* about the 'valve days' activities and is preparing to use these old 'warm' technologies. Doriano doesn't have a valve transmitter but has a Trio 9R-59DS valve receiver in good working condition and will arrange it with the wonderful (for him) old Yaesu FT-767GX transmitter and the 'Extern Receiver' function to commute to the Trio receiver. He intends to build a simple valve transmitter, but at the moment says that if he contacts someone, it will not be complete but 'half valve' equipment!

M1KTA took part in the RSGB AFS contests on 40 and 80m in January which has large contest groups and lots of high power stations taking part. Dom heard quite a few G-QRP members calls in both the CW and SSB legs. Although conditions were reported as 'terrible' the leading QRP (10W) station in the CW leg, **G3SWC**, made 169 QSOs, and the runner-up, **MØRYB**, made 160. There were 18 QRP entrants and Dom made 56 QSOs with his 40m GP and 80m dipole at 50 feet as the sole G-QRP Club entrant. There were 19 QRP (10W) stations in the SSB leg results and **G3SWC** was again the winner with 151 QSOs and **G3KAF** runner-up with 146. Dom made 46 QSOs, again as the sole G-QRP Club entrant. The 2019 contests will be on 6 (CW) and 13 (SSB) January. Why not consider joining Dom in making up a full G-QRP Club team in 2019? There can be a maximum of four stations in each team.

The above photograph shows CQ Scotland Group's 'Kits for Kids' project <https://www.cqscotland.com/> in progress at Hamilton on 23 January. **MMØHQD** has been buying components from Asia recently and bagging them up into small electronic projects for the Group, who then give them away to the parents of local kids as an introduction to the hobby of electronics and amateur radio. David asks if members would consider helping, so more kits could be sent more widely around the UK? David, writes, "Here's how members

could help: 1. Send us components you no longer need, a 'Components Wanted List' is available on request. 2. When next placing an order for parts, you order items that are on our 'Components Wanted List'. If this way of promoting a hobby that we have been enjoying for many years appeals, please do get in touch. Let's see what we can achieve together!". David's email is <davidmm0hqd@gmail.com>.

In a later email David thanked all those member who contacted with offers of surplus components to be passed along to the young builders! He will be on stand 13 and 14 (next to the G-QRP Club) at the Glasgow ASRA Rally on 20 May, and says all are welcome to drop by for a chat and hand in components no longer required. I think this is a wonderful project and one of the best I have heard of to encourage young people into our hobby. The project is supported by the RSGB and I hope other amateur radio clubs in the UK will follow the idea. From a personal point of view, it has solved a problem for me! After 21 years at this QTH my wife and I have decided to 'downsize' to a smaller QTH later this year, and I am in the process of sorting through all the radio equipment and components I have accumulated since 1973 when I was first licensed. I was wondering what to do with everything I won't need and now have an answer for the smaller components!

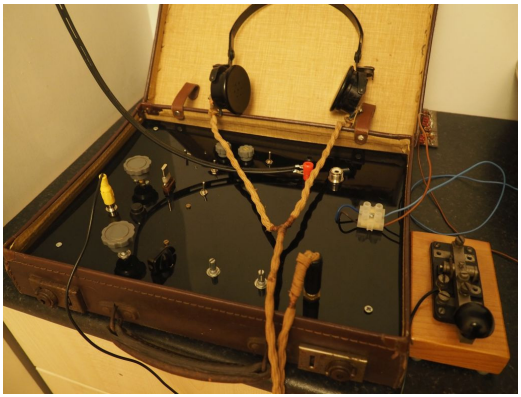


The photograph far left shows **VE3IPS**'s lovely operating position as **6Y5IPS** in January, practising beach-side SSB operations in Jamaica. John managed a few 40m contacts for Winter Field Day and worked EA8 on 20m SSB with 10W with the Yaesu FT-891 and 10 feet vertical coupled to a Chameleon Hybrid Micro balun, (second photograph). He also used the Packtenna Mini 1:1 balun with a homebrew SOTA style linked dipole. John writes, "Band conditions were horrible but the bottled Guinness Stout was not! A passerby asked, 'Are you busy on the short-waves?' and so I made new friends and learned how to play Rummikub with UK visitors from Kent. Only the UK would use the term 'short-waves'!"

G3JFS has experienced every sun-spot cycle since 1947 and says there is no doubt that this one is by far the worst and, if current predictions are correct, it will be a long time before sun-spot cycles get any better. At times, Peter says he is finding it difficult to have meaningful QSOs with QRP and often has to be content with a few 5NN rubber stamp type contacts. In 2017 he made over 900 QRP contacts with 88 DXCC, 77 on CW, 54 on SSB, 44 on RTTY and 37 on other data modes. This year, as at 10 February, he has over 100 QRP contacts with 32 DXCC on CW, largely the result of taking part in NAQCC and Club 72 activities. Peter suggests the moral is to get on and operate no matter how bad things might seem (echoing the words of **GM3OXX** in my opening paragraph).

GØEBQ's latest project is the suitcase radio (shown on the top of the next page). Nigel is calling it a 'nod to the Paraset' rather than an attempt to copy it exactly. It is solid state based on **KD1JV**'s MAS-80, built in an evacuee's suitcase (according to the *eBay* seller!) with a built in ATU based on the club kit, a pair of SG Brown phones dated 1940, and an ex-WD key and vintage Eddystone knobs. Nigel says, "Our club is in the process of building a shack in what was the old Martlesham airfield where Douglas Bader was based and I

hope to use it on open days there with a battery and throw-out antenna as a totally portable unit. I do find QSOs hard to come by since, although the regen receiver is very sensitive, the crystal controlled TX is invariably off the frequency of the station I want to call! His next project is a valve rig.

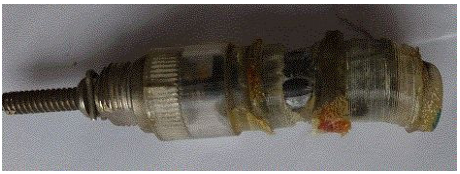


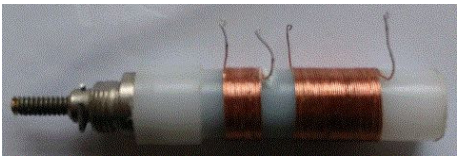
Earlier this year, **5B8DA** says the designer of the BitX20 put plans up at <http://www.phonestack.com/farhan/ubitx/ubitx.html> for a 3-30MHz TCVR, and has now announced a kit with populated boards availble for $109. Paul says the website at <http://www.hfsignals.com/> says it is, "A fully tested and tuned µBITX HF TCVR board (6 x 5½ inches). The Raduino board with display with µBITX firmware installed. Detent-free tuning encoder with push button for menu access, three audio sockets for the mic, earphones, and keyer. A high quality BNC antenna connector and power supply connector". He says you have to supply your own enclosure, PSU, microphone case and speaker to complete the radio. Paul adds, "I might give it a go after I've received and built my QCX".

DDØVR planned to be in the Carribean in December and January and hoped to be QRV 17/31 December from Barbados as **8PØVR**, 31 December/10 January as **FM/DDØVR** from Martinique , 10/14 January from Dominica as **J7ØVR** and 14/20 January from Guadeloupe as **FG/DDØVR**. The photograph left shows Heli's travelling equipment, consisting of KX3 + HL-1.1KFX 500W for SSB QRO and KX2 + Begali Adventure, 5-10W for QRP. Antennas are Hyend <https://www.hyendcompany.nl/> 20-40m 4kW, multiband 800W and a mostly self-build quad for 20, 15 and 10m if space. **W2APF** is QRV 17 February/14 April as **CT/W2APF** from Castro Marim, Portugal. Thaire will use a KX3 and wire antennas and operation will be 'holiday style' on whatever bands are open, and he, "May even get up the courage to try FT8!". **M1KTA** will be QRV 10/11 March for the BERU Contest, and a few days after, as **C6AKT** using homebrew equipment (even the PSU) with a K2 and a ATS-3B. Antennas will be a 20m VDA, four-square on 40m and two-element on 80m. Dom hopes to QSO UK QRPers.

RV3GM experimented with a 75mW ouput one transistor TX in January and on some days managed two to four QSOs using a two-el wire beam antenna on 14060kHz +/- VXO. To identify he was using less than 100mW, Oleg offered code QRPx. He says, "Currently there are 50 QRPx QSOs in my log with 19 DXCC, the best being **G3XJS** near London. Peter used QRP 3W to a Hexbeam. I am often active QRPx in the 'Rendezvous' QRP roundtables on Tuesday, Thursday and Saturdays at 1200z on 14060kHz and happy for QSOs".

G4GIR has acquired a very fine condition AR88 serial no 00726 that belonged to **G3IIY** (SK) who, according to **G4AQS**, acquired it from **G3INN** who bought it back to G from DL. The photograph top right of the next page shows it in **G3IIY**'s shack. Ian says it powered up and appeared to work fine, however it wouldn't peak on Range 2 and investigation





found the Range 2 antenna input coil had melted, RF into the front-end he would guess. The photographs above show the original, and Ian's re-made Range 2 coil former below. All the bathtub capacitors have been re-stuffed and the 'horrid' micamold capacitors replaced. He just now needs to get hold of an SSG to sweep the IF's and perform a full alignment.

GØEBQ has just finished the Skeleton TX from *SPRAT* 173 (page 29) with the space charge 12v RX, just about to test drive it. Nigel says, "It is a real bad boy!" and thanks **G3YVF** the author for all his kind advice. **GØXAR** is learning 3D printing so he can make his own project cases and other radio things. Steve made his own printer from a kit, and says it was, "A bit like *Lego* for grown ups"! At the beginning of February **W4OP** said he had a pretty much complete kit of the Hands Electronics RTX-10, except for any information on the front panel board, documents or schematic. "Can anyone assist?", he asks. Dale can scan and post other module manuals if anyone needs them. His email is <parinc1@frontier.com>.

At the beginning of February **2E1HFH** asked for advice on the G-QRP mailing list to build a BFO. **G4DBN** suggested a CMOS hex inverter like a 74HC04 in a DIL14 package, see <http://electronbunker.ca/eb/SignalGen455.html>. Neil said if you want to trim the frequency, it might need a variable cap from one leg of the resonator to ground, and to look on ExtremeCircuits for the details. He would ditch the zener and R6 and power it from a three-terminal 6V regulator. Neil built the 74HC04 version using dead-bug technique on a bit of PCB offcut soldered into a tiny tinplate box. **G3OOU** says a CMOS oscillators may be very convenient in terms of component count but they can generate a lot of harmonics. A JFET Pierce oscillator does not require a lot of components and should be reliable in operation from a 6-9V supply but, as a high impedance device, it will require some form of buffering to connect to an external circuit.

Thanks to the contributors to this column. Please let me know how your spring goes for the Summer 2018 edition of *SPRAT*; what you have been building, who you have been working, and any other information about QRP, by 10 May. Also, interesting pictures, please don't be shy in letting members see what you have been building and/or where you have been operating from, your antennas, who you have been meeting and even a shack picture to let other members know what you and your equipment look like. Let me know if you intend operating from somewhere other than home during the summer and autumn months so I can let members know to listen out for you.

QSL Cards from Nasko - LZ1 YE

LZ1YE has sent me details of some attractive QSL cards including the Club Log.
Members can make their orders by sending samples, explaining what they want to print, and sending the materials: photos, files...etc via e-mail: qsl@qslprint.com or qsl@kz.orbitel.bg or if no internet access via the postal address: Atanas Kolev, P.O.Box 49, 6100 Kazanlak, Bulgaria. Examples of cards and prices can be seen at **www.qslprint.com**
For people need QSL cards urgently LZ1YE dispatches three days after the payment is made. UK Members can pay via a UK address: Please send your cheque / cash via recorded delivery to: LZ1YE QSP Print service, c/o Melanie Rowe, St. Leonards House, 35 St. Leonards Road, Exeter, EX2 – 4LR, Devon. e-mail: m0mja@aol.com (make cheques payable to : Melanie Rowe)

GQRP Club Sales

Graham Firth, G3MFJ, 13 Wynmore Drive, Bramhope, LEEDS. LS16 9DQ

Antenna Handbook – 2nd edition – **members price £6.00 plus post** } **£2.00 (UK) or £5.50 EU**

Radio Projects volumes 1, 2, 3 & 4 – **by Drew Diamond – members price - £6 each book + post}** } or **£8.00 DX per book**

6 pole 9MHz SSB crystal filter (2.2kHz) £12 plus post **(max of one)** } **£3.50 (UK); or**

Polyvaricon capacitors – 2 gang (A = 8 to 140pF + O = 6 to 60pF) c/w shaft extension & mtg screws - **£1.75 each** } **£3.80p (EU); or**

– 2 gang – (both 8 to 285pF) c/w shaft extension & mounting screws - **£1.75 each** } **£4.50p (DX)**

A Pair of LSB/USB carrier crystals HC49U wires - [9MHz ± 1.5kHz] **£4 pair** } **All components**

HC49U (wire) crystals for all **CW** calling freqs – 1.836, 3,560*, 7.015, 7.028, 7.030* 7.040, 7.045 } plus **postage**

7.122, 10.106, 10.116*, 14,060*, 18.086, 21.060, 24.096 & 28.060 all are **£2 each** } **(ANY quantity)**

HC49U crystals- 1.8432, 3.5, 5.262, 7.0, 10.006, 10.111, 11.5, 14.0, 22.0, 29.0MHz – **50p each** } £1.20p (UK), or

HC49U crystals – 2.00, 3.00, 3.20, 3.579, 3.6864, 4.0, 4.096, 4.1943, 4.433, 4.5, 5.0, 6.0MHz } £3.50p (EU)

7.2, 7.6. 8.0, 9.0, 10.0, 11.0, 12.0, 13.50, 15.0, 16.0, 18.0, 20.0, 24.0, 25.0, 26.0, 27.0, 28.0MHz } £4.00 (DX)

28.224, 30.0, 32.0, 33, 40, 48MHz – **all 35p each** (Some of these are low profile) } Post free

Ceramic resonators – 455, 480kHz, 2.0, 3.58, 3.68, 4.00, 7.37, 14.32 & 20.00MHz **– 50p ea.** } if ordered with

Diodes - Schottky signal diode – 1N5711- 20p each; 1N4148 GP Si – 10 for 10p } with heavier

Varicap diodes - MVAM109 – 40pF @ 9v, 500pF @ 1v. **50p each** } things

- BB204 – twin diodes, common cathode, 15pF @ 20v, 50pF @ 1v **50p** } like binders,

SA602AN - £1.50 (note – I may supply NE or SA, 602 or 612 as available. SA612AD – SMD SOIC-8 £1.40 } toroids

MC1350 - £2.00 These are getting in short supply now so max of 2 per member } polyvaricons

LM386N-1 - 4 to 15v, 300mW, 8pin **DIL - £0.45, LM386M-1 SMD – 35p** } or filters

TDA7052A - 4.5 to 18v, 1W 8pin **DIL** low noise & DC vol control – **£0.60 each** } Use just

TDA2003 - 10w Audio amp 5pin – **£0.25 each** } that postage

TDA2822 - 1.8 to 15v stereo amp – can be bridged. 0.5WAudio amp 8pin DIL – **£0.20 each** } that postage

TA-7642 Radio IC – direct equivalent of **MK484** (& ZN414) – **75p each** }

2SC536 transistors (npn) fT - 100MHz, hFE-320, VCBO +40V **- 5 for 50p** } If ordered

MPSH10 transistors (npn) fT - 650MHz, hFE 60, VCEO 25V **- 10p each, 10 for 80p** } with books

2N3904 transistors (npn) fT - 300MHz, hFE-150, VCBO +40V **- 10 for 50p** } or DVDs

2N3906 transistors (pnp) fT - 250MHz, hFE-150, VCBO -40V **- 10 for 50p** } add this

BC517 Darlington (npn) fT - 200MHz, hFE-30,000, VCBO +40V **- 13p each, 10 for £1.10** } postage

FETs - IRF510 – 50p; 2N3819 - 24p; 2N7000 - 10p; BS170 – 8p - all each } as books

BF981 – dual gate MOSFET – 40p each } or DVDs

Pad cutter - 2mm shaft: 7mm o/s, 5mm i/s diam, gives a 5mm pad with 1mm gap **£6.00** } do not

10K 10mm coils – 0.6uH, 1u2H, 1u7L, 2u6L, 5u3L, 11u0L, 45u0L, 90u0L, 125uL – all 80p each } travel well

Magnet Wire – 18SWG – 2 metres – 60p; 20 & 22 SWG – 3 metres - 60p; } with parts.

24, 25 & 27SWG – 4 metres - 40p; 30, 33 & 35SWG – 5 metres - 30p. }

Bifilar wire – 2 strands - red & green bonded together. Solderable enamel. }

21SWG (0.8mm dia) – 2metres - £1; 26SWG (0.45mm dia) – 3metres – 70p }

Litz wire – double silk covered multi-strand wire 7/.04mm -12p, 14/.04mm. 25p. Both for 3 metres. }

All our wire is solderable enamel insulated. Max of 3 sizes per member per order }

QRP heatsinks - TO92 – 30p; TO39/TO5 – 40p; TO18/TO72 – 60p (pics in Sprat 148) }

Axial lead inductors (they look like fat ¼W resistors) these are low current }

3.3, 4.7, 6.8, 10, 15, 18, 22, 33, 39, 47, 56, 100, 150, 220 and 1000 - all uH, all 18p each. }

Toroid Cores – priced per pack of 5 – max of 2 packs of each per member

T25-2 – 50p, T25-6 – 60p, T30-2 – 70p; T30-6 – 80p ; T37-2 – 80p; T37-6 – 80p; T50-1 - £1.00; T50-2 – 90p; } **Postage for**

T50-6 – £1.10; T50-7 - £1.20; T50-10 - £1.20 ; T68-2 - £1.80 ; T68-6 - £2.40; T130-6** - £2.40ea. FT37-43 – 90p } **toroids includes**

FT50-43 - £1.20 ; FT37-61 - £1.20 ; FT50-61 - £2.40; Ferrite beads – FB43-101 (3.5mm dia x 3.2mm long, } **postage for all**

1.2mm dia hole) – 40p for 5: BN43-2402 - £1.20; BN43-202 - £2.00; BN43-302 - £2.00; BN61-202 - £2.40. } **small parts**

All toroids are plus postage – up to 5 packs = £1.20 (UK), £3.50 (EU), £4.50 (DX). Each additional 5 packs, please add 50%

**** Except ** item** – they are heavy and each counts as a pack (ask for quote if you want more than 2 of the large toroids)

SBSS PCB clamps * – sorry – all sold out now, and no more expected.

MeSquares & MePads * - £6.50 each plus post (UK & EU as parts for up to 4) : will DX please order direct from Rex)

STIX board * – 3" x 1", 80 x 0.15 square pads plus 2 x SOIC pads. £3.75 each. Will post with parts for no extra postage.

QRPme Brass sets * – PCB feet to lift the board off the table - £10 plus post as for components - DX order direct from Rex)

*** these items from Rex's stock are pictured on the website.**

Limerick Sudden kits RX & TX both single band (160 through 20m); **ATU** (80 through 10m) **£40.00 each plus post** UK - £3.50, EU - £5.40, DX - £8.00

Sprat-on-DVD – 1 to 172. Only £5 each to members plus postage, UK - £1, EU - £3, DX - £4.00

Sprat Binders – nylon string type – Black with club logo on spine -16 issues per binder – **new stock** - £6.00 each plus postage (one: UK - £2.00, EU – £4.00, DX - £5.00. More - add £1.10, £1.50, £2.50 each)

Cheques (UK) and payable to G-QRP Club. MINIMUM ORDER for cheque or PayPal payments is £5

You can also pay by BACS. The numbers you will need to do that are - sort: 01-07-44 and a/c: 54738210

I can accept cash in GBPounds, or US$/ €uros (at the current exchange rates) – but please send securely! You can order via e-mail and pay by PayPal - use sales@gqrp.co.uk – and pay us in GBPounds and you MUST include your membership number and address please. PayPal charge us about 4% so a contribution towards that is always welcome, or, send as a gift to friends/family - thanks