



SPRAT

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DEVOTED TO LOW POWER COMMUNICATION

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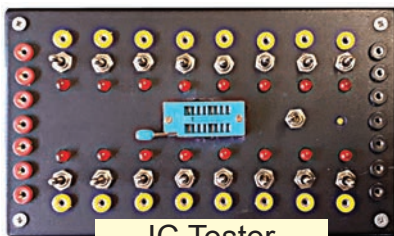
Oner revisited



Inverted 'L'



Less Painful Toroids



IC Tester

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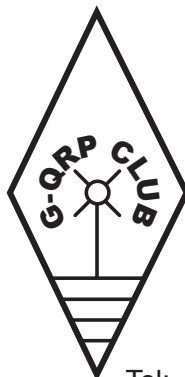
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JOURNAL OF THE G-QRP CLUB



Our founder George Dobbs G3RJV (SK)



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Just after the last *SPRAT* went to print, I received the sad news that **Anne G4VAH**, had passed away. Many long-term members will no doubt recall seeing Anne with her husband **Bob G4JFN**, also silent key, at rallies and conventions; their enthusiasm, cheery faces and disposition were enjoyed by all. Both Bob and Anne devoted much time to the Club for which we were all most grateful and our thoughts are with their family.

The other silent key of note was the sudden passing of **Dave, GM3WIL**, in April. I know he was very much looking forward to our first Scottish G-QRP Convention for many years. Dave was a fixture at our Scottish Club Sales stands working with **Roy, GM4VKI**. Dave's contribution and friendship will be very much missed by many.

Just as this *SPRAT* was going to press, we had to take the sad decision to postpone both the Telford and Prestwick Conventions until 2021. We hope to provide some kind of virtual Convention in September so please keep an eye on the Club e-mail group, GB2RS, PW and the like, for an announcement.

Congratulations go to **Colin, G3VTT**, for being this year's recipient of the **RSGB G4STT memorial trophy**, which is a gold NorCal20. Colin has been working tirelessly for the Club for many years and the recognition is long over due – three cheers for Colin!

I have been doing some trials with some new 'high spec' coils from Spectrum Communications. The results are certainly better than the previous versions but I need to do more detailed tests before I can say how much better. Spectrum are also now stocking kits for the Super Sudden receiver from *SPRAT* 181.

Hopefully by the time *SPRAT* is printed we will have some degree of normality returned to us. However, the important thing is that we all stay safe and healthy to enjoy life post virus and into sunspot cycle 25.

Steve Hartley, G0FUW
Chairman GQRP Club
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30m VFO controlled TxRx+sidetone for CW

Bill G4EHT – 558

Recently I submitted a crystal controlled TX for 20m. I trust that some members have built that simple TX and had fun and success. There was one member in particular- Rob... N7REP who was contemplating building it but hoping to use it on 30m. This seemed a easy task as just the crystal change in the VXO and the Low Pass Filter was all that was required.

Rob contacted me to say that he was pleased it was working, (in its trial stages) although he only managed 2W output, rather than five of my original project, but he felt that would be sufficient for him on 30m. As 30m is one of very few bands that I have not built any QRP gear for, I decided that perhaps I too ought to..... give it a go!

Firstly, I needed crystals so I ordered two (10.106 & 10.116MHz) from the QRP club. I built the VXO but used a slightly different design than that used in my 20m rig, and built a LPF for 30m.

Again, my TX 'strip' was different, but I managed one Watt output from a BD135 transistor in the PA stage. Another board I made up with a 'unidentified' PA Transistor produced 2W output.

The next thing I thought was lacking, was a 'Sidetone' as it is not easy trying to send CW, especially when using a mechanical bug key, so I decided to add that to the design.

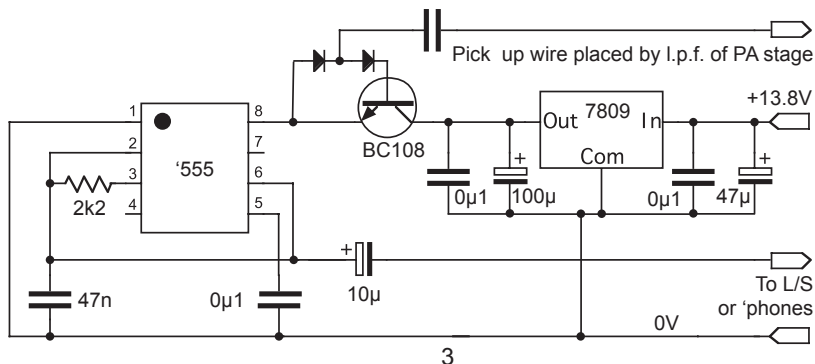
Sidetone

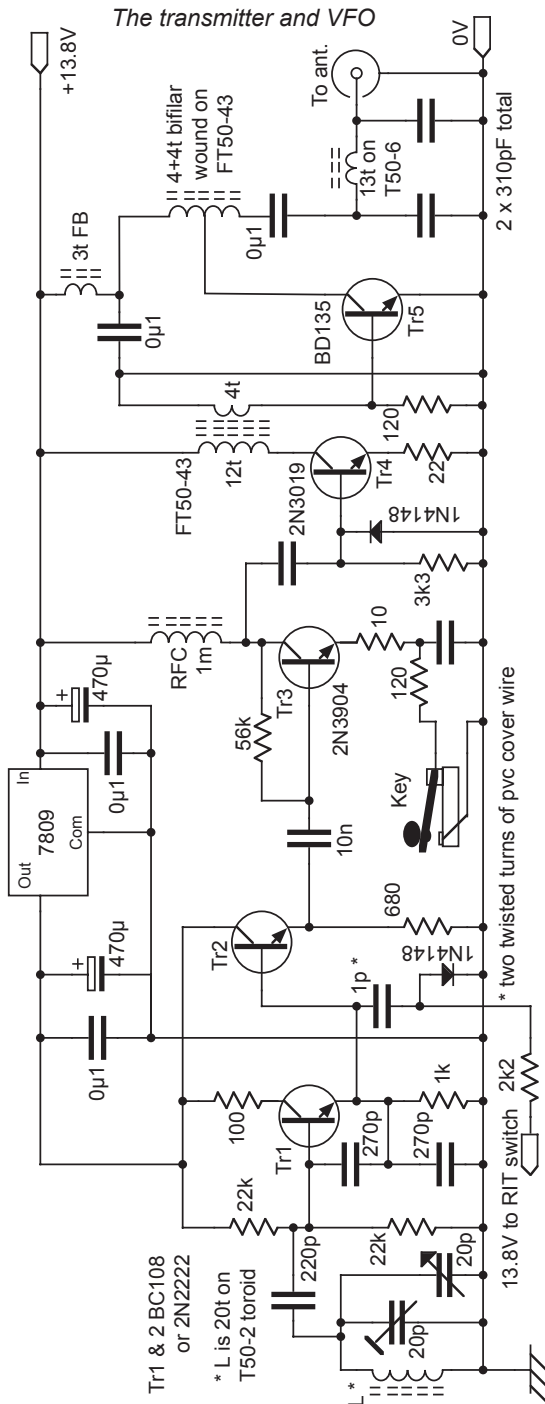
The Sidetone circuit shown here below, is RF activated that I feel is really useful, and this design is really simple with very few components and uses a '555 IC. I find it works well with a supply of 5V, but increasing it to 9V produces a little more sound, as my hearing is very poor. I fed it to a small loud speaker, but if headphones are used then a 5V supply is fine.

The 'pick up wire' needs placing right by the LPF for QRP use, which was built on a copper clad board using the 'glued islands' idea which is a method I have used for many years with great success. All boards in this project I have adopted this construction design.

Having built it I decided that VFO facility would be another 'bonus' So, I set about building a 30m VFO and this too is the one submitted. This VFO too is very simple and I find very stable once it has reached its operating temperature, which at the most is around ten minutes.

The 20pF trimmer in parallel with the tuning capacitor is only there to aid tuning 'set up' this can be omitted if the exact turns are on the toroid. It uses two BC108 transistors, although 2N2222 types are fine too. As it is to be used in a 'transceiver' a 'RIT' facility needed to be used.





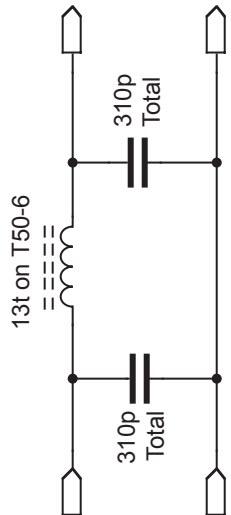
the most difficult part to construct is the band pass filter And if you construct with components as shown then you will find that it tunes to resonance like a charm it is superb.

Likewise with the 'Tuned RF Amplifier' this too works a 'dream' if you Build as I describe..... it too is superb. I recommend that you adhere to the supply rails that are shown and use smoothing as shown. It can be built on one PCB but all of my homebrew gear uses separate boards, and all are inter-linked initially for 'Testing' purposes.

Transmitter

The transmitter part is much simpler than the receiver of course, and is self explanatory. Output from the VFO goes to the 2N3904 and onwards. A suitable clip on heat sink is required for the 2N319 driver transistor And I measured almost half a watt of output from this stage. As my transistor stock is sadly running low I was hoping to use a 2N3866 in this stage as I think that that a couple of watts output may be achieved from this stage alone, but as I didn't have one to try I had to add another stage.

A QRP low-pass filter suitable for the project, was built up on PCB material using the 'island' method.



Again, not having any decent RF Power Transistors to try, I used a readily available (and very cheap to buy) BD135 Transistor. I have used these for 'Top Band and 80m' in the past with success And I am pleased to say that they work up to 30m okay now.

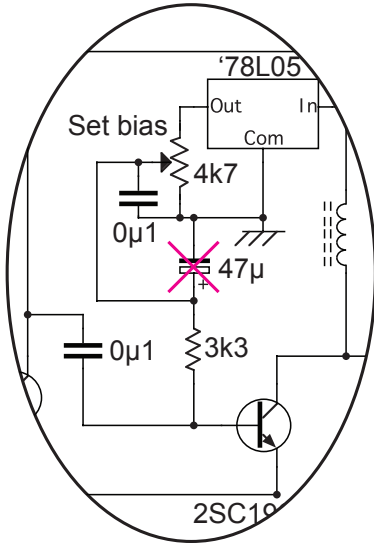
You will need a good hefty heat sink as they can get quite warm, but the one I used ran quite cool with my Homebrew aluminium heat sink. Although all of this project has not yet been put in a box as such, It will make a great little transceiver.

The receive board is excellent as you will discover, and the Transmit board is very simple and uncomplicated. I do not have any outside aerials at my QTH now, so I'm just using an Indoor Doublet, and I am pleased to report that yesterday (22 April) after two 'CQ' calls, I was heard by OE9GHV at 17.31, then by W1NT-6 at 22.16. That's definitely not bad for 1W and a Indoor aerial!

I hope members will enjoy embarking on this great little QRP rig project.

**Regards, vy 73/72
Bill G4EHT – 558**

OOoops!



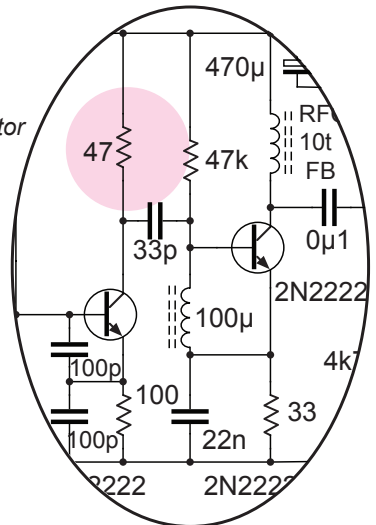
The 'rogue' capacitor

I owe Bill an apology for making two errors on the circuit diagram of his excellent 20m transmitter article that appeared in the spring issue of Sprat (182). On page 15, with the circuit diagram, a resistor value in the collector of the oscillator transistor was left out, it is 47Ω.

There was also a rogue electrolytic capacitor in the bias circuit of the PA device. The 47µF capacitor shown here is totally extraneous and should be omitted.

The diagrams shown here, are of the two components that were affected.

Unlabeled resistor



I also managed to mis-link the 47V zener as in the circuit diagram of the high voltage regulator used by N6QW to power his rig, as it appeared on page 30 of issue 182. A corrected circuit diagram is also shown in Colin G3VTT's AV&V column elsewhere in this issue. Apologies to All.

'tex

SS-DC Challenge

Philip, G4HOJ@yahoo.co.uk

Background

OK...I've had several good valve receivers under my belt now, with details of two offered here recently for anyone interested to build. BUT, thus far, I have shied away from transistors, blaming my eyesight and dexterity issues for the lack of inclusion in my experiments. However, during my bench-work so far, I have developed methods of steadying my hands at critical moments, I have gained a pair of magnifying spectacles and a magnifying panel....and I don't like feeling beaten by anything!

SS-DC
=
Solid State
Direct Conversion

What should I experiment with around solid-state rather than hollow-state, glass devices? Well I love the excitement of building a receiver and hearing the first signals representing the coming to life of a bunch of components....and I have developed a real interest in minimal receivers that perform reasonably well. So, I decided to experiment around Direct Conversion again; a few mixers, lower impedance filters, etc., etc. Therefore, these words are not all about a finished project but document some of my experiments on the way to a working receiver.

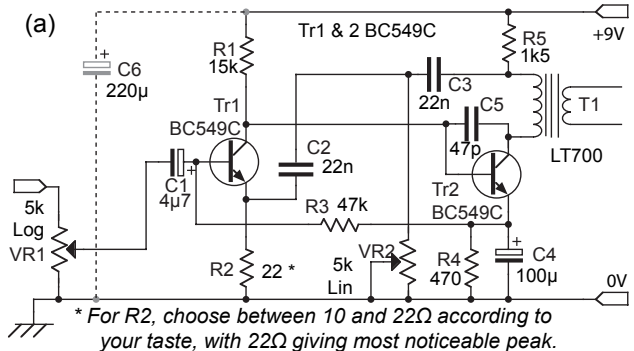
Audio Stages and Filtering

Where to start? I usually begin with audio stages! To be certain of success, I replicated elements of four or five quite different designs found on the pages (CD Files) of Sprat. Of the ones I tried, the one that worked best for me and consumed the least power (a new interest for me?) was a long-standing and often repeated direct-coupled, two-transistor design.

I found that the various designs that used it had a variety of different resistor values so I tried to optimised mine for stability and current versus gain/noise/audio quality. I do have high-impedance phones but they seem a bit big for such a potentially small RX, so I incorporated a cheap step-down transformer to allow use of comfortable, reasonable quality earbuds.

My version of the audio amplifier, draws about 2mA, and can give more output than needed for earbuds but it initially had a very wide frequency response – so much so that a 47 to 100pF must be placed between collector and base of Tr2 to limit very high frequencies. In improving things, I calculated values for C1 and C4 to minimise response below about 300Hz plus, I tried my old trick of introducing a tuneable high-pass 'knee' feedback loop (see note about R2 and feedback level).

The 'knee' can be varied from between about 300Hz and 2800Hz in my circuit. These changes made quite a difference to the suitability of the amp. for my purpose and I feel it gives a good account of itself for such low consumption and simple design.



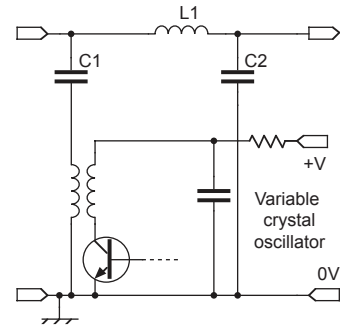
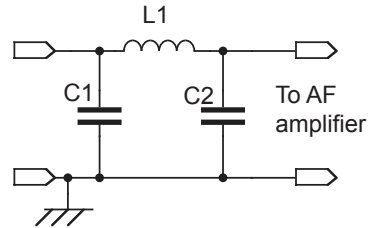
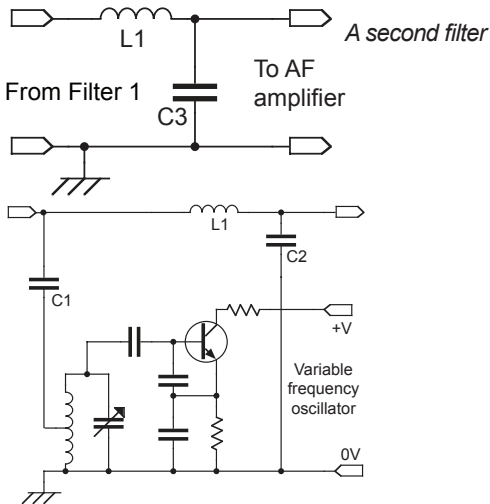
Variation

If you do not wish to use a transformer, then you can either use high-impedance phones, preferably placing a 2.2k resistor in place of the transformer primary and using a capacitor from Tr2 collector to feed the headphones. You can also use an additional transistor in common-collector mode for lower-impedance phones but this adds 3mA or more (as much again as the whole basic receiver) current draw to ensure strong signals do not distort.

I thought it would also be useful to try some passive filtering in front of the audio stages to further tailor the bandwidth. More research showed that 88mH telephone toroids seem to have been the favourite for this approach in the past but when I looked for some, I only found hen's teeth!

Anyway, further browsing showed some 100mH inductors that had relatively low resistance at reasonable cost, so I purchased a couple and started experimenting. I tried bandpass filters but soon decided that a low-pass approach was much nicer to use. I was worried about hum pick-up with inductors but there was no problem. I soon arrived at something that works well enough from an audible point of view but I did not worry too much about matching or absolute frequency response:

OR, add another section and tighten the receiver bandwidth a bit more:



	SSB	CW
L1	<i>is 100mH in all cases</i>	
C1 *	47n	<i>No change</i>
C2	0μ1	+ 0μ22
C3	47n	+ 0μ1

These values are where I ended my experiments. None are necessarily optimised, I just listened and, in my ears, using my earbuds, those values sounded OK!

*NB: The bottom of C1 is earthed for the JFET, Dual-gate FET and SBL1 mixers but for semi-balanced and anti-parallel mixers, I lifted it so it could provide the feed-in point for link-coupled/inductor oscillator feed but still act as filter input capacitor when the bottom of the link/inductor is earthed. Drive seemed optimised at 6 turns up from ground on the inductor of a Colpitts LC VFO and I used a toroid with 20 turn primary and 5 turn link in the collector circuit of the ceramic resonator VXO for those two mixer experiments.

What detector?

You can have a lot of fun here!...but I tried (there are many other mixer configurations of course):

1: Dual-gate MOSFET product detector	Rather noisy and too sensitive for my amplifier and with lots of unwanted detection, including AM almost all the time, plus not the best dynamic range. Quite high impedance. Upside is very low oscillator power required.
2: SBL1 DBM	Most conversion loss, seemed more difficult to optimise, highest oscillator drive requirement of all but probably highest dynamic range of all.
3: Semi-balanced, two diode mixer	Little bit of to oscillator pick-up and common-mode hum but, overall, good.
4: 2 & 4 anti-parallel diode (aka Polyakov or RA3AEE – Russian)	Oscillator at half-frequency, good dynamic range, easy to implement, seemed to be slightly less conversion loss and slightly more rejection of AM than 2.
5: Series switching JFET (passive)	Even lower sensitivity to AM, less oscillator. input required, but easy to utilise and good performance.
6: Bipolar ceramic resonator regen.	Relatively stable and sensitive, avoids the need for separate oscillator, but a surprise for for me, less audio out than all above, plus easily overloaded.

All the above were evaluated with only a single tuned tank circuit input and an endfed, unbalanced antenna, to really test them! BTW, the semi-balanced two diode mixer driven by a, say 6 turn, bifilar windings on the input tank (with centre tap earthed and osc. feed as per detail about filters) can be easily switched to a Polyakov sub-harmonic mixer by switching the second diode so that it disconnects from the opposite phase of the bifilar winding and is connected to the same wire as the first diode.

That way, providing the input tank is tuned or switched, a single oscillator frequency can provide a two-band receiver. In my experiments, I used a 3.5MHz oscillator to receive on 80m with the semi-balanced mixer and on 40m with the anti-parallel mixer. The only thing to take into account is that the tuning rate is doubled on the higher harmonic band.

My final design

I chose to proceed with the jFET switching mixer/product detector, partly because I have never used it in any design and partly because I liked that it is easy to utilise and seemed relatively quiet but sensitive. A jFET is obviously a linear device (well, more linear than a diode) and I think that is why it is so bad (good in my case!) at detecting A.M. when used as a passive, series switch.

As with all the mixers tried, getting the drive level in the right area is important for best performance but this switching FET type wasn't tricky to optimise. The jFET switches on and off (actually, it is rapidly swinging from very high to very low resistance in the signal path at the oscillator frequency as the applied voltage goes up and down in each cycle). The aim is simply to drive it to optimise that high and low resistivity swing.

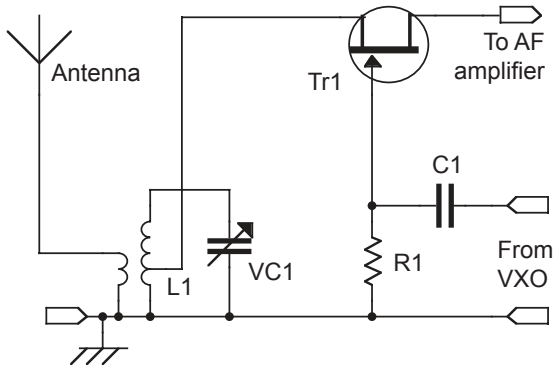
I didn't find very much difference whether I used the source or the drain for input but settled on using the drain. I did find, though, in contrast to a couple of published designs I have seen, that I achieved best performance using much lower impedance input. Using a single tank input, two-turn tap allowed the highest Q but lost some signal transfer and a 6 turn tap allowed high signal transfer but lower Q - so I adopted four turns in my design (The better-matched performance at low impedance may be because the audio filter represents a relatively low impedance to the jFET output side?):

Schematic for FET switching mixer and tank

Components: SS-DC Mixer/product detector:

* You may choose to use different values or even a bandpass arrangement. The only thing I would try to ensure is a low impedance input to the jFET.

This mixer does actually work on bands harmonically related to the oscillator frequencies but I compared results of using harmonic mixing of the 3.5MHz VXO on 7MHz versus using a 7MHz oscillator and the non-harmonic approach seemed to give best signal-to-noise. That may be to do with less-well optimised drive on harmonics?

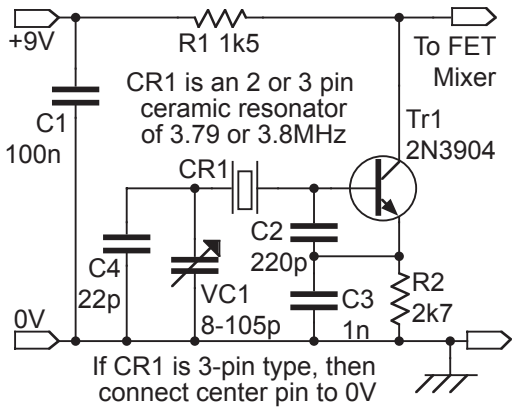


C1	100p	*input circuit (a single tank centred on 3.55MHz)
R1	56k	L1 21t on a small toroid (8.65µH) tapped at 4t, and antenna winding of 2t
Tr1		2N3819 jFET
VC1		Total of 197pF at resonance

Oscillator - VXO

In some ways, oscillators are easier (I probably shouldn't have said that out loud!) than the other parts. Obviously, stability is important and, as mentioned above, getting the drive level somewhere close is also quite, perhaps very, important. I built several bipolar oscillators and had most success with a Colpitts circuit....so, VFO and VXO variations of that, as described in the filter comments, were used in the mixer experiments. Here is the circuit of my ceramic resonator VXO as used with the jFET switching mixer.

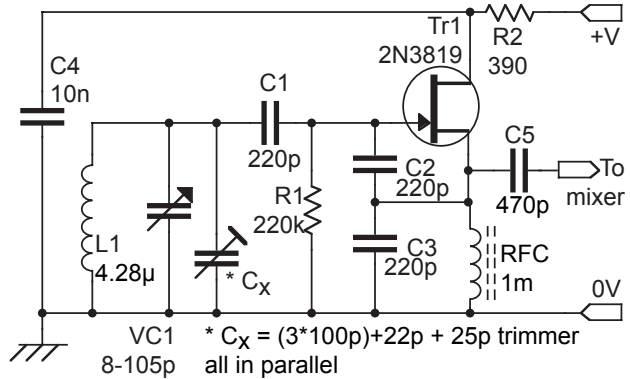
With a two-terminal ceramic resonator, marked as 3.58MHz, found on ebay, and using a 105pF variable capacitor, my VXO tunes from 3.5MHz at full capacitance and up to 3.578MHz before oscillation stopped. The parallel 22pF capacitor keeps things running and limits the upper frequency to 3.575MHz. With 75KHz of coverage, I find, with a reasonable size tuning knob, things work comfortably without a reduction drive.



Oscillator - VFO

I tried the Colpitts circuit above using an inductor and variable capacitor but however I tried it, I wasn't happy so I tried a FET version, which has proved quite stable. In my case, the four fixed capacitors and trimmer in parallel with my tuning capacitor, across a 4.28uH inductor (wound on small toroid), result in a tuning range of 3.495MHz

to 3.817MHz and the 470pF feeding VFO energy to the gate of the mixer seem to provide a suitable drive level with a good match. This FET VFO draws about 1mA, so total with the audio module above is just under 4mA.



Conclusion

With all simpler designs, there are compromises but I am comfortable with the way these circuit elements work together. This little receiver has plenty of volume, selectivity is fine for me, current drain is between 3 and 4mA from a 9v battery (seems to run for ever!) and dynamic range and resistance to unwanted demodulation is good. Obviously, there is no AGC but, for my listening, I don't usually find AGC particularly helpful anyway. You could always try a diode limiter somewhere – perhaps the primary of the transformer?

So, I am really happy that I have broken the SS-DC barrier!...not with anything particularly new or interesting but, when finished, I will have a very useful, small, portable receiver that I can carry around with me with a chunk of wire and listen, in my case, to 80m...although, there is no reason why this receiver shouldn't be built for any band. I tried one of the experimental versions on 144MHz!...but it did need a good pre-amp ahead of it to achieve good enough sensitivity and noise figure at that frequency. I don't know how sensitive it might have been but I did hear a few FT8 and one CW station before I dismantled it.

Construction and cautions

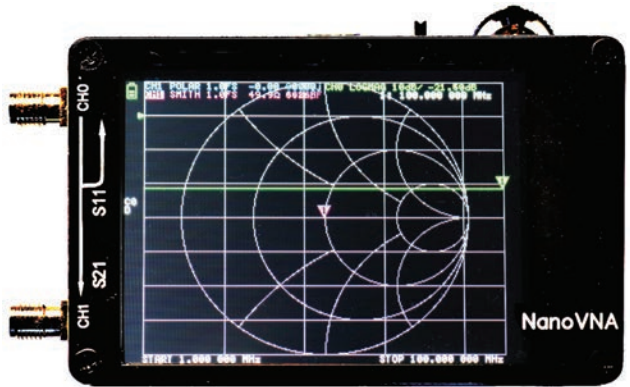
I am still deciding how to package the final version of this receiver to maximise portability, etc. Clearly, it is possible to build quite small – especially if you can see what you're doing! I have used a small 9v battery throughout my experimental and final working receiver stages....and it still has enough 'umph' to power the receiver.

You might wish to include reverse polarity protection but in my case I use a small battery holder that avoids risk of incorrect fitting. Inevitably, there is a fair bit of gain in the audio stages so keep all signal leads short and direct, if necessary using coaxial cable. If you do switch in additional capacitors in the audio filter, make sure the leads to the switch are as short as possible. Otherwise, there is not much to add.

Filters and Smith Charts

Tony Fishpool G4WIF, email: g4wif@gqrp.co.uk

As if almost overnight, affordable vector network analysers have dropped into the keen hands of ham radio constructors in the form of the NanoVNA. Just as suddenly, we've become exposed to Smith Charts which the NanoVNA displays by default when you first switch it on. For me, this was an alien concept and while the many videos on YouTube

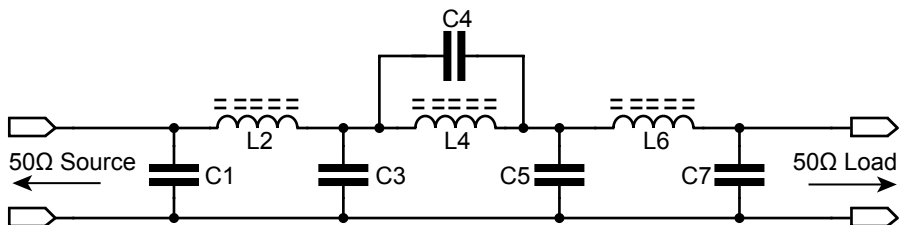


helped explain why they were useful, something was missing, and that was an easy way to play with Smith Charts to see how they “tick”.

The discovery first of “SimSmith” presented a program that was so powerful and with so many features that it was put aside until I found something more understandable and this was the discovery of the online utility, “QuickSmith” located at <https://quicksmith.online>. This is not a program that you need to download. It runs straight off the website.

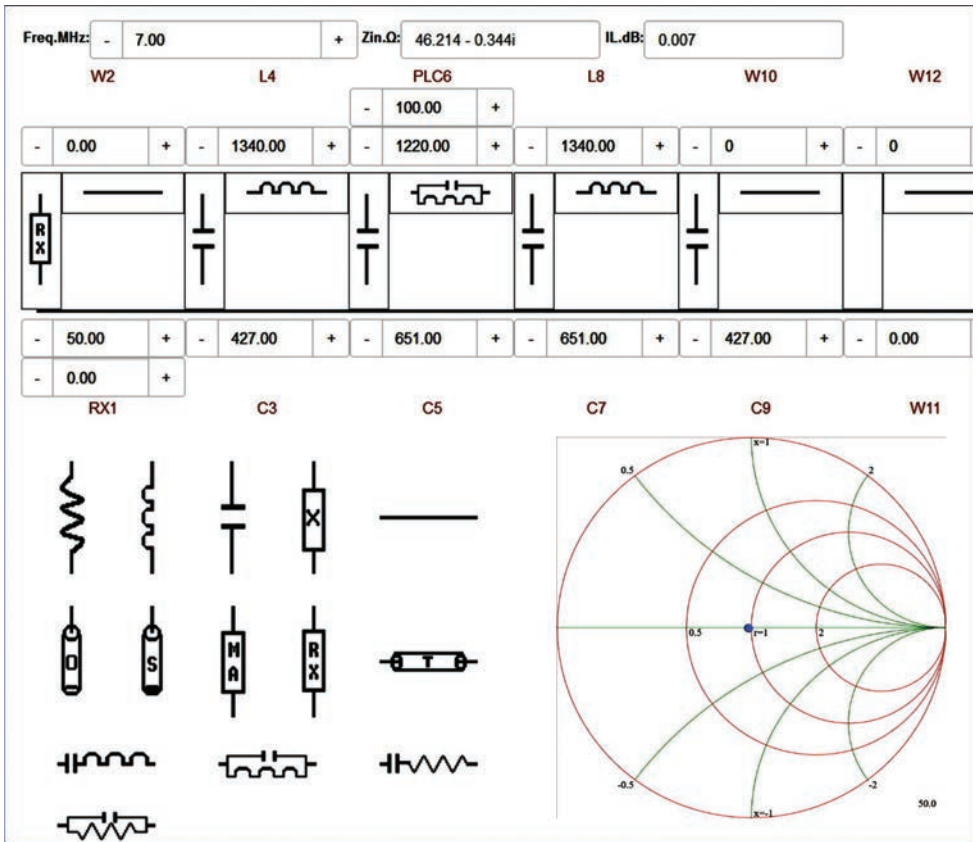
It mainly does one thing and one thing well. It models filters like those that **George G3RJV** made us all aware of decades ago. If you visit the gqrp.com website and access the technical section you will find George’s article concerning the W3NQN filters.

Ed Wetherhold W2NQN published his low pass filter designs in QST February 1999 and he was a prolific contributor to the magazine over the years. Also an article appeared in *PW* July 1998’s “Antennas-in-Action” column. In that issue, Ed W3NQN’s article is titled “Filters – Cutting The Edge” to be found on pages 36 to 39.



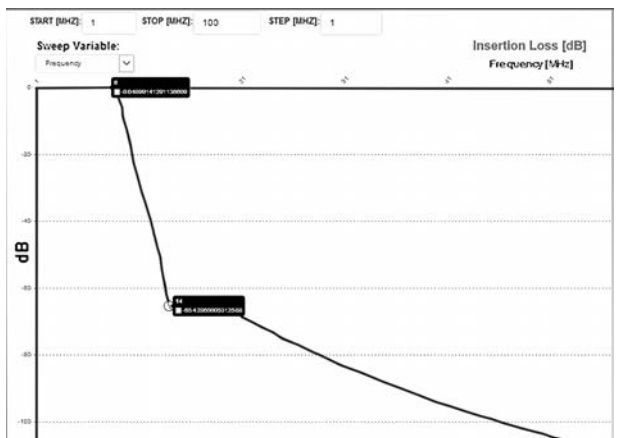
George’s QRP club datasheet has all the component information and it is worth adding to your library. The W3NQN low pass filter in schematic form is shown above.

The club datasheet provides a superb way to get used to using “QuickSmith”. You simply “drag and drop” from the small palette of available components and then assign the values that you want to simulate. In this example shown below, I’ve modelled Ed’s 40m low pass filter from the datasheet.



Having done that you can adjust the frequency (here I have entered 7.00MHz) and you can see that the smith chart is showing the input impedance presented at that frequency. The blue dot at "r=1" (in the centre of the chart) represents a 50Ω resistive match and you can alter the component values in real time to see what effect it has.

I still have a fair way to go before becoming comfortable with Smith Charts but QuickSmith has another useful trick – and that is to plot the insertion loss curve of a filter.



This graph shows immediately that W3NQN and G3RJV knew what they were doing all those years ago before all these great tools were invented!

A Simple IC tester

Pete Moore M0ILZ

I recently tried building some test equipment and, surprise, surprise, it didn't quite do what I expected. Having checked that I had wired it correctly (I had) I was left with the conclusion that some of the ICs weren't quite doing what they should. So, I put together this very simple IC test bench.

Break-out box

It is essentially a simple break out box with some indications and in-built conditioning that allows any pin to be either set to 0V, +5V or open circuit so that it can be configured for custom inputs or monitored if it is an output.

The circuit is shown in Figure 1. It is built around a 16 pin zero insertion force (ZIF) connector since that allows any integrated circuit with up to 16 pins to be tested simply by wiring the appropriate pins. A 5V regulator was included since pretty much all ICs will work off 5V and it is nice to know that a smooth power supply will prevent any problems from power variations or loading.

Mobile phone charger

I powered the whole system from an old mobile phone charger type wall socket because I

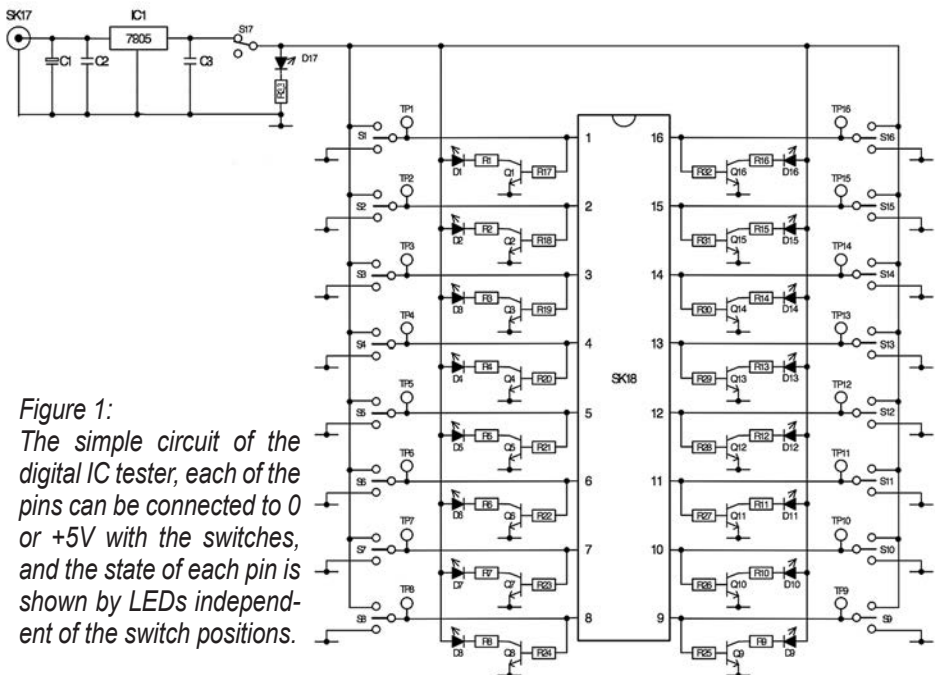
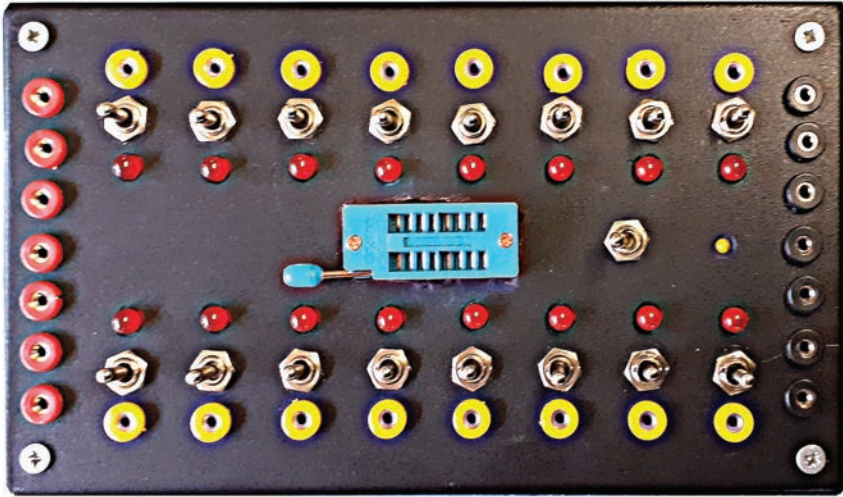


Figure 1:
The simple circuit of the digital IC tester, each of the pins can be connected to 0 or +5V with the switches, and the state of each pin is shown by LEDs independent of the switch positions.



happened to have it available. D17 in the power supply is a yellow LED and is included to let you know when power is applied to the component under test.

Each pin of the socket is wired to a 3-position switch with ON-OFF-ON actuation. One side is connected to +5V, and the other to 0V allowing each pin to be set to these voltages or else left open circuit. The state of each pin is indicated by means of a buffered LED.

Operation is simply accomplished by setting the switches to the appropriate state for the inputs to the IC under test and monitoring the outputs. This will provide a simple means of establishing that the truth table of a logic IC is correct or otherwise (in which case it can be binned). Counters can be tested by connecting a square wave oscillator to the input and monitoring the outputs. A slow frequency will allow the count sequence to be viewed on the LEDs, or else an oscilloscope can monitor the input and output signals.

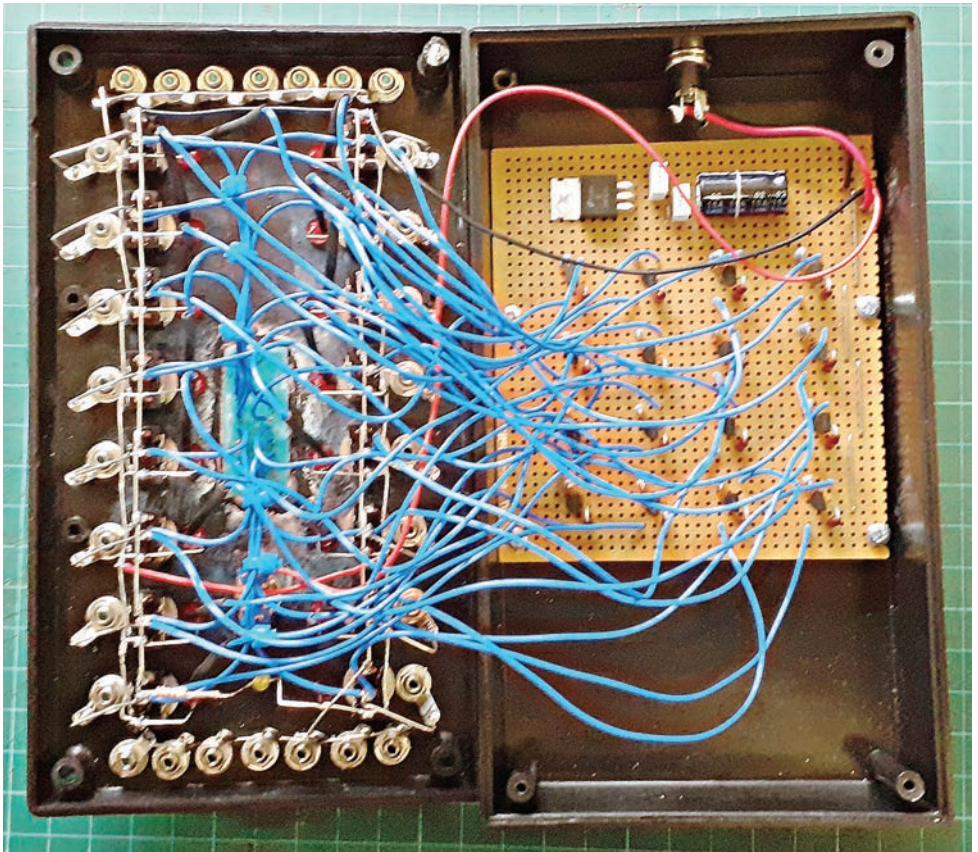
Not just digital

Analogue ICs can be assessed by wiring external circuits such as potentiometers or oscillators to the inputs, with the appropriate switch left open circuit. The output can be monitored by connecting an oscilloscope to the (also open) output.

I chose 2mm sockets for the test points and for the +5V and 0V rails that are located top and bottom because they are sufficiently small to allow mounting on a sensible sized box yet are easy to handle. 2mm test plugs are also easily available. The complete article is mounted inside a black polycarbonate box of dimensions 100mm x 175mm, but any enclosure would do.

The transistor buffers are mounted on a piece of strip board along with the voltage regulator and wired to the other hardware, which is mounted on the lid. Power from the external supply is connected to the unit via a 2mm socket.

The complete component list is shown below, but little is critical and components available in the shack would certainly do just as well as those listed.



Although it looks rather complicated, that is mainly due to the interconnecting wires. Each of the 16 small clusters of components is the group attached to each pin.

Note: there are ring loops of both 0V and +5V running around the area of the test sockets.

COMPONENTS

TP1-16	2mm banana socket	C1	470uF electrolytic
SK17	2mm jack socket	C2	0.22uF ceramic
SK18	16 pin DIL socket, ZIF	C3	0.33uf ceramic
S1-16	3 pole, ON OFF ON, SPDT	IC1	7805 voltage regulator
S17	SPDT	Q1-16	2N3904 or similar
R1-16	120Ω	D1-16	5mm red LED, Vf = 2.5V@ 20mA
R17-32	47k	D17	3mm yellow LED, If = 2mA
R33	2k7		

Less Painful Toroid Transformer Winding

Alain Prevost F1IET

You may think it's painful to create some toroidal transformers? Well, I suppose, yes it can, but it needn't be. There may be an easier way. So please keep an eye on that small idea.

All the new (and also many old) buildings are full of computer networks, and these networks all use what is known as 'CAT5' or 'CAT6' cable. These cables are all made up of four pairs of perfectly twisted colourful wires.

When you will have removed the outer sheath, you will see four nice pairs. The pairs normally consist of green/green+white, orange/orange+white, blue/blue+white along with a brown/brown+white pair.

These pairs can be used for any cabling in your experimental project. If you are using the pairs for cabling, the nominal impedance of such a twisted pair is about 120Ω. But more importantly, it allow you to build toroidal transformer in a snap. The tricky part of finding the right input and connect it to the right output will be much easier with the colorful wires!

Further more, the trifilar transformer, is no longer a nightmare. It can be so easy now. Just untwist one of the coloured pairs, taking care to keep the shape of the wires you separate. Then just carefully twist one of the separated wires onto an existing pair. The maintained shape of the untwisted wire will help you. You now have three wires, all of differing colours so, your trifilar will be finish in a snap.

Shown here below is a trifilar transformer for a the output stage of an experimental PA, in which, I used that trifilar transformer in place of another made with enameled wires. After measurements the difference between the two transformers was tiny.

You can find network cable in stranded or single-core types, depending of the network application.

The price? Every network installer will have often have short lengths of the network cable in the van, at the end of installation. They normally go into the scrap bin. A simple ask, and you can get many feet of network cable at very very low cost :-))

Thanks and enjoy your experiments!

73 Alain F4IET



Oner Transmitter Revisited

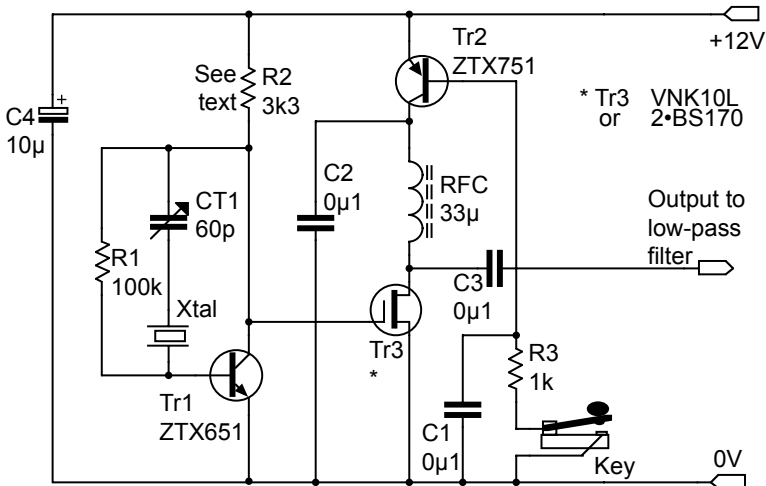
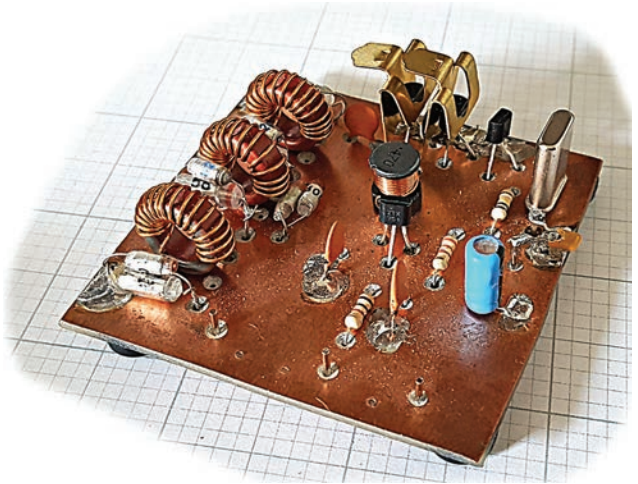
Steve Hartley G0FUW

Some chatter on the Club IO Group during the lockdown prompted me to write up a piece of work I did after **George, GM3OXX**, passed away. One of my GM3OXX favourites was the Oner transmitter, not because of its diminutive size, but because it seemed eminently happier running at higher powers than the OXO.

My original board produced some 2W out with ease on both 80 and 40m. So, I set about building a 21st century Oner, but I ran into problems with sourcing the parts. In particular the VN10KM power amplifier FET transistor is now only available at 'mortgage' prices.

Comparing datasheets showed the humble BS170 (10 for 80p from Club Sales) to be of a similar specification, albeit with slightly lower power handling capabilities. I had used BS170s in transmitter kits from both **Walford Electronics** and **QRP Labs** but I never made the connection to the old Oner.

I noted that a number of designs used a couple of the BS170s in parallel, presumably to increase the power handling, so I gave that a try. Just to be sure I added a couple of the heatsinks also available from Club Sales, but I am not sure these are required for CW use.



The ZTX type transistors George used, are still available from Rapid, CPC and Mouser. And, whilst not the cheapest, they are not ridiculous in price (less than £1). I did try a cheap and cheerful 2N3904 for the oscillator but it did not generate as much 'umph'

as the original so, I stuck with the ZTX types as originally specified by GM3OXX.

For the RFC I tried using a ferrite bead, an FT-50-43 toroid and a pre-wound 47uH RF choke. All gave similar results but the latter two caused much less angst than threading the bead!

I am not one for miniaturising rigs for the sake of it so my Oner Revisited is a bit bigger but it includes a low pass filter on the board; it is now a '2 and a half' being 2.5 inches square.

If you want to multi-band it is no real hardship to build a Oner per band; the extra parts, over and above the crystal and LPF, will not break the bank.

The layout has been tested successfully on 80, 60, 40 and 30m with outputs between 1 and 2W. The prototype was built with a top groundplane and point to point wiring underneath then a couple of PCBs were etched using standard KTT (Kitchen Table Technology).

TR1 = ZTX651

TR2 = ZTX751

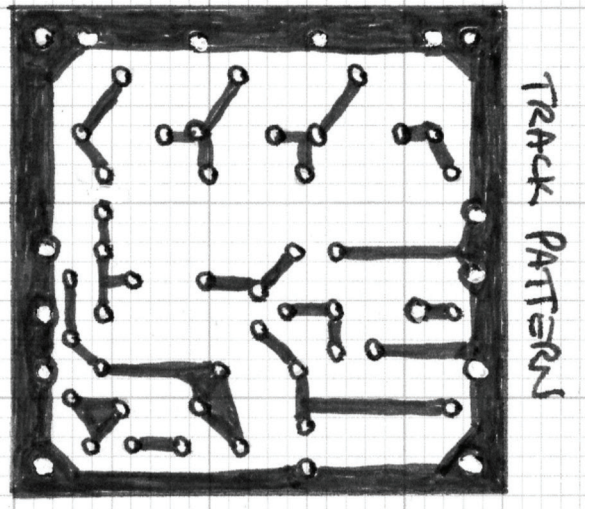
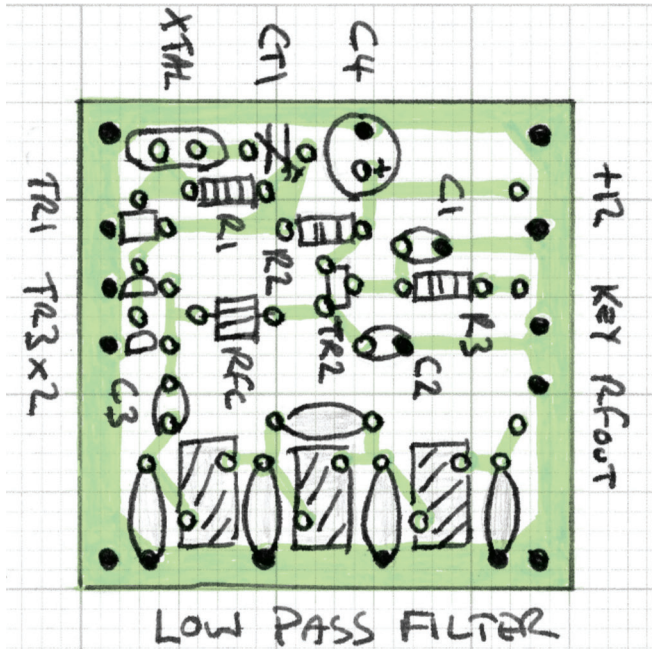
TR3 = VN10KM or
2 x BS170

RFC = 10 turns on
ferrite bead or FT50-43

CT1 = 60pF trimmer or half
of a polyvaricon capacitor

Low Pass Filter values are detailed in a Club Data Sheet available from the Technical Pages of the Club website so are not repeated here.

The PCB Layout of what has now become a '2 and a half'



G-QRP Club Constitution – Consultation

Steve G0FUW email: g0fuw@gqrp.com

In my editorial for SPRAT 181 I said that the Standing Committee would be putting a reworked constitution to the members this year and here it is. Before you read it, it is worth setting the scene as to why we need a new constitution and the rationale behind some of the key changes.

So why now?

The Club constitution first saw the light of day in SPRAT 8, Autumn 1976. Our founders were very keen to keep things simple but as the Club grew it became clear that a Constitution was necessary. The Constitution is currently at version three, dated November 2013, so you can see that revisions are not regular occurrences. So why now?

When I took over as Chairman I asked about concerns and/or proposals for any changes that were seen to be necessary. The resounding message was ‘if it ain’t broke, don’t fix it’; members were generally very happy with the way things were. There were a few concerns raised over a perceived lack of democracy, a lack of clarity over the legal status of the Club, and the liability of its members, in particular members of the Standing Committee. We therefore took legal advice.

The lawyers were very helpful and provided a detailed ‘critique’ of the existing constitution along with pragmatic advice on how to improve it. In the main, the advice merely confirmed what we had thought; it wasn’t detailed enough and it was silent on some legal matters. The only thing that was seen to be ‘wrong’ was that changes to the constitution were within the gift of the Standing Committee, rather than the membership.

We have worked through the legal advice and have addressed the points raised to produce the draft version four, which is presented here. We have also taken the opportunity to clarify the roles of the Club Officers, and to re-name some of them. For example, the Secretary role used to include editing SPRAT and we have decided to separate those two roles to make each less onerous.

The overall aims, ethos and activities of the Club have not changed; indeed, we have made an explicit commitment to maintain our KISS principles and we have no desire to generate bureaucracy for the sake of it. The revised draft really just clarifies what we already do and how that works.

We are circulating the draft now to give members time to consider it and to have a say in its development before putting it to the vote later in the year. The intention is to have the revised constitution in place in time for the 2021 membership renewals.

Please take the time to read it through and send any comments or suggestions for improvement to our acting Secretary, Dick, G0BPS, via g0bps@gqrp.co.uk, or by post to 12 Oak Rise, Terlingham Gardens, Hawkinge, CT18 7FU

Steve, G0FUW
Chairman
g0fuw@gqrp.com

G-QRP Club Constitution

Draft version 4

The G-QRP Club is a non-profit organization of radio amateurs / listeners dedicated to increasing worldwide enjoyment of Amateur Radio by promotion and support of QRP by encouraging low power operating and the building of low power equipment.

Legal stuff.

This constitution sets out the rules for the management and operation of the G-QRP Club (referred to hereafter as 'the Club').

The Club is run as an unincorporated association where all members are jointly responsible for its acts and omissions. Liability of members is limited to the value of their annual subscription.

The Standing Committee will run the Club on behalf of the members in accordance with this constitution and the general ethos of the Club.

The Club will indemnify any Club Officer who, through no fault of their own, is left out of pocket due to a failed contract. The Club will not indemnify any Club Officer who suffers a loss through negligence, or any illegal activity, of their own doing.

The Club is affiliated to the Radio Society of Great Britain and has third party insurance cover as part of that affiliation.

Membership.

Membership is open to any person interested in Low Power Operating, designing or building their own equipment. A membership fee, payable annually will be set by the Standing Committee and posted on the Club website (www.ggrp.com).

Membership fees are due on 1 January each year. Members joining part way through a year will not receive a discount on their membership fee but they will receive all four issues of SPRAT for that year regardless which month they join.

The Standing Committee reserve the right to reject any applications for membership without giving a reason.

Club Officers ‡

There will be a Standing Committee of the Club with the overall responsibility of the running of the Club and Club events. Other members may be co-opted to this group as necessary by a simple majority vote of the existing members.

Membership of the Standing Committee shall comprise:

Chairman, who shall have the responsibility to oversee overall management of the Club.

Secretary, who shall be the primary external point of contact for the Club, shall write official external correspondence, shall take minutes of any formal Club meetings and act in place of the Chairman when they are not available.

Treasurer, who shall control all monies of the Club and ensure the safe keeping of same.

Membership Secretary, who shall take charge of all issues regarding membership, ensuring collection of membership fees.

The current post holder names will be published in our journal Sprat at least once a year and will also be found on the Club website. Meetings of the Standing Committee will normally be carried out via remote conferencing and will take place as frequently as business need dictates.

Any member of the Standing Committee may call a meeting, giving reasonable notice. Meetings require at least three of the four Standing Committee members to be present to make it quorate.

The Standing Committee may make and amend by-laws for the internal management and well-being of the Club.

Other (Ex Officio) Officers of the Club are:

Awards Manager – who will receive, check and process applications for Club Awards

Technical Advisor(s) – who will respond to requests for advice from Club members

On-Air Activity Manager – who will co-ordinate QRP activity periods and contests, receive logs and make recommendations for appropriate Club Trophies.

Club Sales Manager - who will buy and sell books, electronic components and other goods of interest to members.

Web Site Manager – who will maintain the Club website, official e-mail addresses and the Club E-mail Conference Group.

VHF Manager – who will promote and report on VHF QRP activity and construction

QSL manager - who will manage the Club's QSL bureau and QSL cards for the Club callsign, G5LOW.

Trophy Manager – who will arrange for trophies and badges to be made up and delivered

SPRAT Editor – who will receive articles from members, collate and arrange proof reading of each edition of SPRAT. Members of the Standing Committee may act as SPRAT sub-editors as required.

Overseas Reps – who will act as points of contact for the Club in their own country, receiving memberships and attending rallies/conventions on behalf of the Club, as appropriate.

Regional Reps – who will act as points of contact for the Club in their own area of the UK and attend rallies/conventions on behalf of the Club, as appropriate.

Appointment of Club Officers.

When a vacancy arises for a new member of the Standing Committee, or other Club Officer, a calling notice will be posted in SPRAT, the Club's quarterly journal.

New members of the Standing Committee, or other Club Officers, will be selected by the existing Standing Committee members from those that respond to the calling notice. In keeping with the Club's desire to keep things simple, no membership-wide elections will take place.

Removal of Club Officers or members.

Any Officer or member of the Club may be removed from office or membership for just cause, by a simple majority vote of the Standing Committee.

If any member considers that a Club Officer should be removed from office, or that a member should be removed from the membership, they shall report the just cause to the Secretary. If the Secretary is the member to be removed, the report shall go to the Chairman.

Any Officer or member of the Club who the Standing Committee agree should be removed from office or membership will be served one month's notice and will have the right to make their case to the Standing Committee before a final decision is made.

Financial Management.

The Club's financial resources are held in a number of bank accounts. Only members of the Standing Committee have access to those accounts. The financial year shall run from 1 April to 31 March

Members of the Standing Committee and other Officers of the Club will be paid expenses for any out of pocket expenditure made on behalf of the Club.

The Club will maintain sufficient cash in reserve to enable the Club to operate for at least one year without further income.

Club accounts will be prepared at the end of the financial year and examined by a competent person who is independent from the Club. A short statement on the financial position will be published in the next available SPRAT.

Insurance.

The Club is an Affiliated Member of the Radio Society of Great Britain. The Club is therefore covered for Public Liability and Product Liability claims by the RSGB's Club Insurance.

Club Journal.

The Club produces a quarterly journal called SPRAT (stands for Small Powered Radio Amateur Transmission) which will be posted to all paid up members. The journal will comprise articles from members, members' news, and appropriate advertisements.

Club Sales.

The Club will buy and sell books, electronic components and other goods of interest to members. Pricing will be in keeping with the not-for-profit status of the Club. Club Sales will generally operate as a mail order service but may also have stalls at radio rallies. Details of Club Sales available to members will be published on the Club website.

Club Awards.

All awards of the Club shall conform to the internationally agreed power levels for the mode used with a signed certificate of conformity by the claimant. Details of awards available to members will be published on the Club website.

Club Trophies

The Club will award trophies on an annual basis. The decision on who should receive the trophies will be made by the Standing Committee, in consultation with other Club Officials as is necessary. Details of trophies available to members will be published on the Club website. Trophy winners will be announced in the next available SPRAT.

Conventions

The Standing Committee will organize Club Conventions at least once each year. The Standing Committee may work with other clubs and societies in making the arrangements.

Club Officers may attend conventions and similar gatherings organized by other clubs or societies in order to make presentations or to represent the Club.

Donations

The Club may make donations to individuals or groups who are engaged in activities deemed to be in line with the aims of the Club.

Dissolution.

Should it become necessary to dissolve the Club, a notice will be sent to every member setting out the reasons and seeking membership agreement.

The Club may only be dissolved by a majority vote of the Membership. At least 40 members must cast votes to make the vote quorate. If the membership should fall below 100, a simple majority from those casting a vote will apply.

In the event of the Club being dissolved then all remaining physical assets of the Club shall be sold. All remaining monies shall be donated in equal shares to one or more charities selected by the Standing Committee in place at the time. The Standing Committee shall select charities that support research into heart disease, Alzheimer's disease and cancer, and/or charities with objectives that align with those of the Club.

Any proposal to dissolve the Club will be put to a vote of the Membership. Voting may take place using electronic means or by post. Notice of votes will be made in SPRAT at least one month prior to any vote taking place.

Revision of this constitution.

This constitution may be amended, revised, added to, or diminished by a simple majority vote of the Membership. At least 40 members must cast votes to make the vote quorate.

If any member wishes to make a proposal to amend the constitution, the case for amendment shall be made in writing to the Secretary. All such proposals will be considered at the next meeting of the Standing Committee.

Any proposed changes will be put to a vote of the Membership. Voting may take place using electronic means or by post. Notice of votes will be made in SPRAT at least one month prior to any vote taking place.

General Meetings of the Members.

The general ethos of the Club is to keep things simple. As our founder put it "It is vain to do with more what can be done with less."

This constitution allows for members to influence the running of the Club, to propose changes, and to vote on any proposals for change. With a truly global membership it is also unreasonable to expect members to gather in large numbers. The Club will therefore not hold an Annual General Meeting of the Members.

‡ Present Officers

Chairman, Steve, G0FUW; Secretary, Dick, G0BPS; Membership Secretary, Daphne, G7ENA; Treasurer, Graham, G3MFJ)

Treasurer's report – year ended March 2020

Graham G3MFJ g3mfj@gqrp.co.uk

You may have read in the proposed constitution, included with this issue of Sprat, that the Treasurer will give a short report on the club's finances. This is a new thing for me, I have looked after the club's money since **Peter, G3PDL**, the last treasurer, moved to Crete in 2006, and I have never had to do a report.

So, the report is that the club's finances are in a healthy state, as can be seen by the fact that we are still only charging members £6 annual subs, and have done since 1995! The overseas subs are the same plus what the extra postage for airmail delivery costs us. We have now moved to a full colour Sprat, this was something George always wanted, but until Tex came along, we couldn't afford it. Now Tex does, what the printer had been doing and charging us for, so now our printing costs have been reduced.

The last year, 2019 was an expensive one for us, with our leader, George G3RJV sadly becoming SK, and so we covered some expenses for distant travelers to come to the funeral, we also produced a memorial issue of Sprat – interestingly, our first colour issue, so this year we have had the cost of five issues of Sprat.

One of George's things that he liked was that we left the US membership fees over in the USA in US\$. George enjoyed the fact that for events like Dayton and other hamfests he and others attended, we didn't have to send UK money over there to pay costs as our US representative could pay in advance.

Now that we don't regularly have booths at US hamfests anymore, and following a recommendation made when our accounts were examined last year, we decided to bring those dollars over here. This has turned what would have been a loss year into a non-loss year – though as a non-profit making group we don't set out to make a profit of course.

I have shown below, the profit & loss figures for the past few years:

Year ended - March 2017	-£1011
Year ended - March 2018	+£281
Year ended - March 2019	+£504
Year ended - March 2020	+£7400

We have sufficient money in reserve to cover us for at least one year, should some disaster befall us. So, we are fine, and I do not see any increase in subscriptions on the horizon for a few years yet. However, to keep things tidy, we still will not allow renewals for more than one year at a time. Your committee would like to use some of our money to encourage youngsters into the hobby, so this is one of our continuing projects for the immediate future.

Graham G3MFJ

Valve QRP Report April 18 & 19th 2020

Colin Turner G3VTT 182 Station Road Rainham Kent ME8 7PR
g3vtt@aol.com

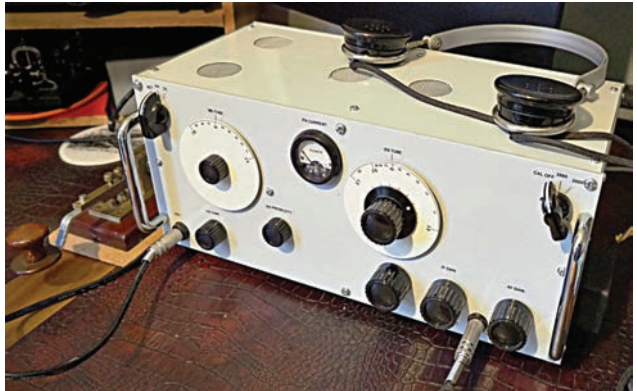
Conditions were very tough again which certainly sorted out the men from the boys and who had the best set up. I have a high urban noise level here in North Kent but a good transmitting site close to the River Medway. I'm looking into a lower noise receiving set for next time and for the Winter Sports as I am currently installing a receive loop.

Hats off go to **Roger GU4HUY** for patience, understanding and plain good operating when we made contact on 3560 early Sunday evening. He was in the noise but chose when to transmit and gave short answers on signals peaks as he rose above the noise and thus we were able to transfer the QSO information.

John G3TYB had fifteen QSOs spread over all bands 160 to 30 metres. Most were on 80m (not surprisingly), three on 60 and 40, and one on 160 and 30m. Gear varied depending upon the band he used and varied from a simple two valve crystal controlled transmitter and regen receiver to two species of VFO transmitters and superhet receivers.

He also used the contest conditions on 40 to try out his new valve receiver boasting a 500 Hz crystal filter and a beam deflection mixer.

It is by no means finished but first results were promising and he managed two QSOs using it and a VFO/PA transmitter on 40m during Sunday afternoon. The picture is his 80m rig with a VFO controlled transmitter and simple super gainer receiver.



Valved Tx Weekend

Derek G3NKS wrote: "I much enjoyed April's Valve TX weekend even though conditions on the bands could have been better. 40m was not good for me, too much QRM from either contests or local noise and on 60m and 80m deep QSB but activity levels seemed reasonable. I made a total of 15 QSOs with the usual set-up: a 2 x 6V6 CO/PA, a Drake R4C and a G5RV doublet at 15ft.

Part of the enjoyment came from having chats as well as exchanging details of equipment and aerials which I always find of interest. Many thanks Colin G3VTT for continuing with these great events. More please! 72 to all."

Kare YU7AE valve day activity was worked from his portable location on Mount Fruska Gora, at 539m ASL JN95UD near the TV/FM tower. He was getting ready for the EA QRP contest and found conditions were very bad with QRN and a lot of contest at the same

time. On the Sunday evening he worked 4 QSO, 2 on 20m (AM1WARD, MM7RNF) and 2 on 80m (HG315VA, OK1JVT) and heard G5LOW a couple of times. The equipment used was his old repainted valve TX (EF80 - 2x EL84 - 1625 with PA g2 regulation for QRP power limit).

On receive he used an FT-817nd with 350Hz CW filter and DSP. The antenna was FD-4 Windom at 6m to 8m above ground in lazy L shape. We thank Kare for his continued loyal support of GQRP.

A regular is **Chris G3XIZ** who tells me 'I enjoyed another challenging Valve Activity Weekend combating local noise, band congestion and contest traffic whilst using a 2 valve regenerative receiver - it was certainly character building. I had 24 contacts using my usual home-made valve TX/RX combination, 18 being valve to valve QSOs with 8 unique valve stations.

Particularly worthy of note was a 4-way QSO that I had on Top Band with G4FGJ, G4GIR and M0JXM - all of us using home-made valve transmitters. Also worked or heard were: G3INZ, G3NKS, G3TYB, G3XJS, G4ARI, G4XRV, G4ZXN and G5LOW (G3VTT) so the regulars were in attendance. Most of my contacts this event were made on 160m - a superb band for inter-G working but still much under-used'.



YU7AE – a magnificent valve transmitter

Loud signal

David G4HMC wrote 'Colin, thank you for organising QRP Valve Day. I found conditions average at best but managed a few contacts. I heard John G8SEQ on Sunday morning calling CQ on 80m with a very loud signal. I called him twice, but was unable to raise him. I heard Herman PA3ALX calling CQ on 80m but his signal was in the noise, so didn't attempt a call.

Herman is usually a good signal here, which I think was a good indicator of conditions on the day. I was using my home brew TRX3 transceiver, all solid state I'm afraid, so a bit of a cheat. However it was great fun, and good to hear quite a lot of activity, more like the old Winter Sports days. David always supports us well in activity periods for which we thank him.

Tim G4ARI 'Thanks for organising another fabulous QRP Valve Weekend with good levels of activity. I connected the Codar AT5 up on Friday evening so I could test everything ready for Saturday, and made a QSO with Jacky, F5GJV/P near Lyon at 21:47 UTC on 80 metres, so that was good news'.

Tim went on to manage 20 QSOs including one with Ludi OK1HAS who sent a recording on Tim's signal. The Codar AT5 performed flawlessly this year after he spent some time and effort replacing the Belling Lee sockets with BNC type and also replacing the valve sockets used for the power connections, see pictures below.

Gerald G3MCK A home-made valve superhet was used by Gerald along with his co/pa and an inverted vee dipole. He suffered contest QRM and local QRN but made 13 contacts in 6 countries but mostly on the Sunday. He suggests we make this a one day event, Sunday only, to beat the contest QRM. Any thoughts?



G3XJS Peter found propagation very variable, with lots of fading, but I knew there were stations active he didn't work so there were plenty of contacts to be had! He is aware, however, that local receiver noise is a major issue for many. I'm sure a Sprat article on receiving loops and other methods of combating local noise would be very welcome. Any volunteers?

And Finally

Peter GM0EUL concludes the report 'Thanks for organising the valve activity weekend again. This is the first time I've really been aware of it and tried to join in. I only managed one real contact on Saturday with Mike M6MPC using my Heathkit HW100 turned down to about 3 to 5 watts on 80m into an end-fed-half-wave.

The vast majority of my QRP valve activity was spent frantically building a transmitter that I hoped to get on the air by the end of Sunday.

Sadly it didn't quite happen but I'm almost there and I will do my utmost to have it ready for the next one and hopefully give it an airing on a Monday, maybe even next week- if it actually works without killing me. The Icom sticker is an old joke from when I last used that piece of aluminium over 30 years ago! Hope they don't see it. Thanks again. Operating is always fun but the added dimension of learning about and playing with valves for me makes it even more so'.



That folks says it all. Next VQD (Valve QRP Days) will be July 18th and 19th 2020.

72 Colin G3VTT/G5LOW

VHF Manager's report

John G8SEQ QTHR Email: john@g8seq.com

Transverters

Transverters or Transmit-Receive converters have been a popular way of getting onto the higher bands for many years now. At one time it was the only way to get onto the VHF/UHF bands to use SSB as all the ex PMR gear that could be modified for 4m, 2m & 70cm was either AM or FM. At a pinch it could be used for CW by adding a BFO.

A transverter, when driven by a fairly modern HF rig could give you all the bells and whistles of the HF rig on the VHF bands and all the modes of the HF transceiver. Nowadays if you buy a modern transceiver you get at least two of the VHF bands (6m & 2m) and sometimes UHF (70cm). However, there are still not that many rigs available that will give you 4m, the exceptions that come to mind being

The IC-847 and the IC-7300 (European model). The reason for the lack of 4m being economics. The USA doesn't have 4m & neither did Europe (except Gibraltar, Cyprus & Iceland). So there was a limited market. Oddly I'd never worked Iceland on 4m until about a year ago even though both countries have had 4m capability for decades. Normal propagation just doesn't allow it. That and the amateur population of Iceland is low, indeed so is the whole population.



The IC-7300 has 70MHz capability

But back to transverters. Ready built transverters can be bought from Kuhne for mega Euros, although they do supply a 2m kit version for about 80 Euros but only to go with the IC-7300. They may work with other rigs – you would have to ask. Their other transverters go from 4m up to 23cms

The Transverter-Store on E-bay have a large selection of VHF/UHF transverters in ready made and kit form varying from about £30 to £100 plus shipping. The store Q5 Signal also has a range of transverters which cover 4m to 23cm. Though these cost \$400 plus, mainly because they all seem to be high power items.

Then there is the second hand market. Microwave Modules, Spectrum Communications* and Meon (PW‡) sometimes crop up at rallies & I suspect many are lying unused in various shacks around the country.

One thing I should mention is, most VHF transverters convert up/down to 28MHz whereas UHF/SHF converters often use 144 or 432MHz. At least this is more usual at 23cms and above.

* See: <http://www.spectrumcomms.co.uk/Amateur.htm>

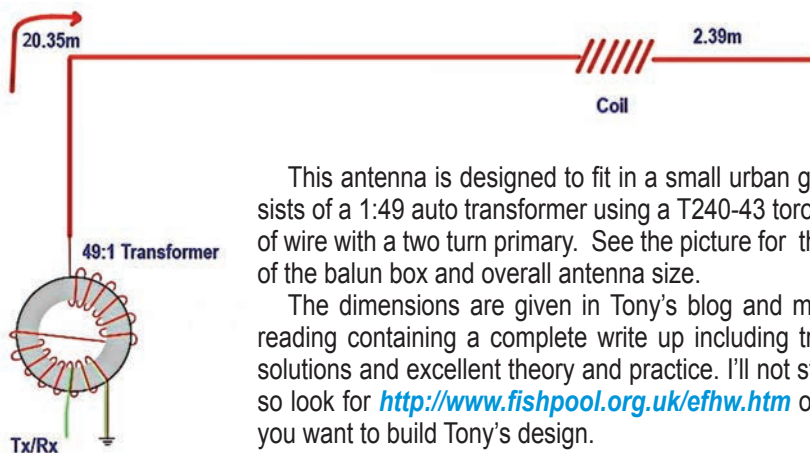
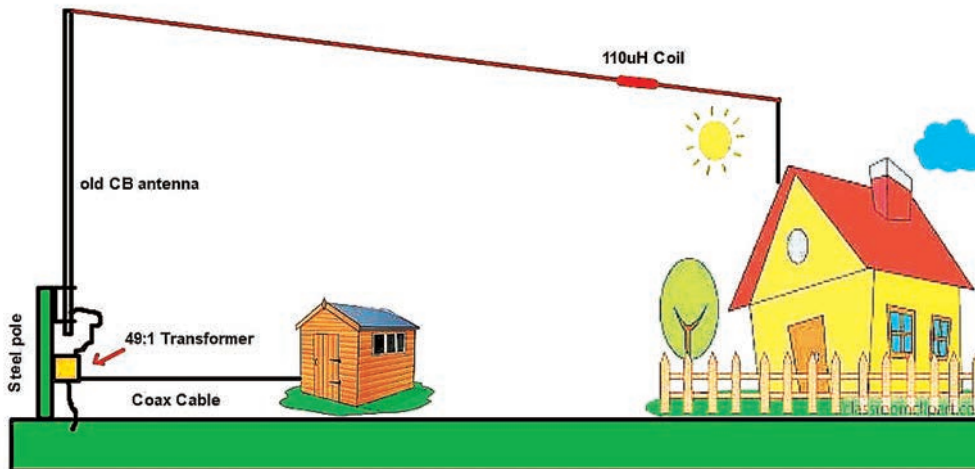
‡ The PW Meon-4 by Andy G4JNT, appeared in PWs, from May, June and July 1991
de John G8SEQ

Antennas Valve & Vintage

Colin Turner G3VTT 182 Station Road Rainham Kent ME8 7PR
g3vtt@aol.com

With everybody incarcerated at home its seems to me we've all had an unexpected chance to build and operate thrust upon us. This time has been good for QRP with more contacts being made under difficult conditions and, judging by the threads on the GQRP reflector, plenty of antenna work is being done.

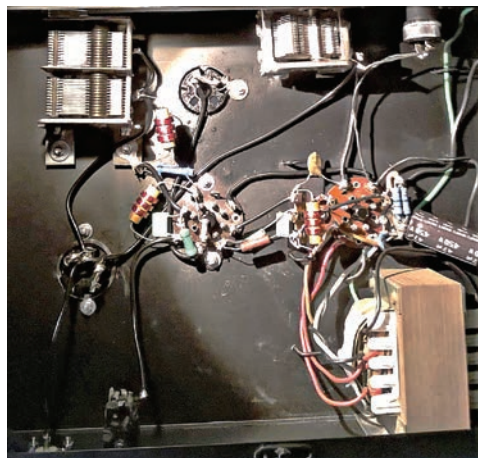
Tony G4WIF has a new found freedom now that Daphne G7ENA has kindly taken over GQRP subscriptions, (doing a great job from what I hear), and he has put it to good use by developing a new antenna system. Tony lives in an urban environment and has made good use of the plot he has and the bits and pieces lying around. Essentially it is an end fed half wave on all band using a transformer with a loading coil and Tony has supplied some excellent graphics for AVV.



This antenna is designed to fit in a small urban garden and consists of a 1:49 auto transformer using a T240-43 toroid with 14 turns of wire with a two turn primary. See the picture for the arrangement of the balun box and overall antenna size.

The dimensions are given in Tony's blog and make worthwhile reading containing a complete write up including tribulations, with solutions and excellent theory and practice. I'll not steal his thunder so look for <http://www.fishpool.org.uk/efhw.htm> on the internet if you want to build Tony's design.

David CT4RL has been working along the lines of the Ameco AC1 single valve transmitter featured a couple of years back in Sprat 166 and Sprat 182 and he has built his own from scratch using a 'Flying Tiger' key box for a chassis. Note that's a front door key box not a Morse key box! 'Flying Tigers' are a Danish company from Copenhagen selling houseware, we even have one here in Kent, and they sell some useful stuff.



Topside of the One-Valve transmitter

Underside of CT4RL One-Valve transmitter

One of my cootie keys uses a butter knife with a large wooden handle which has a wonderful soft feel to it so check this firm out. David has given us a peek under the covers of his project to show the wiring and he is about to start work on a regenodyne, (combination superhet and TRF), receiver using a blue key box. The topside is also nostalgic with plug in coils and 6V6.

Novice Round-up

Mike W3TS has sent a picture of his transmitters used in the Novice Round Up. They run a contest in the US for old time valve transmitter operated at a leisurely pace. (You don't want to strain the valves do you?). Left to right on the top row, Mike used a 12BY7/6L6 MOPA, Little Giant single 6AQ5, the 'Crystal Cracker' using a 50L6 and on the bottom row a VFO transmitter 6AH6, 6AQ5 with a 6GK6 final and



Inside Tony G4WIF's balun box

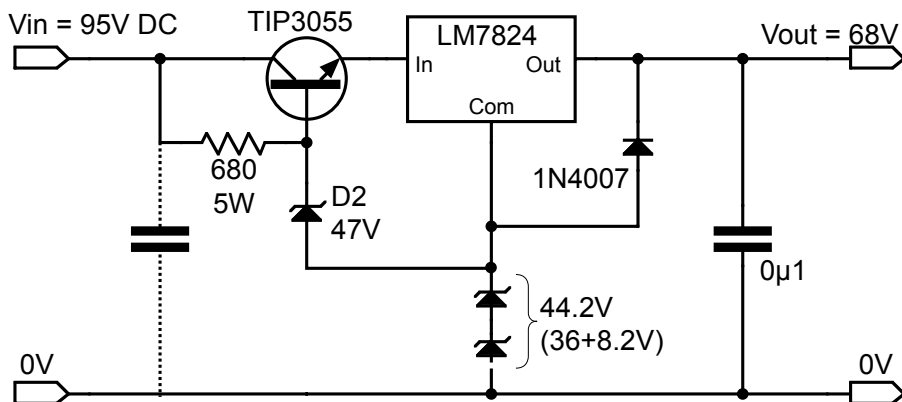


Mike W3TS's 'Old-time' valved lineup

on the right another 6AG7 with a 6T9 MOPA. If you don't understand these terms and what these valve types are then you have plenty of time to read up on your amateur radio heritage. I show these photographs to encourage you to build simple equipment but do watch your fingers with the high voltages.

Diagram Error

We get occasional errors in Sprat and there was an error on the diagram of the 70V regulator circuit provided by **N6QW** on page 30 of the last Sprat (issue 182). The diagram should show the anode of the 47V Zener diode D2 attached to the junction of the anode of the 1N4007 and the cathode of the 44.2 volt volts Zener diodes. The replacement diagram is shown here.



(My apologies for missing it initially – Ed.)

My thanks to those who operated and supported the April Valve QRP days. A report is to be found elsewhere in this Sprat and **Gerald G3MCK** has suggested we operate on the Sunday only due to contest QRM on Saturday which creeps up and around 3560 KHz. Would a single day event suit everybody? I've had a couple of folks contact me saying they prefer a two day event, even one has requested a four day event covering Friday and the following Monday, but what are your views?

The next dates are the weekend of July 18th and 19th. As usual please operate on the QRP frequencies with your old time valve equipment be it transmitter or receiver and send a short report in Word no more than seven days after the event. No logs please, it's not a contest, and circuit or antenna details would be most appreciated.

G4SST Trophy

Finally, the RSGB has seen fit to award me the **G4SST trophy** for work in QRP for which I am grateful. **George G3RJV** once told me I was 'surfing the aether with a club and bearskin like a caveman'. I prefer to view it as keeping a firm grip on the safe and enjoyable activity, reality and technology of the happier past.

There appears to be quite a following of you doing the same which I really appreciate!

Reducing Mains Noise

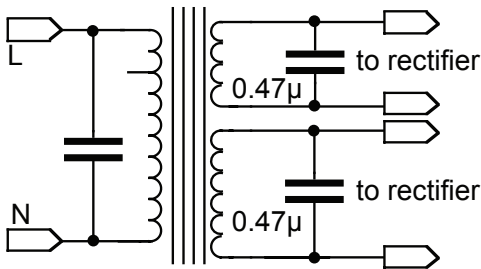
David Smith. G4COE davecoe@blueyonder.co.uk

I built a Radio 4 AM/FM fixed tuned radio for the shack, on LW 198kHz the racket was horrendous masking Radio 4, a $0.47\mu\text{F}$ 250V DC Philips metallized film on the 12V secondary did the trick - those 'orange box' types as I call them – not one squeak of noise on 198kHz except for thunderstorms.

Think about it, all the power station switching noises, voltage spikes, flash-overs and the RF racket the power lines pick up finds its way down the grid system then through the transformer, rectifier and the rest via capacitance and inductive coupling etc. ends up in the headphone or speaker.

Down the Mains

When using mains driven power supplies for radios, it's surprising how much noise comes down the AC mains, this gets into the radio via internal coupling and usually play's havoc on the LF frequencies say below 2MHz especially on the LW bands, a cure is very simple. To rid the racket one can use something like a $0.47\mu\text{F}$ metallized film across the transformer



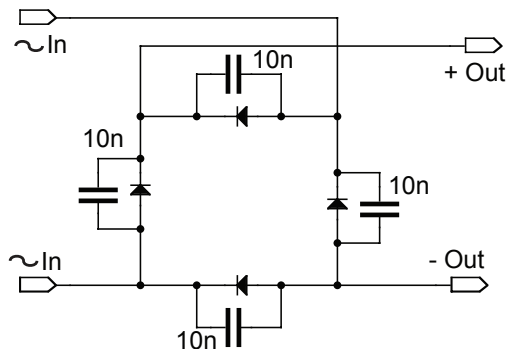
secondary windings whose DC voltage is about 4 times the AC secondary voltage, avoid Mylar, polystyrene types, better is to use one with a class X or class C rating.

For use on the Primary side which is at about 240V ac the correct type of capacitor is imperative for safety reasons and be stamped with a class rating and ARE clearly marked with the AC voltage rating, these are normally

Metallized film or Metallized paper with class X or class Y ratings stamped....

Keep clear of 'EI cheapos', no class marking then DO NOT use:

Please note this cure is for general mains noise picked up by the grid and not for local 'switch-mode' power supply noise as generated in TV's and computers etc. although it 'might' help somewhat, more elaborate filtering and screening may still prove difficult to eradicate this racket.



While at it, add 10nF disc ceramics across the rectifier diodes.

MEMBERS' NEWS

by Chris Page, G4BUE

E-mail: chris@g4bue.com
gc4bue@gmail.com



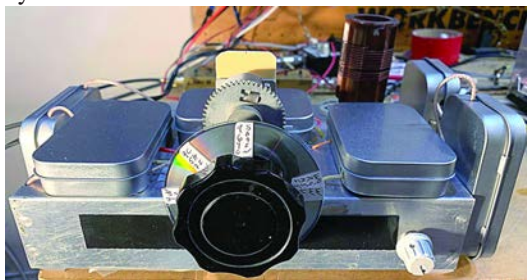
Many congratulations to my good friend **G3VTT** on being awarded the Don Cameron, **G4STT** Memorial Award, awarded annually for an outstanding contribution to low power amateur radio communication. I cannot think of anyone better than Colin to follow me from being awarded it last year. Congratulations also to **K3ESE** for a trans-atlantic milliwatt QSO in April. Lloyd said, "I pretty much never use more than 5W, but the skip sounded great a couple of days ago when I was trying out my new 80m dipole up at 80 feet, so I worked my buddy **F6HKA** with 100mW. I've done that before, but with a sked, but this time I called him at the end of his previous QSO and got a 559! That's something like 38,320 miles/watt".

2EØFRU has built a Morse Tutor kit, sold by club member **MØBMN** as Phoenix Kits (right). Chris says, "The build was fun, even with me having to desolder a couple of items, and try again. The kit has real



potential, and is crying out to have someone design a 3D-printable enclosure for it. It has an Arduino and display, so you can see the characters that are being "transmitted". **GØMGX** is pleased with his CW keyer, a variant of the **K3NG** Keyer, see <https://youtu.be/58RA2NaMXQI>. Mark also built a very simple CW TX using Arduino and some quite clever key shaping of a DDS, see <https://youtu.be/TY4nTLP3vTA>.

N2CQR had been shortwave listening with his S-38Es (right). When the Covid-19 crisis hit, Bill decided to build a 31m AM superhet, as his first lock-down project, and his Q-31 is the result. It has parts from friend's around the world - the oscillator coil is an Eddystone and may be pre-war. Bill has discovered that jazz sounds great on a shortwave receiver, and sounds even even better when the receiver is homebrew. On the *SolderSmoke* podcast, he and **N6QW** have been using a new acronym - SITS! It is what we should all do during the crisis: Stay In The Shack!



G3TPV built his latest QRP valved junk box CW rigs (right), with separate RX and TX units for 80 and 60m, during the lock-down. Alans says the TX is an EF91 xtal oscillator



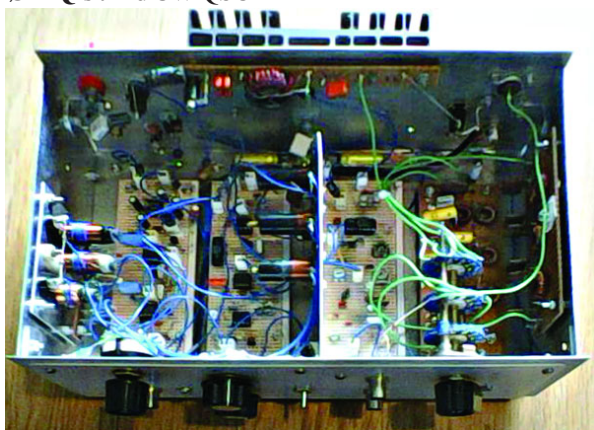
and 6A05 PA to give 4W out. The RXs are as published in *SPRAT* 182, ‘Anoder’ **G4HOJ** very effective circuit, with special features being TX and RX switching control built into the TX units with interconnecting power leads made from old octal valve bases. Each unit is built onto 6x4 copper clad boards, and the transistor battery auxiliary unit comprises side-tone RF monitor, audio booster and xtal oscillators for netting purposes - thanks **G6MNL**.



M5AML had previously used 10W for SSTV and after a long break, decided to try 5W and made 20m QSOs with **F4CYH** and **SV2HYB** (left) with reasonable signals. His homebrew computer to rig PTT/audio interface is a little unreliable and so John made a new one

with isolating transformers for the audio, and a reed relay for PTT switching. While staying home recently, he was tuning around 20m one evening and heard a strong, rasping CW signal. John replied with no luck and then realised he was tuned to his 2nd harmonic! It was **M0IEQ** on 40m, less than a quarter of a mile away, and with 5W John made his first CW QSO with him, which turned out to be **M0IEQ**'s third CW QSO!

G3XIZ has been using an active receiving loop with his SDR Play receiver but any improvement in signal to noise level appears to be only marginal. Chris made a three-band (160, 80 and 40m) QRP digital TCVR (right), and despite having several hundred ‘QSOs’ with it using FT8, says, “FT8 is an interesting mode but not for me I think”. His friend **G6XDK** bought him a QCX TCVR kit for his 70th birthday, which is now working and hopes to be used /P this summer. I was sad to learn **GM3WIL** became a Silent Key in



April. With **GM4VKI**, Dave was the local face of G-QRP in Scotland.

The **UW5ZM** QSL (right) for the CW and SSB QSOs he made with **DD0VR** when he was QRV with 5W CW and 500W SSB as **3D2VR** in September 2019. **OK1IAK** announces a new product, the Blinky SWR, a self-powered accurate QRP SWR/power meter, see <https://remoteqth.com/blinky_swf.php>. **F5VLF** has got fed up repairing his 2m x 2m loop after visits from wild beasts and, having lots of ferrite rods left over from cave radio experiments, proposes to build a couple of such antennas about a foot long, and mount them on adjacent faces of the house with a suitable phasing arrangement.

UW5ZM

Ukraine, QZ Zone 26, FTZ Zone 29
UICRS: RU21130407427874

To radio: **3D2VR**

Via: **DD0VR**

Day Mo Year	UTC	MHz	RST	Mode
28 09 2019	04:24	7	599	CW
28 09 2019	04:47	7	59	SSB

Eugene Nestorov, Chastnika, Ochakov 57500, Ukraine
e-mail: uw5zm.nel@gmail.com

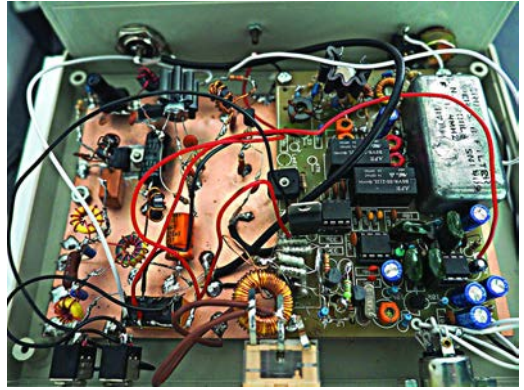
PSE QSL TNX QSL
73! Eugene Nestorov

Intrigued by the ‘One-transistor AM Top Band Transmitter’, originally published by **G3YUQ** in *SPRAT* 5 and revisited at <<https://m0ezp.squirrelhouse.biz/one-transister-35>>



topband-transmitter/>, **M1GWZ** built his own version (left). Phil says, “The only suitable crystal I had was an HC49U 2MHz one, so I removed the cover and thoroughly inked the crystal with a Sharpie pen to bring it in-band at 1.991MHz. The resulting signal has been declared readable at a distance of seven miles by **G4WPD**, despite local QRN. He later reported additional QSOs, albeit local, with **G4AWZ** (1.5 miles), **GØHYT** (2.5 miles) and **GØVDZ** (3 miles), all described as “good, copyable”.

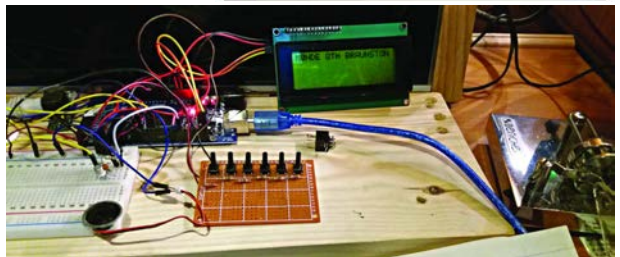
GØEBQ has just finished a 12m version of **N6QW**’s Paesano (right). Nigel says, “I get just over 2W out which is probably as good as an IRF510 can manage at 12m, and I now need some Es. **G4TGJ** made his Arduino dual-band TCVR support 20 and 80m, but put it aside to experiment with simpler circuits. Richard started with an iambic keyer using an ATTiny micro-controller as he doesn’t think anyone wants to hear him use a straight key on the air! He then made an OXO, managed a QSO on 60m and then improved the output to 1.5W. He is now working on a DC RX, experimenting with different mixers and amplifiers.



G8TMV has finally been working on v1.1 of his Quartzmite CW TCVR, an SMT version of the classic Rockmite with many of the modifications and improvements published over the years incorporated, with an output power of just over 500mW. Colin says the website for the original Quartzmite is still up at <https://www.tuckley.org/qmite/>. He still has two v1.0 boards if members would like one. The picture (right) shows a 3D image of the new v1.1 PCB generated with *Kicad* software, and was re-sized to fit in the traditional Altoids tin. If there is interest in the new boards, he will get more made and do board-level kits.



MØNDE has been living on their narrowboat on the Warwickshire/Northamptonshire border for 10 months and says the lock-down has presented some challenges and opportunities. Nigel made a real effort to have a nightly CW QSO with friend **G4UOS** in Somerset, but sadly his QRPP set-up (right) was not often good enough to rag-chew so he had to up the power. This caused problems with RF in the shack



that he fixed by improving the grounding at the base of the homebrew screwdriver 20-80m antenna, that used to be on his RV (right). His current project is the **K3NG** keyer, an Arduino project with very many options and recommends readers *Google* to find the Wiki pages about this fantastic project. Another lockdown project has been using a Raspberry Pi and radio projects, and a *YouTube* channel by **KM4ACK** has proved very useful.



OH5JJL has had lots of fun with his little MTR5B Mountain Topper antenna on 30m, his favourite band. Tuomas has also experimented with a small tuned counterpoise with the Hustler mobile whip antenna (left) and says the first tests are promising. The small tuned counterpoise is based on **G6XN**'s idea. **G3XJS** reminds us 17 June is International QRP Day which is a perfect day to fly the QRP flag on any/all bands with whichever mode(s) you prefer. Although not a contest, Peter says the Club offers an award for the best log (entries to him please).

2EØFRU also built the Phoenix Kits Flat Pack Morse key that he says is a cheap (£7 delivered) key, designed as an easy-to-build kit, making it easy for curious CW novices, clubs or using for SOTA, where you might not want to take your treasured £200 key. He adds the kit was fun to make, took about 20 minutes and there are only two components to solder.



G3CWI wondered how easy it was to tune up a mag loop by ear and was surprised at his findings, see <https://youtu.be/vk4C1V9_Otg>.

Thanks to the contributors of this column. Please tell me how your summer goes for the Autumn 2020 edition of *SPRAT*; what you have been building, who you have been working, and any other information about QRP, by 12 August. 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 your home QTH during the autumn and winter months, particularly in the Winter Sports, so I can let members know to listen out for you.

On-Air Activity

**Peter Barville G3XJS Felucca, Pinesfield Lane, Trottiscliffe,
West Malling, ME19 5EN email: g3xjs@gqrp.co.uk**

It has been a few years since I last filled the role of Communications Manager, but I'm delighted to be here again. Along with all other members may I offer my sincere thanks and appreciation to **Dom** for having filled the role so successfully in the meantime.

The world is now a very different place to what it was just a short time ago, but we are very lucky to have amateur radio as our hobby and pastime. Some might say, it's a passion! Whatever the band conditions may be we can communicate with friends, old and new, build equipment and compare notes with like-minded folk. We should not overlook just how fortunate we are.

Early in the pandemic the RSGB decided to organise the RSGB QSO Hope Party (full details on their website), with activities planned for every weekday. Although their interpretation of 'QRP' doesn't always coincide with the rest of the world, one section is designated "UK 10W Single Op" offering at least the opportunity for members to submit competitive logs. Many members, by arrangement with **Steve G0FUW**, have been using G5LOW and here is his interesting report:

The first Hope QSO Party proved to be a popular event during the pandemic lockdown. The event ran every weekday for six weeks and around 100 logs were submitted daily. A number of members activated the Club Callsign, G5LOW. At the end of the six week event, we were ranked 31 out of 285 UK entrants and 44 out of 526 overall, including overseas entrants.

Our best showing was in the UK QRP CW section, being placed 3rd, just behind **Alan, G0TPH** and **Tim, G4ARI** (both members). Interestingly, overall three of the top ten are QRP entrants, showing that there is life on the bands, and that QRP can still hold its own.

Well done to **G30TK, G0TPH, M1BUU, G8SEQ** and **G0FUW** for flying the Club flag with G5LOW, and to members **G4ARI & MW0CVT** for getting into the top ten overall listings. It is quite remarkable that Tim, G4ARI, was able to win the UK QRP sections for CW, phone and RTTY and claim 2nd place overall. Well done Tim!

At the time of writing, HQP#2 is just starting and we hope to continue the success. A report will follow in the next *SPRAT*. Although publication deadlines mean that you'll see this after the event let's hope that we see a bumper crop of entries for World QRP Day (June 17th every year) trying to win the Suffolk Trophy. Either way, whilst I appreciate that 'contests' are not for everybody, you might like to consider joining the Hope QSO Party fray from time to time. Contact Steve G0FUW to arrange permission to use G5LOW.

Do please send logs for International QRP Day (June 17th) to me asap. Contests or not, I hope you were able to be on the bands flying the QRP flag.

Colin G3VTT has been doing a grand job organising and promoting the QRP Valve Weekends, which have been proving extremely popular, and (believe it or not) it's not long before we should start thinking about Winter Sports. One way or another we all have plenty to look forward to on the bands, and if you are able to fly the flag with homebrew equipment then so much the better!

Have plenty of QRP FUN!

These are the International QRP Calling Frequencies:

CW: 1836, 3560, 5262, 7030, 10116, 14060, 18086, 21060, 24906, 28060

SSB: 3690, 7090, 14285, 21285, 18130, 24950, 28360 kHz

But they are "Centres of Activity" so please spread out if activity levels are high.

Sale of a few more remnants from George G3RJV's shack

Graham G3MFJ g3mfj@gqrp.co.uk



Thanks for all the interest that I received on this subject, I have been able to give a goodly amount to JoAnna, the club doesn't profit from this at all of course, in fact we pick up part of the postal costs. So, here are this issue's offerings.

As you can see from the pictures, there is one of George's watt meters – this is the one that he was currently using, and I personally disconnected in his shack it has an inline head unit plus a display with two meters.

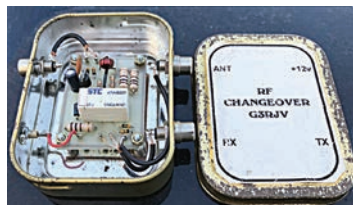
Secondly, there is another Palm Key – this time a Palm portable straight key. It looks new and is in its original box.

Thirdly, there is a tobacco tin with a RF controlled changeover. This was in his shack, but in a box and not connected up. Finally, there is, what Colin tells me, is a Joystick VFA Tuner. The older ones amongst us will remember this item – sorry the VFA is not there, but I am told that this is the tuner for it. I don't know if this is a "George" copy of the original one, but I do wonder – it looks very old! I was given a VFA many years ago, but as I lived in a house with a 300 foot garden, it didn't do anything for me – so I gave it away!

Again, I have made them open to offers, I will not sell them cheap, and I reserve the right to refuse all offers if I think they are too low. Before I accept an offer, I will ask one of the club officers if they think the offer is reasonable, so it won't be just my decision.

Offers please to me, either by email or, if you don't have email, then please drop me a line, use the address on the back of this issue of Sprat. I will not rush to make a decision, in order to give everyone time to think – I waited well over a month last time until offers stopped coming in. Interestingly, the first offer won one of the items, but he had to wait a while. There are more pictures of these items, contact me and I'll send them to you if you might be interested.

There is still a little more, but that will have to wait for room in a future issue!





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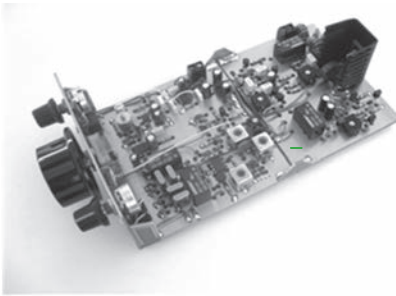
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Note: US \$ based in US \$. Prices in £ or € correct at time of writing but vary with exchange rate fluctuations.

GQR 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 <u>per book</u>
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 + 0 = 6 to 60pF) c/w shaft extension & mtg screws - £1.75 each	} £5.50 (EU); or
– 2 gang – (both 8 to 285pF) c/w shaft extension & mounting screws - £1.75 each	} £6.00 (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, 24.906 & 28.060 all are £2 each (* also in LP)	} (ANY quantity)
HC49U crystals- 1.8432, 3.5, 5.262, 5.355, 7.0, 10.006, 10.111, 11.5, 14.0, 22.0, 29.0MHz – 50p each }	
HC49U crystals – 2.00, 3.00, 3.20, 3.579, 3.58, 3.60, 3.6864, 4.0, 4.096, 4.1943, 4.433, 4.5MHz }	} £1.20p (UK), or
5.00, 6.00, 7.2, 7.6, 8.0, 9.0, 10.0, 10.10, 11.0, 12.0, 13.50, 15.0, 16.0, 18.0, 20.0, 24.0, 25.0MHz }	} £3.50p (EU) or
26.0, 27.0, 28.0, 28.224, 30.0, 32.0, 33.0, 40, 48MHz – all 35p each (Some of these are low profile)	} £4.00 (DX)
Ceramic resonators – 455, 480kHz, 2.0, 3.58, 3.68, 4.00, 7.37, 14.32 & 20.00MHz – 50p ea.	}
Diodes - Shottky signal diode – 1N5711- 20p each; 1N4148 GP Si – 10 for 10p	} <u>Post free</u>
Varicap diodes - MVAM109 – 40pF @ 9v, 500pF @ 1v. 50p each	} <u>if ordered</u>
– BB204 – twin diodes, common cathode, 15pF @ 20v, 50pF @ 1v 50p	} <u>with heavier</u>
SA602AN - £2.00 (note – I may supply NE or SA, 602 or 612 as available. (Max of 4 per member)	} <u>things</u>
MC1350 - £2.00 (Max of 2 per member)	} <u>like binders.</u>
LM386N-1 - 4 to 15v, 300mW, 8pin DIL - £0.45	} <u>toroids.</u>
TDA7052A - 4.5 to 18v, 1W 8pin DIL low noise & DC volume control – £0.60 each	} <u>polyvaricons.</u>
TDA2003 - 10w audio amp – 5 pin £0.25 each	} <u>or filters</u>
TDA8222 - 1.8 to 5v stereo amp – can be bridged. 0.5W Audio amp 8pin DIL – £0.20 each	} <u>Use just</u>
TA-7642 Radio IC – direct equivalent of MK484 (& ZN414) – 75p each	} <u>that postage</u>
BC109B (metal) (npn) fT – 100MHz, hFE-320 - 10 for 50p	}
MP5H10 transistors (npn) fT – 650MHz, hFE 60, VCEO 25V - 10p each, 10 for 80p	} <u>If parts are</u>
2N3904 transistors (npn) fT – 300MHz, hFE-150, VCB0 +40V - 10 for 50p	} <u>ordered</u>
2N3906 transistors (pnp) fT – 250MHz, hFE-150, VCB0 -40V - 10 for 50p	} <u>with books</u>
BC517 Darlington (npn) fT – 200MHz, hFE-30,000, VCB0 +40V - 13p each, 10 for £1.10	} <u>or DVDs</u>
FETs - IRF510 – 50p; 2N3819 - 24p; 2N7000 - 10p; BS170 – 8p - all each	} <u>add this</u>
BF981 – dual gate MOSFET – 40p each	} <u>postage</u>
Pad cutter - 2mm shaft: 7mm o/s, 5mm i/s diam, gives a 5mm pad with 1mm gap £6.00	} <u>as books</u>
10K 10mm coils – 1u2H, 1u7L, 2u6L, 5u3L, 11u0L, 45u0L, 90u0L, 125uL – all 80p each	} <u>or DVDs</u>
Magnet Wire – 18SWG – 2 metres – 60p; 20 & 22 SWG – 3 metres - 60p;	} <u>do not</u>
24, 25 & 27SWG – 4 metres - 40p; 30, 33 & 35SWG – 5 metres - 30p.	} <u>travel well</u>
Bifilar wire – 2 strands - red & green bonded together. Solderable enamel. 3 sizes	} <u>with parts.</u>
21SWG (0.8mm dia) – 2metres = £1; 26SWG (0.45mm dia) – 3m = 70p; 30SWG – 3m = 60p	}
Litz wire – double silk covered multi-strand wire 7/0.4mm -12p, 14/0.4mm. 25p. Both for 3 metres.	}
All our magnet wire is solderable enamel insulated. Max of 3 sizes per member per order	
QRP heatsinks - TO92 – 30p; TO39/TO5 – 40p; TO18/TO72 – 80p (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, 470 and 1000 - all uH, all 20p 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 – £2.50; T130-6** – £2.60ea. 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 - £2.40; BN61-202 - £3.40.	} 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 – these are heavy and each counts as a pack (ask for quote if you want more than 2 of the large toroids)	
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 packs. £3.75 each. Will post with parts for no extra postage.	
* 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 - £5.50, EU - £6.50, DX - £9.00	
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 info you will need to do that is –

The G-QRP Club Account, sort: 01-07-44, and a/c: 54738210

I can accept cash in GBPounds, or US\$/euros (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